

UTCC

International Journal of
Business and Economics

IJBE

Volume 3 Number 2, December 2011

- **Managing Pains of Rapid University Growth in an Emerging Economy**
Benjamin Botchway 7
- **Chinese Viewpoints of Workplace Spirituality**
Chieh-Wen Sheng and Ming-Chia Chen 29
- **Competition in Multi-Echelon Distributive Supply Chains with Linear Demand**
Deming Zhou 43
- **Enterprise Risk Management (ERM) Framework for Energy Industry**
Edward W. Sun, Ye Chen, and Svetlozar T. Rachev 71
- **Supply Chain Collaboration: A Case Study of Thai Textile-Apparel Industry**
Ekkprawatt Phong-arjarn and Chawalit Jeenanunta 81
- **C-Lope Model as Relationship Model between Job Satisfaction and Customer Satisfaction**
Janez Stare, Mitja Dečman, and Maja Klun 91
- **Perceived Effectiveness of Fear-Related and Social Disapproval Message Themes in Anti-Smoking Campaign Among the Youth in Kazakhstan**
Kim-Choy Chung and Liza Rybina 103
- **A Competitive Management Model for Thai Small and Medium Garment Entrepreneurs**
Kornkanok Jarathiranpreeda and Somchai Harnhirun 111
- **Identification of Business Risks in Management of Infrastructure Projects in Iran**
Mohammad Mehdi Mortaheb and Alireza Ahmadian Fard Fini 125
- **Thailand's Military Logistics Key Performance Indicators: A Case Study of Royal Thai Army's Medical Logistics**
S.Parapob, N. Suthikarnnarunai, and P.Buranaprapa 135



Supported by



University of the Thai
Chamber of Commerce

TMA

Thailand Management
Association



Kellogg College,
University of Oxford

Editors:

Ungul Laptaned
Suthawan Chirapanda
Gilbert Nartea

UTCC

*International Journal of
Business and Economics*

Volume 3 Number 2, December 2011

IJBE

President

Chiradet Ousawat, University of the Thai Chamber of Commerce, Thailand

Advisory Board

Chun-Ping Zeng, New York Institute of Technology, USA
Ekachai Apisakkul, University of the Thai Chamber of Commerce, Thailand
Eric Ng, University of Southern Queensland, Australia
Jang Ruy Asgarkhani, Faculty of Commerce - C P I T, New Zealand
Jason David, Centennial College of Applied Arts & Technology, Canada
John Groth, Texas A&M, USA
Kirthana Shankar, Tokyo Institute of Technology, Japan
Maruey Phadoongsidhi, Sahaviriya Group, Thailand
Michael E. Drew, Griffith Business School, Australia
Naengnoi Chai-Onnom, University of the Thai Chamber of Commerce, Thailand
Orna Lavi Eleuch, Osaka University of Economics, Japan
Rich Kim, Hanyang University, South Korea
Saowanee Thairungroj, University of the Thai Chamber of Commerce, Thailand
Steve Byers, Idaho State University, USA
Uraivan Thanasthit, University of the Thai Chamber of Commerce, Thailand
Thanavath Phonvichai, University of the Thai Chamber of Commerce, Thailand
Thasana Boonkwan, University of the Thai Chamber of Commerce, Thailand
Vacharaporn Apibunyopas, Kasetsart University, Thailand
Wanchai Rattanawong, University of the Thai Chamber of Commerce, Thailand
Ya Ling Kajalo, Helsinki School of Economics, Finland
Zhenzhong Ma, University of Windsor, Canada

Editor-In-Chief

Ungul Laptaned, University of the Thai Chamber of Commerce, Thailand

Associate Editor

Suthawan Chirapanda, University of the Thai Chamber of Commerce, Thailand

Guest Editor

Gilbert Nartea, Lincoln University, New Zealand

Secretariat

Wanrapee Banchuenvijit, University of the Thai Chamber of Commerce, Thailand

Editorial Board

Anbalagan Krishnan, Curtin University of Technology, Malaysia
Anson Ka Keung Au, The University of Hong Kong, Hong Kong
C.Swarnalatha Raju, Anna University, India
Chang-Shiann Majekodunmi, South Africa
Chen Wei Ru, INSEAD Asia, Singapore
Chian-Son Westerlund, Helsinki School of Economics, Finland
Chin-Shyh Sim, University of Qld, Australia
Chu Hui Steiner, Program Leader, University of Derby, Israeli
Chun-Huw Escalante, University of Georgia, USA
Daniel Arif, The British University In Dubai, UAE
Marc Sim, University of The Sunshinecoast, Australia
Hsun-Ming Lee, Texas State University - San Marcos, USA
Huei-Zhen Gu, Lungwa University of Science and Technology, Taiwan
I-Hua Bon, Universityersiti Tun Hussein Onn Malaysia, Malaysia
Jaroslav Laukkanen, University of Kuopio, Finland
Jasper Johnson, North Dakota State University, USA
Ly-Fie Sugianto, Monash University, Australia
Mahesha Kapurubandara, University of Western Sydney, Australia
Marc Lindblom, Helsinki School of Economics, Finland
Mehdi Asgarkhani, C.P.I.T New Zealand, New Zealand
Preeyanuch Awasthi, U.P.Technical University, India
Preeyanuch Mazumdar, National Institute of Bank Management, India
Raja John, National Institute of Technology, India
Reema Khurana, Institute of Management Technology, India
Ronald D. Awasthi, U.P.Technical University, India
Stuart Garner, Edith Cowan University, Australia
Takashi Koshida, Matsue National College of Technology, Japan
Tingyang Lewis Quynh Nhu, Vaasa University, Finland
Victoria Chen, National Chung Cheng University, Taiwan
Vineet Yamada, Nakamura Gakuen University, Japan
Wan-Shiou Hu, University of Western Sydney, Australia
Wen-Yen Edwards, University of Hawaii - Hilo, Hawaii, USA
Yikuan Lee, San Francisco State University, USA
Ying Sai, Loyola Marymount University, USA
Yong Zhen, United Int'l College (UIC), Beijing Normal University, China
Yungchih George Karjaluo, University of Oulu, Finland

Supported by



University of the Thai Chamber of Commerce

TMA

Thailand Management Association

Publisher

UP Organizer and Publication Co. Ltd., Bangkok, Thailand

Copyright © 2011 University of the Thai Chamber of Commerce and Thailand Management Association

All right reserved.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without permission in writing from the editors.

ISSN: 1906-5582

Welcome to the sixth issue of the UTCC International Journal of Business and Economics (UTCC IJBE). We, the editors, appreciate greatly the support of the University of the Thai Chamber of Commerce and the Thailand Management Association (TMA) in asking us to become involved in this endeavor as editors of the UTCC IJBE.

Over the past few years, we have noticed the rapid development of business, economics, and accountancy within the industrial, academic and governmental sectors. More and more people are talking, researching and applying business, economics, and accountancy within a myriad of contexts. There is much excitement in the field.

The UTCC IJBE has been established in response to this increased interest in business, economics, and accountancy issues as a forum for interested parties to advance their knowledge and science of the said discipline. The geographical scope of the journal is not solely limited to Thailand and the surrounding region.

This sixth issue of the UTCC IJBE represents a compilation of submitted papers. It is hoped that this issue will set a new benchmark in terms of academic publications in Thailand, especially in the field of business, economics, and accountancy.

The Editors would like to invite academicians, practitioners and policy makers to submit their manuscripts on business, economics, accountancy, and other related disciplines. Through the support of our Editorial and Advisory Board, we hope to be able to provide academic articles of the highest quality to all our readers.

Ungul Laptaned
Suthawan Chirapanda
Gilbert Nartea
Editors

The Editors

Editors-In-Chief



Dr. Ungul Laptaned is an Assistant Professor in the Department of Logistics Engineering at the School of Engineering, University of the Thai Chamber of Commerce. He graduated with a Ph.D. in 2003 from the University of Nottingham, United Kingdom in the field of Manufacturing Engineering and Operations Management. Ungul has published over 40 proceedings and journal papers, pertaining to Industrial Engineering Network, Asia Pacific Industrial Engineering and Management, International Association of Science and Technology for Development, Operations and Supply Chain Management, Intelligent Manufacturing System, Business and Information, to name a few. He served as a program chair and a steering committee for several domestic and international conferences. He is a journal editor of International Journal of Logistics and Transport, and Thai Researchers' Consortium of Value Chain Management and Logistics Journal, and has consulted for several public organizations and industrial firms on logistics and supply chain management such as Thailand Research Fund, Phitsanulok Province, Public Warehouse Organization, Amatanakorn Industrial Estate, Wyncoast Industrial Park, Iron and Steel Institute of Thailand, Chacheongsao Province, and Kerry Distribution (Thailand) Co., Ltd., JWD InfoLogistics Co., Ltd., and TKL Logistics Co., Ltd.



Dr. Suthawan Chirapanda is a full-time lecturer at the School of Business, University of the Thai Chamber of Commerce. She obtained her PhD in International Management and Marketing Strategy from Leeds University Business School, University of Leeds, UK. Her research interests are: (1) marketing strategy, (2) strategic management, (3) international business and (4) business performance. She also had attended academic conferences organized by the American Marketing Association (AMA), the Business and Information (BAI), the Research and Development, the Innovation and Design (R&DID), and the Annual London Conference on Money, Economy and Management.



Dr. Gilbert Nartea is an Associate Professor in the Faculty of Commerce, Lincoln University, New Zealand. Dr. Nartea graduated a Master's Degree from New England and a Ph.D. from Illinois, USA. He is a senior lecturer in Finance. His teaching interests are in the area of investments, futures and options, and finance, futures and options. The area of research interests area asset pricing, investment management, decision-analysis and risk management, and microfinance and poverty alleviation. He has published several papers in such journals as of Property Investment and Finance, International Journal of Managerial Finance, Asian Journal of Business and Accounting, Australian Journal of Agricultural and Resource Economics, Pacific Rim Property Research Journal, Review of Applied Economics, Review of Development Cooperation, American Journal of Agricultural Economics, and Journal of the American Society of Farm Managers and Rural Appraisers.

Foreword

Welcome to the 2nd edition of the 3rd volume of the UTCC International Journal of Business and Economics (UTCC IJBE), the Editors received a number of papers from different countries such as Germany, Hong Kong, Iran, Kazakhstan, Slovenia, Taiwan, Thailand, and United Kingdom. The submitted manuscripts for academic coverage represented the diverse scope of marketing, banking, economics, insurance and risk management, industrial and operation management, strategic management, and international and global business management. After the review process, a total of ten manuscripts were selected for publication.

The first article deals with human resources issues. This paper is authored by **Benjamin Botchway**, entitled ***“Managing Pains of Rapid University Growth in an Emerging Economy”***. This paper attempts to fill gaps in studies on growth pains of rapid growing universities in emerging economies. This action-based research work seeks to analyze rapid growth at a higher educational institution, delineate its structural and change characteristics using growth models of Larry Greiner and Churchill and Lewis as framework guide. The main findings of research are that the organization has almost gone through the creativity phase and is ending approaching the point of leadership crisis.

The second article is co-authored by **Chieh-Wen Sheng and Ming-Chia Chen**, and is entitled ***“Chinese Viewpoints of Workplace Spirituality”***. This research aimed to investigate the causal relationship of workplace spirituality with the viewpoints of the Chinese. It conducted focus group meetings with 51 workers and analyzed the most influential classics to Chinese, including Confucian Analects of Confucianism, the Tao Te Ching of Taoism, and the Platform Sutra of the Sixth Patriarch of Zen Buddhism. Results suggested that with Chinese viewpoints the causal relationship of workplace spirituality is a continuous circulation.

Article number three entitled ***“Competition in Multi-Echelon Distributive Supply Chains with Linear Demand”*** is examined by **Deming Zhou**. This research identified competition in multi-echelon supply chains with a distributive structure. Firms in the supply chain are grouped into homogeneous sectors that contain identical firms with identical production capabilities that all produce exactly one undifferentiated product. The study also discussed certain network transformation properties, and using these properties, we examine the effect of demand parameter changes and cost changes on any firm's equilibrium price, quantity, and profit.

The fourth article is conducted by **Edward W. Sun, Ye Chen, and Svetlozar T. Rachev**. Their paper is entitled ***“Enterprise Risk Management (ERM) Framework for Energy Industry”***. In this paper, it describes the approaches that can enhance business management decision making, particularly for the energy industry. By identifying and proactively addressing risks and opportunities, enterprises of energy industry could protect and create value for their stakeholders, including owners, employees, customers, regulators, and society overall.

The fifth article, entitled ***“Supply Chain Collaboration: A Case Study of Thai Textile-Apparel Industry”***, was conducted by **Ekkprawatt Phong-arjarn and Chawalit Jeenanunta**. This study aims to examine how to build SCC in Thai T/A supply chain. The forms of collaboration, the major factors affecting SCC, and the major collaborative activities are discussed in the paper. The paper proposed the collaborative index and classification of SCC. The authors selected the garment company for studying the status of SCC, the drivers and barriers of building the collaboration. The result shows the level of SCC, the drivers, and the barriers of building SCC.

The sixth paper is co-authored by **Janez Stare, Mitja Dečman, and Maja Klun**, and is entitled ***“C-Lope Model as Relationship Model between Job Satisfaction and Customer Satisfaction”***. The paper discusses a C-LOPE model, focused on the services offered by providers, which claims that the level of customer satisfaction is indirectly dependant on four factors, namely leadership, organisational climate, performance and electronic business, making a providers person, influenced by these factors, directly connected to customer satisfaction. The parameters of four factors are presented in the paper and tested in the empirical research. Preliminary results are presented and C-LOPE model modifications and improvements are suggested.

The seventh article is examined by **Kim-Choy Chung and Liza Rybina**, and their paper is entitled **“Perceived Effectiveness of Fear-Related and Social Disapproval Message Themes in Anti-Smoking Campaign among the Youth in Kazakhstan”**. This study examines the effectiveness of message theme in anti-smoking campaign in Kazakhstan using semi-structure interview. Data from 189 students revealed both fear-related (disease and death) and social-disapproval themes are perceived effective in reducing smoking behavior among the non-smoking youth in Kazakhstan. However, there is inconclusive evidence to indicate similar finding among the smoking youth.

Article number eight is entitled **“A Competitive Management Model for Thai Small and Medium Garment Entrepreneurs”**, and is written by **Kornkanok Jarathiranpreeda and Somchai Harnhirun**. The objective of this study is to develop a competitive management model for Thai small and medium garment entrepreneurs. This is a quantitative research, using questionnaires as a tool for collecting samples from 360 entrepreneurs, supporting with elaborate interviews with experts in garment business. The analysis will use technical statistic information.

The ninth article entitled **“Identification of Business Risks in Management of Infrastructure Projects in Iran”**, and is written by **Mohammad Mehdi Morteheb and Alireza Ahmadian Fard Fini**. This research is aimed to outline some of the crucial business risks associated with execution and management of infrastructure projects in Iran, from contractors’ point of view. To meet research objectives, a succinct literature review was conducted for investigation of suitable risk identification methods and exploration of discovered risks from identical contexts in other similar countries.

The last but not the least, the article is written by **Supamanat Pharphop and Nanthi Suthikarnnarunai**, and entitled **“Thailand’s Military Logistics Key Performance Indicators: A Case Study of Royal Thai Army’s Medical Logistics”**. This research study, therefore, will develop key performance indicators in logistics, especially in medical corps logistics. The main objective is to identify the indicators that can be used for developing the model in solving any military logistics problems such as mathematical model or simulation model as a quantitative tool. The study also proposes the mathematical tool and mechanism to support the theoretical framework by using logistics key performance indicators.

May you find these articles informative and substantial for further discussion to advance our existing knowledge in the application of Business, Economics, and Accountancy.

The UTCC International Journal of Business and Economics’ Editorial Board and its Editors would like to welcome future submission from interested parties to make this journal your forum in sharing ideas and research findings.

Ungul Laptaned
Editor-In-Chief

Suthawan Chirapanda
Associate Editor

Gilbert Nartea
Guest Editor

Contents

Managing Pains of Rapid University Growth in an Emerging Economy Benjamin Botchway	7
Chinese Viewpoints of Workplace Spirituality Chieh-Wen Sheng and Ming-Chia Chen	29
Competition in Multi-Echelon Distributive Supply Chains with Linear Demand Deming Zhou	43
Enterprise Risk Management (ERM) Framework for Energy Industry Edward W. Sun, Ye Chen, and Svetlozar T. Rachev	71
Supply Chain Collaboration: A Case Study of Thai Textile-Apparel Industry Ekkprawatt Phong-arjarn and Chawalit Jeenanunta	81
C-Lope Model as Relationship Model between Job Satisfaction and Customer Satisfaction Janez Stare, Mitja Dečman, and Maja Klun	91
Perceived Effectiveness of Fear-Related and Social Disapproval Message Themes in Anti-Smoking Campaign Among the Youth in Kazakhstan Kim-Choy Chung and Liza Rybina	103
A Competitive Management Model for Thai Small and Medium Garment Entrepreneurs Kornkanok Jarathiranpreeda and Somchai Harnhirun	111
Identification of Business Risks in Management of Infrastructure Projects in Iran Mohammad Mehdi Mortezaei and Alireza Ahmadian Fard Fini.....	125
Thailand's Military Logistics Key Performance Indicators: A Case Study of Royal Thai Army's Medical Logistics S.Parapob, N. Suthikarnnarunai, and P.Buranaprapa	135
Guide for Authors	167

Managing Pains of Rapid University Growth in an Emerging Economy

by

Benjamin Botchway

Eliane-Green Tech

15 Wenesleydale Road Birmingham, B42 1PR, UK

Tel: 0044 (0) 794 88 44 831,

Email: Benjamin.botchway@gmail.com

UTCC
*International Journal of
Business and Economics* **IJBE**

Managing Pains of Rapid University Growth in an Emerging Economy

by

Benjamin Botchway

Eliane-Green Tech

15 Wenesleydale Road Birmingham, B42 1PR, UK

Tel: 0044 (0) 794 88 44 831,

Email: Benjamin.botchway@gmail.com

Abstract

Growth is essential to development. But, when its pace is fast, a whole range of problems such as human resources, managerial control and finance and information technology can result. Besides, when development is jettisoned primarily by volumetric expansion rather than innovation and operational excellence, the organization will certainly experience growth pains. This paper attempts to fill gaps in studies on growth pains of rapid growing universities in emerging economies. This action-based research work seeks to analyze rapid growth at a higher educational institution, delineate its structural and change characteristics using growth models of Larry Greiner and Churchill and Lewis as framework guide. The main findings of research are that the organization has almost gone through the creativity phase and is ending approaching the point of leadership crisis. On the basis of research findings, a number of recommendations have been made which have to be taken as a matter of urgency. These include management, human resources, financial and marketing related strategies.

Keywords: Growth, Growth Model, Managing Change, University

1. Introduction

Rapid-growth companies play important role in local and international economies. Managers strive to manage their growth processes and attendant challenges with the view to sustain competitive advantage during the different phases of growth. Research analyse rapid-growth companies including high-technology and low-technology firms and how they adopted management practices to build the necessary entrepreneurial capacity to sustain growth (Garnsey et al., 2006; Louvion & Martens, 2006; Packham, 2005; MacPherson et al., 2004). However, little or no research focuses on educational organisation per se. Robert Lowe's (2002) case studies focus on university-based start-up firms, but not universities start-ups themselves. The key aspect of his finding was that technology was transferred into universities from corporate laboratories rather than the other way round.

The aim of this paper is to review an unfolding developmental process and attendant challenges of the American University of Nigeria (AUN), a private university institution (Botchway, 2010) based on the phase and stage models of Larry Greiner (1972), and Churchill and Lewis (1983). The five key questions of research conducted in 2009 included: a) How can university growth be measured? b) How is leadership crises related to growth? c) What environmental risks and threats

emanate from growth? d) What are the management style and impact? and; e) What are the growth challenges and opportunities?

On the basis of the Life Cycle development model used in this study, two main propositions can be drawn. First, when management holds their grip on operations, there will be little or no: a) delegation and decentralization of operations; b) use of teams and collaboration systems, and; c) formalization of transactions and operations. Second, there is no significant difference in the perceptions of staff/tutors and management with reference to: a) concerns about organizational success; b) concerns about maturity, and; c) formalization of transactions and operations as the institution grows. These propositions are examined in the light of data on the growth paths of the educational institution. Further analysis including an aggregate comparison of the institution with other institutions' growth paths and organizational challenges is envisaged. Structurally, this paper includes a review relevant literature or organizational growth and related models, research methodology, industry and company background, findings and discussion, and conclusion and recommendations.

2. Review of Literature

Salmi (2010) lists ten errors of building a world-class university. The list includes: a) too much emphasis on infrastructure and little forward planning; b) late curriculum development; c) concept importation or replication; d) poor leadership and lack of team building; e) cronyism at board/governors level; f) poor costing, financial and sustainability planning; g) over-ambitious enrollment targets; h) impatience; i) poor capacity planning and imbalance in local-foreign academics mix. The problems are noteworthy, but are neither listed according to hierarchy of importance, nor attributable to a particular stage in institutional growth. University growth and impact on the environment is described by Kravits' (2010) report on American University's (Washington DC) commercial/financial growth at loggerheads with the immediate property business and Stent's (1978) research on Brazilian universities' growth impact on labour market and politics.

Railsback (2007) describes using organisational life cycle framework a 'long and delayed childhood' of George Fox University and its rapid growth in the late 1980s due mainly to a) the entrepreneurial style of the president; b) new marketing and recruitment strategies; c) development of new undergraduate and graduate programmes, and; d) mergers and acquisitions.

In the main, two approaches to analysis of rapid-growth of organisations can be identified. These include the *Life Cycle* perspective which sees growth as a natural evolutionary phenomenon and the *Strategic* perspective which sees growth as a consequence of choice.

Rapid-growth process entails fast short term increases in areas such as sales, volume or productivity, people, and costs. Sudden changes can evoke side effects that risk company's profitability and future prospects. The sources of change are both external and internal. The former includes competitors, suppliers, customers, the labor force, the prevailing economic climate, and the legal environment. The internal sources of change exists within the organization itself and includes shifts in workers' attitudes, declines in productivity, and changes in key personnel. Rapid-growth usually requires detailed planning, reinforcement of objectives and organization-wide transition. The skills and capability for early awareness and management of rapid growth and its side effects are crucial.

Mintzberg (1978) and Flamholz (1990) are representatives of the *Strategic* choice perspective to firms' growth. Mintzberg (1978:72) notes the impact of evolutionary change on strategies, structures, and culture. He states: ".....long period of evolutionary change is suddenly punctuated by a brief bout of revolutionary turmoil in which the organization quickly alters many of its established patterns. In effect, it tries to leap to a new stability quickly to re-establish an integrated posture among a new set of strategies, structures, and culture". Mintzberg's (1983) typology of structural forms indicates structures shift during organisations' lifespan. The differences in the structural forms are determined by the coordinating mechanisms, location of power, flow of authority and decision making and extent of formalization and specialization. It follows that although hybrid forms are possible, turbulence and contradiction is to be expected as organizations shift away from one particular form towards another, even if the process of change is a deliberate one.

Flamholtz (1990) noted that organization structures and managerial competences are required when small, entrepreneur-driven businesses grow into larger, professionally-managed ones. He argues that strategic planning in younger and smaller companies tends to be based either on personal feel or intuition, or on fire fighting approaches. Such organizations will undergo a great deal of pain and distress unless those in the strategic apex learn to adopt rational and systematic approaches to strategic decision making and organizational redesign as their organization grows (Vechhio, 2006:367; Vic, 2007).

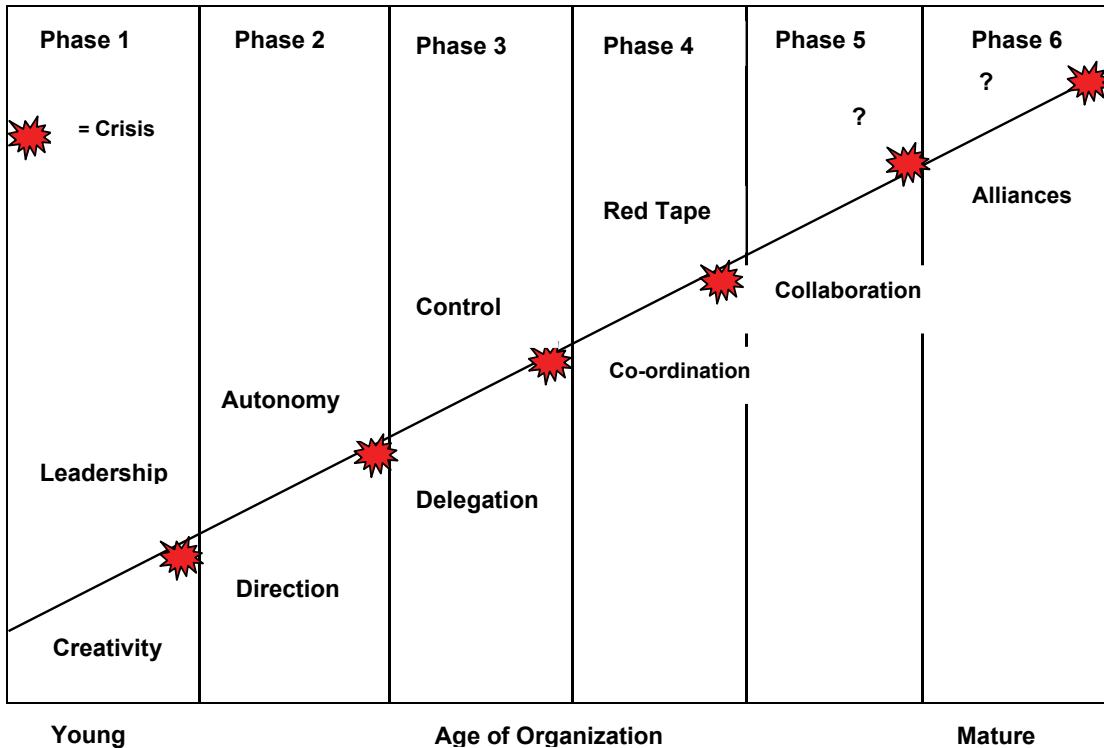
Greiner (1972), Churchill and Lewis (1983), Scott and Bruce (1987), Kazanjian (1988), and Gornsey (1996) epitomise the *Life Cycle* perspective. The traditional linear models of Greiner (1972), and Churchill and Lewis (1983) which consider conceptualize firms' growth as a sequence of growth stages through which all companies advance (Gorman & McCarthy; 2000). Greiner's (1972) model, one of the earliest growth models identifies five stages (now six) or phases of growth.

Greiner (1972) argues that growing organizations move through five (now revised to include a 6th phase) relatively calm periods of evolution, each of which ends with a period of crisis and revolution (Figure 1). Each *evolutionary* period is characterized by the dominant management style used to achieve growth. The corresponding *revolutionary* period is characterized by dominant management problem that must be solved before growth will continue. To make a successful transition and evolve from one stage to the next, Greiner argues that an organization must overcome a '*crisis*' in management. Since, the word '*crisis*' normally connotes a negative turning point, we may substitute this for '*transition*'.

The five phases of growth and the matching crisis of the model include: a) Creativity/Leadership; b) Direction/autonomy; c) Delegation/control; d) Coordination/red tape, and; e) Collaboration/crisis undetermined.

Phase 1 Creativity / Leadership: Founders of the organization dominate this phase. Their main emphasis is on creating both a product and finding a market and are usually more focused on technical and entrepreneurial activities than management ones. They put all their efforts in making and selling a new product. Management problems occur when the organization starts to grow. These cannot be handled through informal communication and dedication. Thus, founders could find themselves carrying unwanted management responsibilities. In this phase, a crisis of leadership occurs and the first revolutionary period begins. There is a need to solve management problems by finding or locating a good and capable manager who can pull the organization together. This leads to the next evolutionary period called *direction*.

Phase 2 Direction / Autonomy: During this phase, the new manager and key staff need to focus on instituting direction, while lower level supervisors are treated more as functional specialists than autonomous decision-making managers. Lower level managers demand more autonomy and this eventually leads to the next revolutionary period - the crisis of *autonomy* and the best solution to this is usually greater delegation.



Source: Greiner, L. (1972)

Figure 1 Greiner Growth Phase Model

Phase 3 Delegation / Control: During this phase managers give up responsibility. But lower level managers are not accustomed to making decisions for them. As a result many organizations flounder during this revolutionary period of delegation and the organization usually begins to develop a decentralized structure company-wide which drives motivation at the lower levels. The next crisis begins when top managers perceive they would lose control over a highly diversified field of operation. The crisis of control often results in a return to centralization, which could be inappropriate and can create as a result a negative feeling among those who had lost influence.

Phase 4 Coordination / Red Tape: This phase is characterized by the use of formal systems to achieve greater coordination by top management. Often, coordination systems eventually get carried away and this leads to the next revolutionary stage - the crisis of *Red Tape*. This crisis must often occur when the organization has become too large and complex to be managed through format programs and rigid systems.

Phase 5 Collaboration /?: This phase begins just after the company has managed to overcome the crisis of *Red-Tape*. While the coordination phase was managed through formal systems and

procedures, the collaboration phase emphasizes a major spontaneity in management actions through teams and the skillful management of interpersonal differences. Initially, Greiner was not certain about the next revolution stage. But, he indicates this would centre on 'psychological saturation' caused by an exhausted intensity of teamwork and the heavy pressure for innovative solutions.

Phase 6 Extra-Organizational Solutions: This recently added sixth phase suggests that growth may continue through merger, outsourcing, networks and other solutions involving other companies. Growth rates will vary between and even within the phases. The duration of each phase depends almost totally on the rate of growth of the market in which the organization operates. The longer a phase lasts, though, the harder it would be to implement a transition. Churchill and Lewis (1983) identified five stages of small business growth namely, existence, survival, success, take-off and resource maturity.

Stage I Existence: The company is alive and in its simplest format to start with research of customers and develops if appropriate new or better suppliers. Management in this stage is directly supervised by the owner(s). The company is vulnerable to failure if there is inadequate management of the above-mentioned issues.

Stage II Survival: The organization at this stage has managed thanks substantial customer stock to remain active. Special focus is on financial items like cash flow, profitability and assets. The organisational structure is usually the same as in the *existence* stage. The owner(s) is/are still capable to supervise the business directly. Some organizations start to enjoy high demand of their products or services. Their goal is to satisfy new customers using existing resources. Survival and growth are the overarching aims.

Stage III Success: At this stage, the organization has two main orientations: invest success dividends for further growth, or enjoy or spend the wealth accrued, or 'disengage' from the business. Disengagement is a sub-stage in which the organisation enjoys profitable and stable business: customers' demand is satisfied and market penetration is substantial. The organization grows and there is the need to engage more people in order to operate successfully. Owners have to start to delegate responsibilities. Some organizations stay on long term in this *disengagement* sub-stage. But, this depends on how large the market segment is. Financial health and growth capabilities are characteristics. An extension on original strategic plan is necessary and the organizational structure required here is basically the same as in the first sub-stage: more people and delegation of responsibilities. If everything works well, then the organization is ready to proceed to the next stage.

Stage IV Take Off: Churchill and Lewis consider this fourth stage as very important in every company's life cycle. The main issues in this stage are management of rapid-growth and how to finance it. They company would enjoy a positive and healthy growth if both issues are controlled and managed. At this stage cash flow should be an existent commodity and the costs must be kept under control. A company at this point is very vulnerable to failure. If growth comes too fast, the company runs out of cash and owners loose total control, the company may go out of existence. Managers who are competitive would succeed in this stage.

Stage V Maturity: This last stage focuses on desirable management skills to consolidate and control profits. Business reviews and flexible business plans are deemed necessary. Growth is not presumed in this model. However, Churchill and Lewis used a much broader set of measures including firm's size, complexity and diversity with the view to address some of the shortcomings associated with Greiner's model which is limited only to small and growing firms. The model focuses largely on

internal organizational issues. Scott and Bruce (1987) extended the model to include managerial and industry issues.

The growth models suggest that in order to make organisations continue to grow beyond a certain point entrepreneurs or managers must be prepared either to change their values-in-use about organizing so as to match these to the life-stage of their companies. Else, they must be prepared to face premature stagnation, decline and perhaps death. The models are descriptive and help to understand why certain management styles, organizational structures and coordination mechanisms work or fail at certain phases in the development of an organization. Hizon and Bronson (2004) used the growth model to analyse strategies of innovative technology adoption at certain growth phases of organisations' life cycle. Feindt, Jeffcoate and Chappell's (2002) work identified critical success factors for rapid growth in SMEs' e-Commerce.

The stage models have been criticised, because of the following presumptions that: all firms pass through the same sequence of phases; measures firm's size only in terms of annual sales and number of employees, and; early stage or start-up phase of a firm is automatic. Greiner's model focuses less on knowledge-based businesses. Generally, the growth models do not emphasize on internal organizational issues and how organization structure must change and adapt from one stage to the next. Storey (1994) criticises the models for being merely descriptive rather than predictive. He suggests that three critical and interrelated factors need to be considered in order to gain proper understanding of small firms' growth namely, the background and resources of the entrepreneur, the nature of the firm itself, and the strategic decisions taken the owner/manager. Also, Garnsey (1996) is of the view that greater emphasis need to be placed on role and impact of external environment and stakeholders when explaining a firm's growth process. Despite, their imperfections, the phase model of Churchill and Lewis offers management analyst "the ability to foretell what is going to happen tomorrow, next week, next month, and next year - and the ability afterwards to explain why it didn't happen" (Churchill & Lewis, 1983:49).

4. Methodology and Techniques

The rationale for this action-based research (Somekh, 1995:34) is four-fold: *practical* in that this work deals with a real-world issue in an educational organization settings; *change* is required as an integral part of this research; the *cyclical process* of this work involves feedback loop in which the original findings will generate possibilities for change in the organization, and *participatory* in that the author was active and not passive in this research work (Denscombe, 2004:73-74). The research approach has several advantages in that it contributed to professional self-development of the author and offered a good opportunity for resolving practical issues and problems of organisation growth in an educational institution. However, this action research suffers the limitations of scope and scale required for making generalizations, feasibility of exercising controls over factors of relevance to research and adopting a wholly impartial approach to research (Susman & Evered, 1978).

A stratified sampling technique was used to select respondents. The sample population is 33 or 17% of total population N=193. Two main respondent groups- 26 (78.7%) academics and staff, and 7 (21.3%) managers- were interviewed after a semi-structured pilot survey. The feedback was integrated into a semi-structured questionnaire. Likert-scale questionnaire statements devised focused on three key issues namely, the description of rate of organizational growth, organizational concerns, and perception about management styles and approaches. Besides, other triangulation techniques including observation, focus group discussions and documents were used to enhance

validity of data. The questionnaire tool was economical and easy to complete by respondents, code and process. However, some respondent might have perceived that it provided little opportunity for making further comments to the questionnaire statements.

Although several measures were undertaken to increase reliability and validity of research, readers need to be cautious drawing generalized conclusions based solely on this work. Basically, the limitations of the research methodology are four-fold: the generality of the findings; small, but statistically valid sample size 33 respondents; partial organizational perspective based on a single case study, and; limited coverage of study (other educational institutions could have been included).

5. Background to Education Industry and Institution

Higher education in the Country area embraces all institutions that provide post-secondary education leading to the award of degrees, certificates and diplomas. Currently, there are 53 universities, 41 polytechnics, and 62 colleges of education. The universities include 41 conventional universities, 9 technological universities and 3 agricultural universities which provide teaching, research and development and community services.

Despite substantial increases in the number of institutions, demand for university education in recent years far exceeds supply. Also, there has been considerable increase in the number of private university establishments. This is mainly due liberalization and expansion of higher education provision. Private sector participation shows that higher education cannot be financed solely by the government, and that other forms of provision are required to augment dwindling resources yearly earmarked for higher education through government efforts. Majority of the private universities are joint-venture partnerships owned and financed by religious and corporate organizations. Students' enrollment continues to increase in line with demographic trend. However, the number of academic staff has not kept pace with such increase: the result has been a significant deterioration of student-academic staff ratios. The majority of universities have begun to develop collaboration networks with the view to supplement income and support growth.

AUN was founded in 2004 as an international private institution with its academic programmes built on models of national and international accreditation standards. The institution has created opportunity for 2,000 students (2007) during its short lifetime. The continuous increase in enrollment and rapid organic growth has created the need for better structures, management styles and approaches. Table 1 is a SWOT analysis of AUN. It delineates strengths and opportunities which the institution could take advantage of, weaknesses which could be managed and the threats which could be eliminated or otherwise confront the institution at unawares.

Table 1 SWOT Analysis

Strengths	Weaknesses
• Achieved accreditations. • 'Best of two worlds' – Nigerian cum American Higher Education systems. • Dynamic and growing institution. • Supportive AUN community. • Credible and career-oriented programmes. • Highly qualified and dedicated national and international faculty. • Safe learning environment.	• Unique niche (teaching, research and service). • Inadequate faculty to meet growth needs. • Narrow programmes. • Inadequate knowledge of market. • Limited assessment of learning outcomes. • Space (offices and classrooms) limitations.

• State-of-the-art physical facilities and ICT enabler.	• Construction work-in-progress. • Lack of strategy focus.
---	---

Opportunities	Threats
• Increased demand. • Growth in quality and number of enrollments. • External relations. • Funds and grants. • Distinct niche (teaching, research and service). • Continuous improvement.	• Pains of growth. • Increased competition. • Shortage of academic staff. • Reduced funds and grants. • Volatile political climate. • Other risks and uncertainties.

6. Results and Discussion

The Cronbach (1951) Alpha ($\alpha = 0.70$) showed high internal consistency and reliability of the questionnaire model employed. The response rate was 100%. Figure 2 indicates a general slight variation in responses to the questionnaire statements. For example, the standard deviations around the mean responses for growth in number of degree programs and number of students enrolled yearly were relatively small ($\sigma = 0.8$).

Rate of Growth: Perceptual measures about the rate of growth at AUN covered six areas of business process: a) number of degree programs; b) number of published research; c) number of students enrolled yearly; d) capacities of physical planning and design; e) cost of campus site maintenance, and; f) instructor-student ratio. These areas were seen to be vital measures of performance.

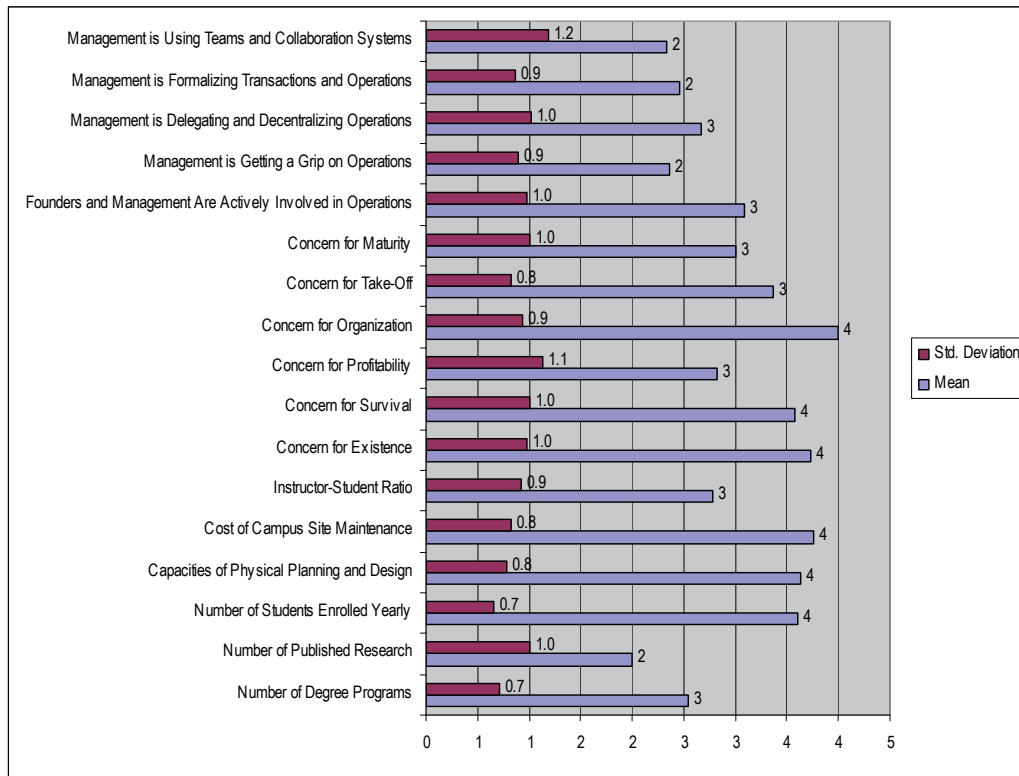


Figure 2 Descriptive Statistics

As shown in Figure 3 , growth in terms of costs of campus site maintenance (18.2%), capacity expansion of physical planning and design (12.1%) and number of students enrolled yearly (3%) have been rapid to extremely rapid. These developments contrast markedly with the very slow pace of growth in the areas of published research output (36%), instructor-student ratio (9.1%) and number of degree programs on offer (9.1%).

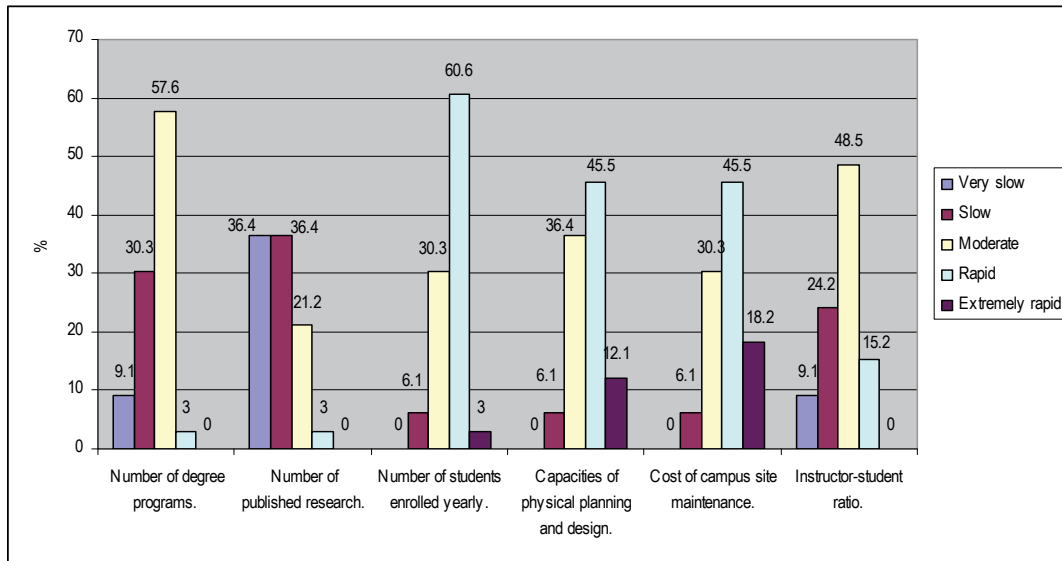


Figure 3 Rate of Growth

The very slow growth rate of research publication output can be inferred from unhelpful academic policies which tend to de-motivate and stifle academic research pursuits. It was noted that since last year, academics had to finance themselves 50% share of costs of logistics and expenses pertaining to domestic and international conferences attendance and other research projects. Besides, the poor instructor-student ratio places greater burden on academics, leaving them with little or no time for research, university-industry engagements and development and management of research projects and fund-raising activities.

Leadership Crisis: To ascertain the level of importance (1-5, where 1 is unimportant and 5 extremely important) which respondents attach to concerns about rapid growth, six questionnaire statements were constructed: a) concern about existence; b) concern about survival; c) concern about success in terms of profitability; d) concern about organizational success; e) concern about take-off, and; f) concern about maturity. Analysis of responses is depicted in Figure 4. A relative large number of respondents were doubtful about success. About 36% were extremely worried about the general management, whilst 33.3% saw the need to revamp the institution all together with the view to reinvigorate management for transactional leadership which visible and palpable. A respondent preferred a somewhat '*management-by-walking*' approach be encouraged. Some 18% of respondents perceived existential problems besetting growth as extreme cause for concern.

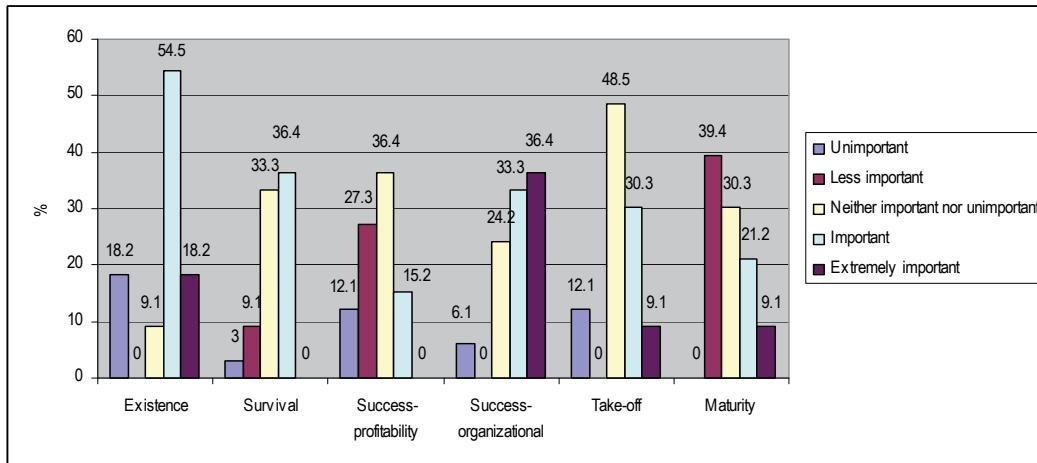


Figure 4 Organizational Concerns

Environmental Risks and Threats: About 73% of respondents believed some immediate and existential problems are there awaiting AUN as it rapidly grows. Observations seem to corroborate this fear as the political and social environment in which the organisation operates has not been favorable to the young, private-owned joint-venture.

Strong Management Grip: The role of the managers is bound to change with the different phases of organizational growth. Arguably, top management has almost managed single-handed since the start-up in 2004. Evidence show that top management still supervised many operations themselves and seems reluctant to expose the ‘inside’ of management to the public and/or let go the grip on helm of affairs. This management style of ‘grip and exclusion’ seems to preclude inflow of ‘other’ ideas and cross-fertilization of knowledge and innovation and ossify a culture of mistrust. If this culture exists for long, it would have deleterious effect on motivation, productivity and growth itself. At some point in time management would have to delegate some functions and assume new and sometimes unknown managerial responsibilities.

In order to locate where AUN lies in the organizational growth trajectory, five questionnaire statements were presented. These attempted to measure perceptual levels (1-5, where 1= very low and 5 = extremely high) about management operations: a) founders and managers are actively involved in operations of the organization; b) management is getting a grip on operations; c) management is delegating and decentralizing operations; d) management is formalizing transactions and operations, and; e) management is using teams and collaboration systems.

Inaccessibility: Results are depicted in Figure 5. Evidence showed that the vigour and vibrancy of founders and top management in all activities across the board during the early part of start-up. This has significantly tapered off if not ceased entirely. Response, especially from top management to growth needs have been moderate to very low. This contrasts markedly with the early start-up engagements when full-house Board meeting sessions were held and regular tours to campus, surprise visits to classrooms, study sessions, cafeteria and dormitories, and informal rapport with students took place. The main explanation to the low level engagement of management/founders given was the effects of either changing roles or problems of role definition.

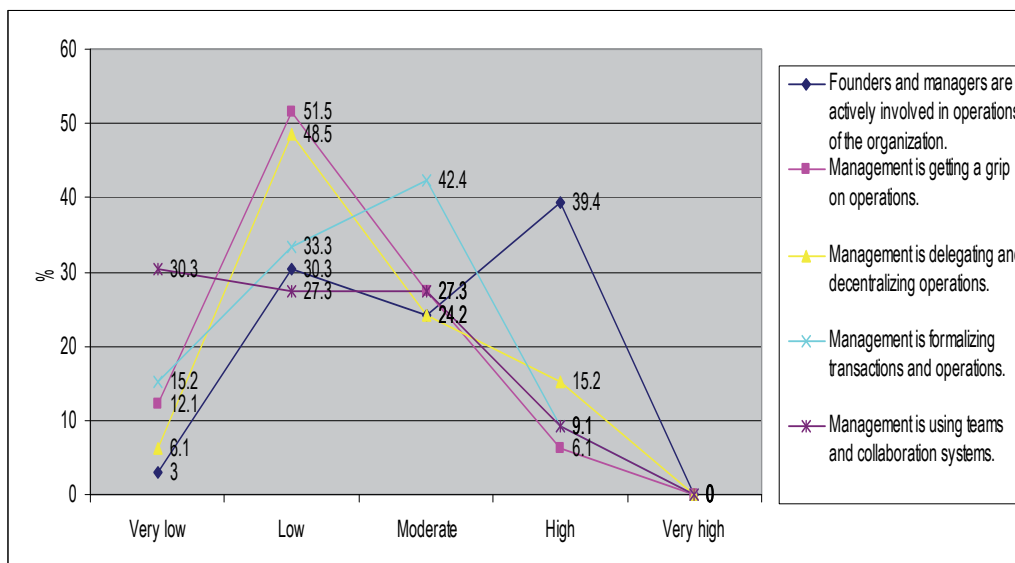


Figure 5 Perceptions about Management Operations

Lack of Strategy Focus: Half (51.5%) of respondents perceived management has tightened their grip on operations as the institution grows rapidly. It appeared this style of management and rapid growth, especially in student numbers and infrastructures caused management to loose visibility and control over operations. Recent incidents such as inconsistencies in students' pre-registration exercises, delays in arrival of student textbooks ordered from abroad, conflicting examination schedules, information overload and communication breakdown, conflicting roles, staff and students' disenchantment all go to explain lack of strategy focus.

Structural Inconsistencies and Misinformation: Evidence shows that communication is infrequent and informal, and structure is non-existent or rudimentary. The comments of a director about roles, responsibilities and structural dysfunction paint a good picture of the structural problems:

"The confusion here is that maintenance requests should be forwarded to HR but the help line is in the hands of [planning, physical development unit] personnel. Or have you transferred the maintenance supervisor from ... to HR so that he take his orders from there and report there as well? [AUN] is becoming a magical institution.... the more I look these days, the less I see and the more I read, the less I understand. Please let us not run away from reality. If there is a problem somewhere, is better we identify it and solve rather than creating more confusion."

Since management is not doing well by letting off their grip on operations, it logically follows that the pace of delegation and decentralization of function vis-à-vis rapid growth is very low. It seems the organization is not reaping the benefits of decentralization which include enhancement of employee motivation, performance, satisfaction, creativity, involvement, commitment and consequently increased productivity. Respondents (30.3%) perceived very low efforts made by management to exploit the benefits of teamwork and collaboration for competitive advantage. Globalization and national differences make the nature of teamwork and collaboration important at AUN (Klein & McHugh, 2005). Teaching and learning are complex tasks that demand expertise in domains beyond the competencies and creativity of one person or nationality. It seems management has not fully realized the national differences of staff and may run the risk of inefficiencies, communication barriers, and coordination breakdowns. Until it realizes this fact and

grows effective teams and collaboration systems, it would find it hard to leverage expertise, effort, commitment, and adaptability for its goal achievement.

7. Further Analysis

Further analysis using Factor Analysis was made to get an insight into the relationships between the 17-item questionnaire variables and reduce them to a meaningful set which best explains the growth model. After a closer examination of the correlations between the 17 variables in the research instrument, two main issues came to the fore. These included the issues which pair of variables could be a sufficient substitute for the others and whether the elimination of a set of paired variables would be justified without the loss of detail whilst isolating the pattern of perception that respondents perceive as being the crucial factors for explaining rapid growth and its consequences.

The solution to the two issues raised appeared to lie in Principal Component (PC) analysis which is a major procedural stage in Factor Analysis (Cooley & Lohnes, 1952). The correlation map in Figure 6 shows interesting linkages between sets of pair variables (*where $r = 0.5$ is strong positive correlation*). Overall, strong positive correlations were identified within the growth stage variables: a) 'Founders and managers are actively involved in operations of the organization' and 'Management is getting a grip on operations' ($r = 0.6$); b) 'Management is getting a grip on operations' and 'Management is delegation and decentralizing operations' ($r = 0.6$); c) 'Management is delegation and decentralizing operations' and 'Management is using teams and collaboration systems' ($r = 0.6$). Another strong positive inter-group linkage exist between growth rate and organizational concern: 'Number of published research' and 'Take-off' ($r = 0.6$). The organizational concern variable 'Take-off' again correlates positively with the growth stage variable "Management is delegation and decentralizing operations" ($r = 0.5$).

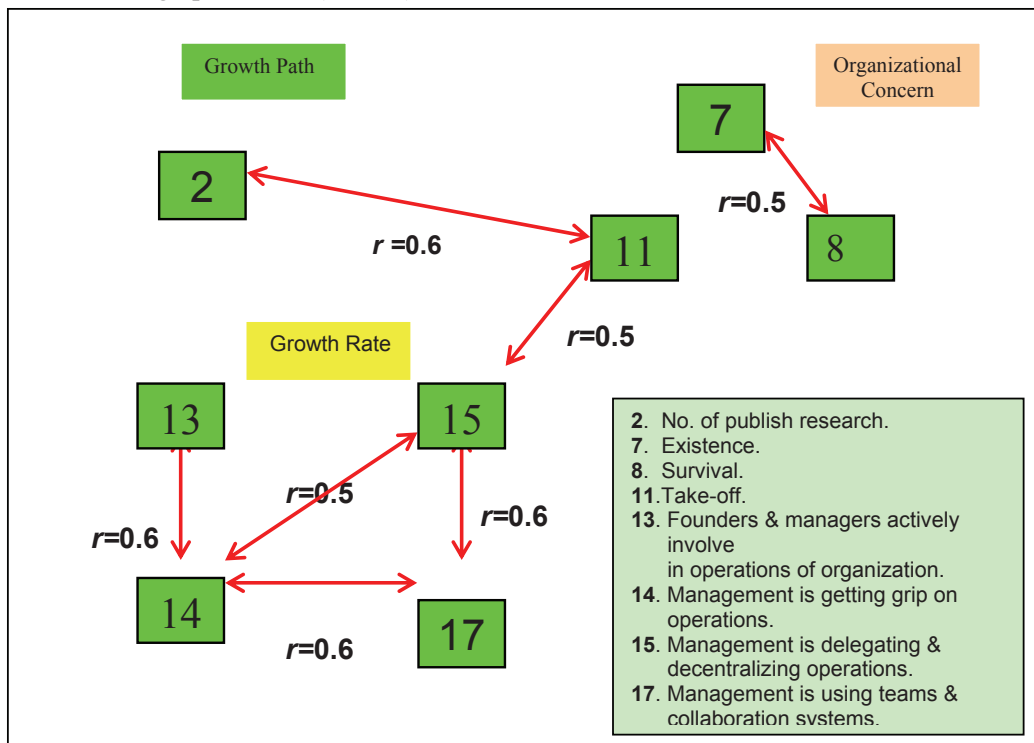


Figure 6 Correlation Map

These pair correlations corroborate the strong positive linkages within the growth stage variables, and between this group and the organizational concern group variables. Only a growth rate variable is linked to the organizational concern group variables. It seems the ‘Take-off’ issue is significant in the findings, but further investigation and explanations are needed about the correlations.

Table 2 shows VARIMAX factor loadings on the 17 variables and 5 PCs (Principal Components) isolated. These PCs account for 66.8% of total variance. A model comprising the five factors may be adequate to represent the data, thus fulfilling the task of Factor Analysis as a data reduction technique.

Management Style Factor: A vital stage in the Factor Analysis was the naming of the significant factors by observing the factor loadings using the knowledge and experience gained from the survey environment. Factor 1 is dubbed the ‘*Management Style*’ factor which alone accounts 24.1% of total variance. It is positively loaded on the ‘Management is Using Teams and Collaboration Systems’ ($r = 0.9$), ‘Management is Delegating and Decentralizing Operations’ ($r = 0.8$) and ‘Management is Getting a Grip on Operations’ ($r = 0.7$) variables.

Table 2 PC Analysis

Variables	PC1	PC2	PC3	PC4	PC5
1. Number of Degree Programs	0.2	0.4	0.1	0.0	0.1
2. Number of Published Research	0.6	0.5	0.0	0.1	0.3
3. Number of Students Enrolled Yearly	0.0	-0.1	0.2	0.3	0.0
4. Capacities of Physical Planning and Design	-0.2	-0.2	0.3	0.4	-0.1
5. Cost of Campus Site Maintenance	-0.1	-0.2	0.3	0.2	0.0
6. Instructor-Student Ratio	0.4	-0.4	-0.1	0.4	-0.1
7. Concern for Existence	0.2	0.5	-0.4	0.0	-0.5
8. Concern for Survival	0.2	0.5	-0.6	0.4	-0.2
9. Concern for Success-Profitability	0.1	0.8	0.5	0.4	0.1
10. Concern for Success-Organization	0.1	-0.1	-0.2	0.4	0.7
11. Concern for Take-Off	0.6	0.2	0.1	-0.1	0.1
12. Concern for Maturity	0.5	0.1	0.2	-0.7	0.3
13. Founders and Manag’t are Actively Involved in operations	0.5	-0.4	-0.4	0.2	0.2
14. Management is Getting a Grip on Operations	0.7	-0.3	-0.3	-0.1	-0.1
15. Management is Delegating and Decentralizing Operations	0.8	-0.3	0.0	0.0	-0.1
16. Management is Formalizing Transactions and Operations	0.3	-0.3	0.1	0.1	0.1
17. Management is Using Teams and Collaboration Systems	0.9	-0.1	0.5	0.0	-0.4
% of Variance	24.1	14.9	10.9	9.5	7.5
Cumulative %	24.1	38.9	49.8	59.3	66.8

Note: * 5 Components extracted; Factor Extraction Method: Principal Component Analysis; PC Principal Component. Rotation Method: VARIMAX with Kaiser Normalization. Factor loadings in dark italics ≥ 0.50 .

The *Management Style* factor collaborate the characteristics of management style described above. This factor is a strong indicator of the growth phase in which the organization is at the moment (i.e. between Phase 1 and Phase 2). Factor 2 named '*Success-Profitability*' factor which is highly and positively loaded on 'Concern for Profitability' ($r = 0.8$). It accounts 14.9% of total variability. Cumulatively, Factors 1 and 2 account 38.9% of variance. This factor explains the huge investment made and the financial burden on the founders who should expect a long time before break-even. Factor 3 termed the '*Team-Collaboration*' factor is positively loaded on the 'Management is Using Teams and Collaboration Systems' variable ($r = 0.5$). This factor confirms the need to realize structural inconsistency and the call for quick assessment and correction of the structural and communication gaps. All three factors seem representative of the research model; they account cumulatively about 50% of total variance.

Impact of Management Style: One-Way ANOVA (Analysis of Variance) was conducted to assess variance for the dependent variable 'Management is Getting a Grip on Operations' by the single independent variables 'Management is Delegating and Decentralizing Operations' and 'Management is Using Teams and Collaboration Systems' and 'Management is Formalizing Transactions and Operations'. Results showed that the more management grip tight to control operations, the less it delegates, decentralize operations, gives autonomy to lower hierarchy functions and positions, and above all the less the intention to use teams and collaboration systems.

Table 3 shows that there are no significant difference in the perceptions of academics/staff and management groups with reference to 'Capacities of Physical Planning and Design' ($F=0.085$; $p=0.772$), 'Concern for Success-Organization' ($F=0.000$; $p=1.000$), 'Concern for Maturity' ($F=0.000$; $p=1.000$), and 'Management is Formalizing Transactions and Operations' ($F=0.328$; $p=0.571$), because their p -values are larger than their F ratios. However, the perceptions of the two groups showed significant differences with respect to the remaining variables, since their p -values (*Sig.*) were less than their F ratios.

8. Management Implications

Churchill and Lewis model provides a framework for examining rapid growth. The model articulated the five stages of strategic choice growth namely, existence, survival, success, take-off and resource maturity. Evidence shows that AUN has past the existence stage and has entered the survival stage. Management seems to have more work to do as result of increased diversity and complexity. These will embrace appraisal of managerial styles, organisational re-structure, crafting formal systems, planning strategic goals and engendering stakeholders' involvement in the business process.

AUN seems to have passed the birth stage. Initially, the founders were technically or entrepreneurially oriented. They were heavily involved in the conception, planning and inauguration of the institution. There has been significant increase in student numbers, class size, expansion of site and facilities and burgeoning costs of maintenance, repair and operations. Also, there has been growing concerns about organizational success and future take-off. The perception about risks in the environment was found to be high. The sources of risks lie mostly in volatility of cultural, political and economic conditions in which the organization operate. Communication have been frequent and informal. Long hours of work by pioneer staff were rewarded with modest salaries and promises of benefits.

Table 3 Analysis of Variance

Variable		Sum of Squares	Df	Mean Square	F	Sig.
1. Number of degree programs	Between Groups	0.253	1	0.253	0.493	0.488
	Within Groups	15.929	31	0.514		
2. Number of published research	Between Groups	1.632	1	1.632	1.666	0.206
	Within Groups	30.368	31	0.980		
3. Number of students enrolled yearly	Between Groups	0.912	1	0.912	2.180	0.150
	Within Groups	12.967	31	0.418		
4. Capacities of physical planning and design	Between Groups	0.054	1	0.054	0.085	0.772
	Within Groups	19.582	31	0.632		
5. Cost of campus site maintenance	Between Groups	0.962	1	0.962	1.413	0.244
	Within Groups	21.099	31	0.681		
6. Lecturer-student ratio	Between Groups	10.240	1	10.240	18.377	0.000
	Within Groups	17.275	31	0.557		
7. Concern for existence	Between Groups	0.793	1	0.793	0.826	0.370
	Within Groups	29.753	31	0.960		
8. Concern for survival	Between Groups	0.747	1	0.747	0.740	0.396
	Within Groups	31.313	31	1.010		
9. Concern for success-profitability	Between Groups	0.937	1	0.937	0.726	0.401
	Within Groups	39.973	31	1.289		
10. Concern for success-organization	Between Groups	0.000	1	0.000	0.000	1.000
	Within Groups	28.000	31	0.903		
11. Concern for take-off	Between Groups	3.746	1	3.746	6.492	0.016
	Within Groups	17.890	31	0.577		
12. Concern for maturity	Between Groups	0.000	1	0.000	0.000	1.000
	Within Groups	32.000	31	1.032		
13. Founders and management are actively involved in operations	Between Groups	3.898	1	3.898	4.503	0.042
	Within Groups	26.830	31	0.865		
14. Management is getting a grip on operations	Between Groups	2.279	1	2.279	3.025	0.092
	Within Groups	23.357	31	0.753		
15. Management is delegating and decentralizing operations	Between Groups	3.949	1	3.949	4.166	0.050
	Within Groups	29.385	31	0.948		
16. Management is formalizing transactions and operations	Between Groups	0.253	1	0.253	0.328	0.571
	Within Groups	23.929	31	0.772		
17. Management is using teams and collaboration systems	Between Groups	2.015	1	2.015	1.442	0.239
	Within Groups	43.319	31	1.397		

Decisions and motivations were found to be highly sensitive to market feedback. Informal communications have become infeasible as additional functions have to be implemented. Evidence gathered indicates that leadership crisis is in the offing. This correlates with low levels of decentralization, delegation, teamwork, collaboration and appreciation of knowledge potential.

There exist minimal or no significant difference in the perceptions of academic/staff and management groups with reference to growth in site and facilities, and concerns about organisation success and resource maturity. However, the perceptions of the two groups showed significant differences with respect to the remaining variables identified in the research.

Evidence shows that AUN is in transition to Phase 2 of Greiner's model. A new direction is needed to avert a leadership crisis. The cure for this rapid-growth syndrome is not easy. It is not impossible either. It is important to quickly recognise the need for a transition and pursue organisational restructuring. The institution need to look within itself and develop a clear vision, define 'why the organization exists' and 'where it wants to be taken'.

Management Challenges: The pains of growth have directly affected AUN and they seemed to have been slow in recognising the need for transition. New competent managerial, academic and administrative staff should be welcome in order to achieve managerial efficiency during the growth process. Open and frank discussions, exchange of ideas without fear, adoption of transformational management style that would change the 'out-of-the silo' to 'management-by-walking-around' approach need to be considered. Turnover rate at top-echelon has been relatively high. AUN has had four Presidents since 2005. The new President hired in 2010 seems to be more strategically focused, and the odds of success for effective rapid growth management seem high.

Human Resources Challenges: Rapid-growth warrants hiring more knowledge workers for increased productivity. The challenge here is to develop an ability to recruit talented and enthusiastic people academic and support staff. This can be achieved by the use of HR professionals. Hiring the wrong staff would increase search and quality costs. It is also very crucial to develop the ability to retrain and retain key skills by using effective incentive programs, improving working environment, job design, job rotation and opportunities for mobility to achieve increased motivation. Also student enrollment needs to be scrutinized to ensure that good students are admitted without infringing individual rights and exclusion.

Financial Challenges: As AUN grows, it would need resources (capital) to purchase additional assets: equipment, inventory, facilities and larger buildings. It also needs capital to pay added employees and other costs of increased business. Capital investment must be large enough to support business operations in both good and bad times. New and innovative management accounting practices (such as time-related Activity-Based Costing) systems and plan need to be in place. This should be in alignment with operations and business goals. Budgets should be developed for every department in order to contain increasing costs.

Marketing Challenges: Marketing challenges are caused mainly by external factors. The institution needs to be aware of the turns and new demands of the market in order to have sustainable growth. Business plan should determine in detail the dynamics and demographics of potential student population. Competition should be examined and marketing strategy should be consequently developed in response to market demands.

References

- Álvarez, P. & Rodríguez, B. (2002) "How to Manage Rapid Change". *Seminar in Strategy and International Business Seminar Report (57147S)*. Helsinki University of Technology Department of Industrial Engineering & Management Institute of Strategy and International Business.
- Botchway, B. (2010) "Exploring Entrepreneurial Profile among Undergraduates of a University in an Emerging Economy", 33rd Annual ISBE Conference, Institute for Small Business & Entrepreneurship, London.
- Churchill, N.C. & Lewis V.L. (1983) "The Five Stages of Small Business Growth". *Harvard Business Review*. 61(3):30–50.
- Cooley, W. W. and Lohnes, P. R.(1952) *Multivariate Procedures for the Behavioral Sciences*, New York, p. 151.
- Cronbach, L. J. (1951) 'Coefficient alpha and the internal structure of tests' *Psychometrika*, Vol.16, pp.297-334.
- Denscombe, M. (2004) *The Good Research Guide*. Second edition. Maidenhead:Open University Press.
- Feindt, S. Jeffcoate, J. & Chappell, C. (2002) "Identifying Success Factors for Rapid Growth in SME E-commerce". *Small Business Economics*. 19(1).
- Flamholtz, E. (1990) *Growing Pains: How to Make the Transition from an Entrepreneurship to a Professionally Managed Firm*. San Francisco, CA.: Jossey-Bass.
- Garnsey, E. (1996) "A New Theory of the Growth of the Firm". in *Proceedings of the 41st ICSB World Conference*, Stockholm, June.
- Garnsey, E., Stam, E. & Heffernan, P. (2006) "New Firm Growth: Exploring Processes and Paths". *Industry & Innovation*. 13(1):1-20.
- Gorman, G. G. & McCarthy, S. (2000) "Business Development Support for Knowledge-based Firms in Newfoundland and Labrador: An Exploratory Study". *North Atlantic Forum 2000*. Corner Brook, Newfoundland, 24-27 September.
- Greiner, L.E. (1972), "Evolution and revolution as organizations grow", *Harvard Business Review*. 50(4):37-46.
- Hizon, M. I. R. & Bronson, J. W. (2004). "The Role of Technology as a Competitive Weapon in Each of the Five Phases of Growth". Presented in 2004 at the 18th annual USASBE National Conference. University of Wisconsin-Whitewater. Department of Management. [Online]. Available from: www.sbaer.uca.edu/research/usasbe/2004/pdf/65.pdf. (Accessed: 15 April 2007).
- Kazanjian, R. K. (1988) "Relation of Dominant Problems to Stages of Growth in Technology-Based New Ventures". *Academy of Management Journal*, 31(2):257-279.

- Klein, H. A. & McHugh, A. P. (2005). National differences in teamwork. In W. R. Rouse & K. B. Boff, (Eds). *Organizational Simulation*. New York: Wiley.
- Kravitz, D. (2010) "American University's growth causes pains for neighboring businesses," *Washington Post*, Saturday, December 11.
- Louvion, C. & Martens, R. (2006) "Case Study: *Shopzilla Scales Software Agility With Agile Tools*". *Agile Journal*. Saturday, 05 August. [Online]. Available from: http://www.agilejournal.com/component/option,com_magazine/func,show_article/id,68/ (Accessed: 19 March 2007).
- Lowe, R. (2002) "The Role and Experience of Inventors and Start-ups in Commercializing University Research: Case Studies at the University of California". *Center for Studies in Higher Education*. Paper CSHE6-02. [Online]. Available from: <http://repositories.cdlib.org/cshe/CSHE6-02>. (Accessed: 16 April 2011).
- Macpherson, A., Jones, O. & Zhang, M. (2004) "Evolution or revolution? Dynamic capabilities in a knowledge-dependent firm". *R&D Management*. 34 (2), 161–177.
- Mintzberg, H. (1987) "Crafting Strategy". *Harvard Business Review*, July-August: 66-75.
- Mintzberg, H. (1983) *Structure in Fives: Designing Effective Organizations*. Englewood Cliffs, NJ.: Prentice-Hall.
- Pawson R and Tilley N (1997) *Realistic Evaluation* London Sage Publications.
- Packham, G. Brooksbank, D. & Brychan, C. M. (2005) "Climbing the mountain: management practice adoption in growth oriented firms in Wales". *Journal of Small Business and Enterprise Development*. 12(4):482 – 497.
- Railsback, G. (2007) 'Growing Pains from Rapid Growth: A Historical Case Study of George Fox University from 1983 to 2003', *Christian Higher Education*, Vol. 6:5. October , pp. 409-427.
- Salmi, J. (2010) "Ten Common Errors When Building a New World-Class University", September, <http://blogs.worldbank.org/education/category/tags/new-university> (Accessed: 10.05.2011).
- Scott, M. & Richard, B. (1987) "Five Stages of Growth in Small Business". *Long Range Planning*. 20(3):45-52.
- Somekh, B. (1995) "The contribution of action research to development in social endeavours: a position paper on action research methodology". *British Educational Research Journal*. 21(3):339-355.
- Stent, A. (1978) "Growth Pains for Brazilian Education". *Change* Vol 10:6 June-July.
- Storey, D. (1994) "The Growth of Small Firms", in *Understanding the Small Business Sector*, London: Routledge. pp:112-159.
- Susman, G. & Evered, R. (1978) "An assessment of the scientific merits of action research". *Administrative Science Quarterly*. 23(4):582-603.

Vecchio, R. P. (2006) *Organizational Behavior: Core Concepts*. 6th ed. Minster, OH: Thomson South-Western.

Vic, T. (2007) Managing People (MP) Seminar Lecture 5, MBASHR-MP-070308-06 Sem 6. Liverpool: University of Liverpool Laureate Online Education BV. [Online]. Available from: <http://fcweb.embanet.com/> (Accessed: 15 April 2007).

Wickham, P. (1998) *Strategic Entrepreneurship*. London: Pitman.

William, S., Hartnett, T. & Strassner, E. (2003) “ Higher Education in Nigeria: A Status Report”. *Higher Education Policy*. 16.

About the Author



Dr. Benjamin Botchway is currently is a manager of a renewable energy technology company. He has been a pioneer faculty and Associate Professor of Business and Entrepreneurship at the American University of Nigeria (a ‘greenfield’ institution), where he taught Operations Management and Entrepreneurship and contributed to strategy and curriculum development of the School of Business and Entrepreneurship. Dr. Botchway also taught as a senior lecturer Supply Chain Management, Logistics and Business at both undergraduate and postgraduate levels at Birmingham City University, UK. He has worked as an industrial development expert with the United Nations Industrial Development Organization (UNIDO- Vienna), and contributed to a number of practical problems solving initiatives in both upstream and downstream automotive industry supply chains. Areas of his research interests include Supply Chain Integration and Rationalization, and Entrepreneurship Education.

Chinese Viewpoints of Workplace Spirituality

by

Chieh-Wen Sheng

Department of Commerce Technology & Management,
Chihlee Institute of Technology, Taiwan
E-mail: cwsheng@mail.chihlee.edu.tw

and

Ming-Chia Chen

Department of Hospitality Management,
Ming-Dao University, Taiwan
E-mail: amom@mdu.edu.tw

UTCC
*International Journal of
Business and Economics* **IJBE**

Chinese Viewpoints of Workplace Spirituality

by

Chieh-Wen Sheng

Department of Commerce Technology & Management,
Chihlee Institute of Technology, Taiwan
E-mail: cwsheng@mail.chihlee.edu.tw

and

Ming-Chia Chen

Department of Hospitality Management,
Ming-Dao University, Taiwan
E-mail: amom@mdu.edu.tw

Abstract

This research aimed to investigate the causal relationship of workplace spirituality with the viewpoints of the Chinese. It conducted focus group meetings with 51 workers and analyzed the most influential classics to Chinese, including Confucian Analects of Confucianism, the Tao Te Ching of Taoism, and the Platform Sutra of the Sixth Patriarch of Zen Buddhism. Results suggested that with Chinese viewpoints the causal relationship of workplace spirituality is a continuous circulation. Starting from the interpretation of environment, an individual would introspect and make practices of workplace spirituality and then his/her self-feelings, interpersonal relationships and furthermore the external environments would be influenced. After all, the change of surroundings would influence reversibly the way people interpret environments.

Keyword: Workplace Spirituality, Spirituality, Chinese Viewpoints

1. Introduction

Workplace spirituality has begun to be valued in academia and among practitioners since 1990s. Although there are different viewpoints in the study of workplace spirituality, it can be indicated that the influences of religions and cultures are usually mentioned (Mitroff & Denton, 1999; Wilber, 2000; Claude & Zamor, 2003; Hicks, 2003; Sheng & Chen, 2007; Stephen, 2007; Sheng, 2008; Gotsis & Kortezi, 2008; Zafar, 2010). Since the concept of workplace spirituality mainly originates in the U.S. (e.g. Conger, 1994) and people hope to realize their faith and spiritual values at their workplaces, most of researches regarding workplace spirituality come out in Western countries and are embedded in Western cultures, economics and religions (e.g. Christianity). Very few are discussed from Oriental viewpoints. Most of the thoughts and behaviors of Oriental Chinese, even people in Korea and Japan, are much influenced by the thoughts of Confucianism, Taoism, and Zen Buddhism, which include the way to treat people, the way to live, and the way to interact with people at workplaces. Therefore, important references in Confucianism, Taoism, and Zen Buddhism were analyzed in this study. Besides, this study held several focus group meetings. The subjects participating in meetings are workers with average working years of more than six years. Through

the meetings, the Chinese's opinions regarding the content, cause and effect of workplace spirituality were investigated under the influences of Confucianism, Taoism, and Zen Buddhism.

2. Spirituality and Workplace Spirituality

In the application form for 2008 International Spirit at Work Awards, spirituality is defined as the innate human attribute with vertical and horizontal components (ICSW, 2008). The vertical component is "a desire to transcend the individual ego or personality self...is experienced as a conscious sense of profound connection to the Universe/God/Spirit." On the other hand, the horizontal component is "a desire to be of service to other humans and the planet." A person with strong spirituality including vertical connection and the ability to serve others (horizontal component) will have a clear grasp on his/her mission, ethics, and values.

As to workplace spirituality, some scholars indicated that it is a unique thinking way of ego, work, and working organizations through which employees may have opportunities to realize or feel again their inner life, meanings of their works, and the relationship between an individual and society (Ashmos & Duchon, 2000; Hicks, 2003). Basically, such a kind of definition thinks that workplace spirituality is a thinking way with spiritual insights, which is related to workplace.

There are other kinds of definitions about workplace spirituality. For example, some argued that workplace spirituality should include a process in which individuals at workplace will discover or nourish their deep and original feelings and concerns about their inner life, work, interpersonal relationship; their connections with society, morality and the world; and their desires to transcend ego and service others (Claude & Zamor, 2003; ICSW, 2008). Such a kind of definition about workplace spirituality emphasizes the process, which can cultivate a worker's spirituality, which is not only restricted in workplace scope but also expanding to the concerns about the world and morality, etc.

To summarize the two kinds of definitions above, it can be inferred that workplace spirituality is not only a static result or a feeling but also including a dynamic workplace process of acting and thinking, through which individuals can discover and nourish their spirituality. This kind of spirituality tends to relate with work but can also be applied to other more comprehensive aspects, such as concerns with family, society, environment, and even the world or universe (ICSW, 2008; Sheng, 2008).

3. The Influences of Culture and Religion

The early researches about workplace spirituality are closely related to religion. In the late 1990s, the Academy of Management formed a special interest group called the Management, Spirituality and Religion Interest Group. With the expansion of this group and discussions of more diversified participants, the relationships between workplace spirituality and religion are not as obvious as before (Mitroff & Denton, 1999; Ashmos & Duchon, 2000; Kale & Shrivastava, 2003; Sheng & Chen, 2007). Zafar (2010) finds out that both sectors experience spirituality and religiosity more or less to a certain extent but at the same time fail to identify any organization where workplace spirituality is being followed in letter and spirit.

In spite of this, Howard (2002) and Sheng (2008) still think that religion is a good catalytic approach to workplace spirituality. As for the influences of cultures on workplace spirituality, some researches indicated that individuals with different cultures tend to nourish their workplace spirituality in

different approaches. For example, in Western cultures, it is believed that workplace spirituality of employees could be established by organizational mechanisms; while in Oriental cultures, people believe that self-cultivation in morality is the key factor for individual's introspection and spirituality, including the workplace spirituality (Zohar, 1997; Wilber, 2000). Daniel (2010) proposed that workplace spirituality is an element of the organizational culture and that it has an important effect on team effectiveness.

In addition, Kent (2006) found that many researchers tend to separate the variables of personal spirituality and workplace that they usually treat personal spirituality as a kind of personal values. For example, Kolodinsky, Giacalone & Jurkiewicz (2008) divided organizational spirituality into two different concepts, which are personal spirituality and organizational climate, a concept about workplace described by Kolodinsky et al. as "an individual's perception of the spiritual values within an organizational setting." Nevertheless, to most of the Orientals, especially the Chinese, the boundary between life and work is not clear and people tend to fuse religion and spiritual thinking into their life and work (Sheng, 2008). Meanwhile, to some Chinese workplaces are just like cloisters in the city and to work is to learn how to get along with people, to take lessons in dealing with problems, and to practice moral teachings. Thus, the spiritual values that Chinese felt in an organization in fact are parts of (or will become) personal spirituality and vice versa. That is to say, to Chinese the relationship between variables about personal spirituality and workplace might be a bi-directional cause and effect relationship instead of the unidirectional framework provided by Kolodinsky et al.

4. Research Design

Driscoll & Wiebe (2007) suggested that in order to prevent that viewing workplace spirituality only as a technique to reach financial or material ends, it is better to investigate workplace spirituality with qualitative methods, such as narrative analysis or hermeneutics. Thus, this study first analyzed the classical writings of Confucianism, Taoism, and Zen Buddhism, which include Confucian Analects, the Tao Te Ching, and the Platform Sutra of the Sixth Patriarch. Then several focus group meetings were held. After content analysis and narrative analysis of Chinese ancient books and focus group meetings, this study explored the content and causal relationship of workplace spirituality from the Chinese viewpoints. The research procedures used are as below:

1. Selecting sentences of classical writings

- a. Three Chinese literature professors and one general director of a library picked out the most qualified classical sentences in the writings, which still match the thoughts of modern Chinese.
- b. Two professionals familiar with workplace spirituality screened these sentences and selected ones that are most related to the topic of this study.

2. Initiate focus group meetings

- a. Seven focus group meetings with 51 participants were held and the topic of the meetings was workplace spirituality.
- b. Important sentences regarding workplace spirituality were selected from the meeting records.

3. Carry out content analysis

- a. Three experienced professionals screened the sentences selected during the two procedures above.
- b. Sentences of consensus were left and divided into three parts: the content, the cause, and the effect of workplace spirituality.

4. Carry out narrative analysis: researcher chose the most representative sentences and return them to the original texts to conduct the narrative analysis.

5. Results

Cause of Workplace Spirituality

Based on content analysis, this research concluded five factors of the cause of workplace spirituality as shown in Table 1. Among which, the stimuli of frustrations and challenges are both mentioned in the focus group meetings and in ancient books. Therefore, this study focus on this factor here to demonstrate narrative analysis of this aspect, namely cause of workplace spirituality.

In the chapter Tsze Han of Confucian Analects, the Confucius said, “When the year becomes cold, then we know how the pine and the cypress are the last to lose their leaves.” Confucius described “leaves” as the moral integrity and described “the pine and the cypress” as the superior person and described “the year becomes cold” as the adversity and frustration in life, which meant that the superior person would insist on his moral integrity till the end of the world even face frustrations in life. The originality of this sentence was that Confucius was once besieged in Chu and his student, Tsze Lu, was aggrieved for what he suffered for that Confucius was a superior person of great moral integrity. At this time, Confucius said to Tzse Lu, “Although orchids grow in the deep forest, they would not stop perfuming; the superior person does not give up his moral integrity for he faces obstacles.” This sentence indicated that Confucius thought that whether a person’s worth would be recognized or not depends on timing; however, the superior person was much like orchids in the deep forest, would not be frustrated by the obstacles to stop his self-disciplines. Confucius said, “When the year becomes cold, then we know how the pine and the cypress are the last to lose their leaves” when he escaped from Chu and recalled the memories at that time.

Table 1 Cause of Workplace Spirituality

Causes of WPS	Representative Sentences
The Stimuli of Frustrations and Challenges	1. When the year becomes cold, then we know how the pine and the cypress are the last to lose their leaves. ^a 2. Some people can even discover the new possibilities when facing low tides and can start over again. ^b
The Diversified Opportunities	Once a person tries something different...there will be different consequence... ^b
Influences from Others	When a person finds that the group is so introspective, he will [try to be introspective]... ^b
Encouraging Environment for people to Experience on Their Own	Only when a person tries to find the answers on his own can he [progress]... ^b
Positive Demonstrations	1. I will manifest no ambition, and the people will of themselves attain to the primitive simplicity. ^c 2. The good of superior person should be like water [to be kindly and influential]. ^c

^a From Confucian Analects^b From focus group meetings^c From Tao Te Ching

The relationship between frustration and developing moral integrity was not only mentioned in the Confucius Analects but was also mentioned in focus group meetings. In focus group meetings, some people mentioned that frustrations were inevitable at workplaces; however, people could view frustrations in more positive ways and more meaningful practices could be generated and people could start over again.

There must be high tides and low tides in everyone's work. The question is: How does one deal with the low tides when he/she faces low tides? **Some people can even discover the new possibilities when facing low tides and can start over again.** (FG01)

According to the statements above, it can be indicated that an environment of obstacles and frustrations might encourage people who desire to make improvement for that they will adapt themselves to the environment with more positive angles and they will not only insist on their moral self-discipline but also ask themselves to make adjustments.

Content of Workplace Spirituality

Based on content analysis, this research also concluded five factors of the content of workplace spirituality as shown in Table 2. Among which, Stabilization of One's Own Nature and Introspection, Repentance, and Reform are the introspective process to help increase spirituality at workplaces. On the other hand, To Practice Morality, To Convey Positive Attitudes, and To Help Others Actively are the kinds of behavioral practices to help increase spirituality at workplaces. The following is the narrative analysis aimed the factor of Stabilization of One's Own Nature.

First is the sentence "The real stabilization is to keep your own nature stable," which is picked out from the following paragraph of the Platform Sutra of the Sixth Patriarch.

The Knowledgeable [a respectful title for the Buddhism dharma listeners], if you practice your stability, do not judge a person by he/she is right or wrong, by he/she is kind or evil, or by the mistakes he/she has made and you will see that **the real stabilization is to keep your own nature stable**. The Knowledgeable, if you are attracted by your stability of physical body but talk about other's right or wrong, merits or defects, or good or evil, it would stand against the way of Buddhism dharma.

The paragraph above shows that Zen Master focus stabilization on one's own nature, not on the physical body, and the stabilization will help people keep themselves, not to mind others overly, than to increase their spirituality through an introspective process. Such a point of view can be found as well in many places in the Platform Sutra of the Sixth Patriarch, for example the sentence of "If one can realize his/her own nature, everyone in his/her eyes is Buddha," which means the one who realized his/her nature will treat others respectfully and equally and than others will not make the one in great agitation.

Table 2 Content of Workplace Spirituality: Introspection and Behavior

Content of WPS	Representative Sentences
Stabilization of One's Own Nature	1. The real stabilization is to keep your own nature stable. ^d 2. If one can realize his/her own nature, everyone in his/her eyes is Buddha. ^d 3. Calm down yourself. ^b
Introspection, Repentance and Reform	I daily examine myself three times. ^a
To Practice Morality	1. The superior man will keep honest and open. ^a 2. The one who exercises government by means of virtue is like the north polar star, which keeps its place and all the stars turn towards it [if a leader shows virtue, others will follow him/her]. ^a 3. Treating small matters without forbearance confounds great plans [forbearance is the morality for a great achievement]. ^a 4. A person must care [and do]...the mortality in daily lives... ^b
To Convey Positive Attitudes	To convey your [positive] motives to people around. ^b
To Help Others Actively	To try one's best to help others actively. ^b

^a From Confucian Analects

^b From focus group meetings

^d From Platform Sutra of the Sixth Patriarch

In addition to the sentences mentioned in the Platform Sutra of the Sixth Patriarch that a person may view him/herself inward instead of being interfered by outward environments, there were also people mentioned in the focus group meetings that people could calm down when they faced the obstacles at their workplaces. After calming down, people may find proper solutions to complicated questions or situations with stabilized natures.

At that time, I **had** to prepare a lot of documents... the process of the entire experiment...there are many things [to deal with]... [One thing that] I could not understand...than I ...put myself there... (After that) I solved this problem... To solve... you must calm down first... **calm down yourself**... (FG03)

Effect of Workplace Spirituality

What is the impact on an individual when he/she increased workplace spirituality through an introspective process or through behavioral practices? The result is shown in Table 3. Among which, some sentences indicate both the content and effect of workplace spirituality, so we put them in both Table 2 and Table 3.

Table 3 Effects of Workplace Spirituality

Effects of WPS	Representative Sentences
To Win Others' Approval Naturally	1. The one who exercises government by means of virtue is like the north polar star, which keeps its place and all the stars turn towards it. ^a 2. The one who holds in hands the Right Way, the whole world will follow him/her. ^c
To Treat Others Equally and Respectfully	If one can realize his/her own nature, everyone in his/her eyes is Buddha. ^d
To Resist Compression	1. To become more and more resistant to compression. ^b 2. Treating small matters without forbearance confounds great plans. ^a
To Accept and Approve Oneself	1. To approve oneself...have a sense of achievement. ^b 2. To become more mature and reliable. ^b 3. ...I feel that I can make some kind of progress in... ^b
To Acquire a Sense of Belonging	To find a sense of belonging. ^b

^a From Confucian Analects

^b From focus group meetings

^c From Tao Te Ching

^d From Platform Sutra of the Sixth Patriarch

In Table 3, this research concluded five factors of the effect of workplace spirituality, which included that to make individuals able (or perceive to be able) to win others' approval naturally, to treat others equally and respectfully, to resist compression, to accept and approve oneself, and to acquire a sense of belonging. The following is the narrative analysis aimed the factor of To Win Others' Approval Naturally.

In the chapter Wei Chang of Confucian Analects, the Confucius said, "The one who exercises government by means of virtue is like the north polar star, which keeps its place and all the stars turn towards it." In this sentence, Confucius used north polar star as description. Although the north polar star does not change its place, other stars still turn towards it. It was indicated by Confucius that a political leader should rule his country with morality and he would win people's approval and allegiance, which would be like all the stars turn towards the north polar star.

What Confucius said above is much like the sentence "The one who holds in hands the Right Way, the whole world will follow him/her" in Tao Te Ching. Before the time that Tao Te Ching was written, there was a small country intruded by its neighbor country. The ruler of the small country always ruled his country with morality. He abandoned his throne and left his country for that he did not want his people endangered by wars. His people were grateful for his virtue and followed him voluntarily to another place. Even people from other countries were moved by his virtue and came to submit to him. Eventually, the ruler constructed another small country. After he passed down his throne for several generations, this country overthrew the tyrant in Shang Dynasty and developed the

Zhou Dynasty.

Therefore, when Lao-tze wrote Tao Te Ching with five thousand words before he left the Central Plains of China because of his disappointment about the government, he felt the chaos of current situation and wrote down the sentence “The one who holds in hands the Right Way, the whole world will follow him/her,” which is indicated that if a political leader insists on The Tao (Right Way), he will win everyone’s approval and allegiance.

As shown above, the Chinese believe that once a person behaves well or is equipped with moral standard, such as integrity, forbearance, openness and honesty, he will naturally win people’s approval.

6. Discussion

The Inseparability of the Chinese’s Work, Life, and Moral practice

Driscoll & Wiebe (2007) suggested that authentic spirituality is much more important than technique spirituality, which can be inferred that “spirituality” is more important than “workplace” in the phrase of “spirituality at workplace.” When people at workplace practice their authentic spirituality that could be cultivated during their daily introspection and behaviors, such spirituality is a kind of workplace spirituality (Sheng, 2008). Long & Mills (2010) advocates workplace spirituality as necessary for organizations and the individuals who work in them to prosper.

We can see that few contents of Chinese classical books adopted in this study are directly involved with “How should people work?” while most contents are involved with “How should people live and practice morality?” However, to most of the Chinese, the relationship of work, family, life, and moral practice is inseparable. Sheng (2008) indicated that the Chinese tend to fuse their religious or spiritual habits into their life or work. For example, the Chinese usually say that “to get married and start a career,” which reflects that the relationship of family and work is complementary and indispensable. Meanwhile, the famous motto of Zen Master, Bai Tsang Huai Hai, “If one does not work a day, he/she must not eat anything a day,” which is not only an attitude of work but also an attitude of life and moral practice.

For that to most of the Chinese, work, life, and moral practice is similar conducts. These conducts are mutual inclusive that work is a part of life and a part of moral practice, and the life is also a part of work, and so on. Therefore, to nourish spirituality at workplaces is also just a way to practice morality in life, and vice versa.

The Influences of Workplace Spirituality on External Environments

There is a sentence in Tao Te Ching “Everything has its origin,” which means that everything in the world has its own origin and the ultimate of origin is “Tao.” Tao is similar to a rule of nature, which exists both in simple things and complicated environments. Therefore, a person, a particle of sand, or a drop of water, they all originate from the same origin of the Universe. That is much like a Buddhist maxim, “A particle of sand is the Universe and a flower is the Paradise.” Everything can mirror and influence its larger external world. As for the thoughts of the Confucianism, it was also mentioned by Yuan-Kang in the Yue-Jiue Book in Han Dynasty that “One can find the meaning of a thing through observing subtle things,” which implies that the truth, origin, or developing trend could be told through observing subtle traces.

According to the viewpoints of the Confucianism, Taoism, and Zen Buddhism above, it can be indicated that in the Chinese concepts, everything originates from the same origin and an individual or any tiny thing will be connected to the external environments and to one another. Therefore the influences on individual caused by workplace spirituality will further change the external environments.

The Circulation of Workplace Spirituality

In Buddhism, the circulation of karma is an important concept. For example, the sentence of “A cause brings an effect and the effect is also the cause” in the Platform Sutra of the Sixth Patriarch indicates the mutual dependence of causes and effects. In such a condition, people have to know that the causes before will result in the effects at present and the effects at present will be also the causes in the future. The most important is that the past, the present, and the future is on the same path experienced by a being. Moreover, the space-time concept is very flexible in Buddhism; therefore, the evident relationship of causes and effects may be seen in a minute or may take a long time, even after many generations. Meanwhile, a person may influence others first and eventually be influenced by others. So, Zen Master told us not to distinguish causes and effects in an opposing position but to fuse them to acquire the equilibrium, which is a kind of enlightenment.

Although the concept of cause and effect is seldom mentioned in Confucianism, the concept of learning is strongly emphasized. For example, the sentences “To learn with practice is very delighted” and “Reviewing old lesions will acquire new knowledge” both demonstrate that even a person has achieved something or has reached to certain level he/she still has to review or practice what he/she has learnt and new comprehensions or results will be generated. This kind of concept to keep learning influences many Chinese viewpoints of workplace spirituality, and the Chinese think that the relationship among work, learning, and moral practice is a process of circulation including learning, achieving, reviewing or further learning, and achieving again, and so forth.

7. Conclusion

The integration of Table 1 to Table 3 and the above discussion is shown as Figure 1. The factors of cause of workplace spirituality were arranged from Table 1 and indicated in the left box. Most of the factors are of environment, for example the diversified opportunities, and one should notice that these environmental factors include not only favorable circumstances but also unfavorable circumstances such as frustrations. That is to say that no matter under unfavorable circumstances or favorable circumstances, there are always people encouraged and their behavioral practices and introspections may be deepened. This phenomenon is like what Confucius said, “When I walk along with two others, they may serve me as my teachers,” which indicates that people should be equipped with the attitude of learning, and that is when we see men of worth, we should think of equaling them; when we see men of a contrary character, we should turn inwards and examine ourselves to avoid the character. Under such a viewpoint, the objectivity of environment is not so important. What is more important is that whether a person’s interpretation and response to an environment could help him to adjust himself under unfavorable circumstances or to learn positive factors from other people under favorable circumstances or not.

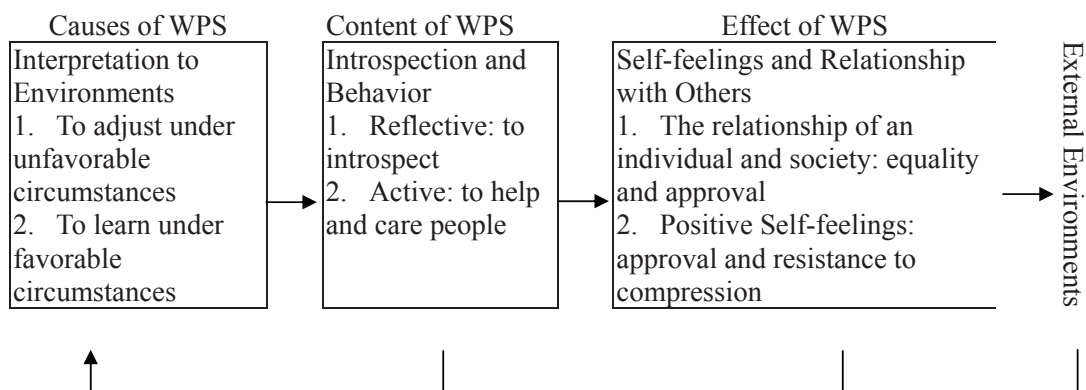


Figure 1 The Relationship of Workplace Spirituality

As to the content of workplace spirituality, the behavioral practices and introspections were concluded in Table 2 and presented as the central box of Figure 1. As shown in Table 2, there are two factors of introspections including Stabilization of One's Own Nature and Introspection, Repentance, and Reform. In addition, there are three factors of behavioral practices including Practice Morality, To Convey Positive Attitudes, and To Help Others Actively. Such a result is similar to the findings of Lips-Wiersma & Venkataraman (2007) focused on corporate spiritual foundation. They divided spirituality into two parts: reflective and active. This study continues using their terms to classify the content of workplace spirituality in Figure 1.

After all, the right box in Figure 1 is the effect of workplace spirituality on an individual based on the five factors shown as Table 3. We classify the five factors into two parts. The first one is named the relationship of an individual and society, which includes two factors of To Win Others' Approval Naturally and To Treat Others Equally and Respectfully. On the other hand, there are another three factors related to positive self-feelings, the second part of effect of workplace spirituality, such as To Resist Compression, To Accept and Approve Oneself, and To Acquire a Sense of Belonging.

In addition to the investigations of the cause, content, and effect of workplace spirituality, according to the discussions above and the viewpoint of Seaward (1995), workplace spirituality does not only influence an individual but also influence the external environments. Therefore, this study lists external environments as a variable in the most right box in Figure 1. The influences on external environments were discussed in many researches. For example, Thompson (2000) suggested that a corporation with more spirituality would benefit more in investments and the stockholders' equity than other corporations. Moreover, Duchon & Plowman (2005) found that the working unit in an organization with more workplace spirituality tends to have better working efficiency.

In conclusion, according to the previous discussions of the circulation of cause and effect, the concept of circulation is added in Figure 1. It can be inferred that whether the influences from external environments or any of the two boxes on the right side of Figure 1, they will have impact on an individual to arouse his/her interpretation to environment and reform the cause of workplace spirituality. Then, the cause will arouse another circulation again, from the introspections, behaviors, self-feelings, relationship with others, and external environments, over and over again.

References

- Ashmos, P. D., & Duchon, D. (2000), "Spirituality at work," *Journal of Management Inquiry*, 9(2), 134-145.
- Claude, J., & Zamor, G. (2003), "Workplace spirituality and organizational performance," *Public Administration Review*, 63(3), 355-363.
- Conger, J. A. (1994), *Spirit at Work: Discovering the Spirituality in Leadership*, C. A.: Jossey-Bass.
- Daniel, J. L. (2010), "The effect of workplace spirituality on team effectiveness," *Journal of Management Development*, 29(5), 442 – 456.
- Driscoll, C., & Wiebe, E. (2007), "Technical spirituality at work: Jacques Ellul on workplace spirituality," *Academy of Management Proceedings*, 2007, 1-6.
- Duchon, D., & Plowman, D. A. (2005), "Nurturing the spirit at work: impact on work unit performance," *Leadership Quarterly*, 16(5), 807-815.
- Gotsis, G., & Kortezi, Z. (2008), "Philosophical foundations of workplace spirituality: a critical approach," *Journal of Business Ethics*, 78(4), 575-600.
- Hicks, D. (2003), *Religion and the Workplace: Pluralism, Spirituality, Leadership*. Cambridge: Cambridge University Press.
- Howard, S. (2002), "A spiritual perspective on learning in the workplace," *Journal of Managerial Psychology*, 17(3), 230-242.
- ICSW (2008), "Information for the application for 2008 international spirit at work awards," Download from www.spiritatwork.org/index.php/isaw_aboutaward, 2008/12/12.
- Kale, S. H., & Shrivastava, S. (2003), "The enneagon system for enhancing workplace spirituality," *The Journal of Management Development*, 22(4), 308-328.
- Kent, R. E. (2006), "Six components of a model for workplace spirituality," *Graziadio Business Report*, 9(2), <http://gbr.pepperdine.edu/062/workplace.html> (browse on 2008/12/10).
- Kolodinsky, R. W. Giacalone, R. A., & Jurkiewicz, C. L. (2008), Workplace values and outcomes: exploring personal, organizational, and interactive workplace spirituality, *Journal of Business Ethics*, 81(2), 465-480.
- Lips-Wiersma, M., & Venkataraman, N. (2007), Practical compassion: towards a critical spiritual foundation for corporate responsibility, *Academy of Management Proceedings*, 2007, 1-6.
- Long, B. S. & Mills, J. H. (2010), "Workplace spirituality, contested meaning, and the culture of organization: A critical sense making account," *Journal of Organizational Change Management*, 23(3), 325 – 341.
- Mitroff, L. I., & Denton, E. A. (1999), *A Spiritual Audit of Corporate in America*, C. A.: Jossey-Bass.

Seaward, B. L. (1995), "Reflections on human spirituality for the worksite," *American Journal of Health Promotion*, 9(3), 165-168.

Sheng, C. W. (2008). *Workplace Spirituality: A Study of its Cause and Effect in Organizational Context* (1st year report, NSC-96-2416-H-263-001-MY3). Taiwan: National Science Council.

Sheng, C. W., & Chen, M. C. (2007). "Look for workplace spirituality," *Symposium of 2007 Innovation + Technology + Life + Economy + ?* (Taipei: Chihlee Institute of Technology) Paper No.4020, 1~11.

Stephen, M. K. (2007), "Religion, spirituality, and the workplace: challenges for public administration," *Public Administration Review*, 67(1), 103-114.

Thompson, W. D. (2000), "Can you train people to be spiritual?," *Training and Development*, 54(12), 18-19.

Wilber, K. (2000), *A Brief History of Everything*, Boston: Shambhala Publications.

Zohar, D. (1997), *Rewiring the Corporate Brain*, C.A.: Berrett-Koehler Publishers.

Zafar, J. (2010), "Measuring religiosity and workplace spirituality in Pakistan: a case study of armed forces and university teachers," *Cross-cultural Communication*, 6(4), 93-100.

About the Author

Competition in Multi-Echelon Distributive Supply Chains with Linear Demand

by

Deming Zhou

Department of Decision Sciences and Managerial Economics,
Faculty of Business Administration,
The Chinese University of Hong Kong, Shatin, N.T. Hong Kong
Tel: 852-26097768 (office), Fax: 852-26035104
E-mail: deming@baf.msmail.cuhk.edu.hk

UTCC
*International Journal of
Business and Economics* **IJBE**

Competition in Multi-Echelon Distributive Supply Chains with Linear Demand

by

Deming Zhou

Department of Decision Sciences and Managerial Economics,
Faculty of Business Administration,
The Chinese University of Hong Kong, Shatin, N.T. Hong Kong
Tel: 852-26097768 (office), Fax: 852-26035104
E-mail: deming@baf.msmail.cuhk.edu.hk

Abstract

This research identified competition in multi-echelon supply chains with a distributive structure. Firms in the supply chain are grouped into homogeneous sectors that contain identical firms with identical production capabilities that all produce exactly one undifferentiated product. Each sector may distribute its product to several different downstream sectors, and each sector is only supplied by a single upstream sector. The demand curves in final markets are assumed to be linear, as are the variable costs of production in all sectors. Competition is modeled via the Successive Cournot model in which firms choose production quantities for their downstream market so as to maximize their own profits, given prices for the input. Under these assumptions, equilibrium prices, quantities, and firm-level profits for any multi-echelon distributive network can be derived. The paper discussed certain network transformation properties, and using these properties, we examined the effect of demand parameter changes and cost changes on any firm's equilibrium price, quantity, and profit. The examination of lateral effects in these networks provides some novel insights. An important insight is that prices represent a compromise between the prices in the perfect discrimination case. The research also explored the effects of concentration and market power on profits. While upstream concentration has the expected affect, the consequences of downstream concentration on upstream sectors, and therefore on sectors in parallel (lateral) paths can be quite counter-intuitive. Many of these results are consequences of the distributive network structure.

Keywords: Mutli-Echelon, Supply Chain, Competition, Distributive Network

1. Introduction

In many industries it is common to see multi-stage supply chains, in which different companies occupy different stages of the chain. The number of entrants at any level of a supply chain can vary quite substantially. Supply chains also exhibit considerable structural variation across industries. Basic goods and commodity products are often purchased by several distinct sectors. For example, steel is purchased by the automotive industry as well as by the construction industry. Goods can also be sold in more than one geographically distinct marketplace. Such examples display a distributive structure. In other cases, the supply network can have an assembly structure where many inputs may be required to assemble a product. Of course, both of these characteristics can also be present simultaneously.

In this paper we address competition in multi-echelon distributive supply chains, a generalization of the serial chain model of Corbett and Karmarkar (2001). Firms are grouped into sectors where all firms within a sector are identical. Each sector produces exactly one product and uses exactly one input. A product may be purchased by many sectors. The resulting system can be pictured as a network which has a multi-echelon or arborescent structure in which each sector is represented by a node. Each node is supplied by a unique node, but may be a supplier to more than one node. The network representation of such distributive structure is sketched in Figure 1.

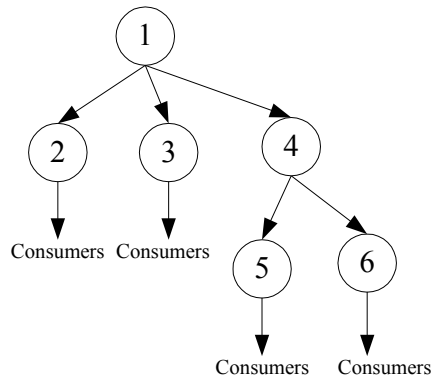


Figure 1 An Example of Distributive Network

Our purpose is to study system-wide equilibrium behavior while considering vertical and horizontal interactions among sectors in the whole network as well as the competition between firms within each sector (node). We develop models of competition where each individual firm in each sector of a large multi-echelon distributive network acts as a decision maker optimizing its own profit. This model allows us to examine the impact of cost structure, network (distribution) structure and sector concentration on prices, quantities and profits. As in Corbett and Karmarkar (2001) we model competition using the Successive Cournot framework. We provide explicit expressions for equilibrium prices, quantities and firm-level profits. We construct network transformation methods that can compress networks to simpler forms, or expand them to particular (binary) forms. By using these transformation methods, we are able to analyze the impact of cost and demand parameters without having to deal with the complexity or specific form of the network structure. Importantly, we are also able to study the effect concentration in any sector in the network on any other sector. These effects are in some cases quite non-intuitive.

Conventional wisdom and earlier studies in the literature state that lower concentration (a larger number of firms) in a market generally causes the total output of that market to increase, the consumer price to decrease, and each incumbent's profit to decrease (Seade 1980a). These results are indeed obtained in the serial and assembly cases, under assumptions similar to those of this paper. However, we find that for the distributive case, with the consideration of vertical and horizontal interactions, firm-level profit for incumbents could increase or decrease with changes in concentration. This result is due to the combined effect of competition and upstream resource price changes.

Examples of distributive network structures abound. Perhaps the most obvious case is that of simple geographical distribution, where goods from a plant are sold in more than one region, with no cross-selling across regions (due to distance and cost). Distributive structures also occur in many process industries, where one product is used in more than one distinct “downstream” production process to make different products. Examples include metals (steel, aluminium, copper), agricultural

products (milk, wheat, corn), petro-chemicals (leading to a vast range of sectors including polymer plastics like PVC and HDPE, fibers like polyester and chemicals like methanol, ethylene and olefins), and electronic components (like memory chips) going into different boards and products.

Cement production provides a good example of a two-tier distributive network. The first stage is the production of clinker from limestone. At a second tier, clinker is ground, blended with fillers like slag, and packaged into the final product. The grinding plants tend to be closer to market regions and so are geographically distributed, while clinkering must be done close to the sources of raw material (limestone and coal). Grinding plant costs are an order of magnitude smaller than clinker plants, so that there can be many more entrants at the lower tier than at the upper. In some regions, a third tier in this sector is distribution to retail locations, which happens in countries with many small contractors who buy cement locally.

Changes in costs, concentration, technology, network structure, or demand can have both vertical and lateral effects in distributive systems. For example, an increased demand for gasohol affects prices and production of corn, and thus of starch, corn syrup, and hundreds of other foods, cosmetics and industrial products. The magnitudes of the changes in any sector depend on many, perhaps all, other sectors. Methods for understanding and estimating these changes, and for solving large problems, are not readily available. If multiple concurrent changes occur in these systems, it is not easy to assess the composite effects of those changes. And in some cases, the changes can be counter-intuitive even in terms of direction.

We note that the (post-entry competition) model of this paper is a pre-requisite not only for entry decisions, but also for other types of analyses. For example, a facility location decision in the context of a supply chain could use the post-entry production model to understand the consequences of alternative location choices. Ho et al. (2004) study competitive location with a simpler imbedded one-tier Cournot model of production competition after location choice. But in many sectors, for example cement, petrochemicals, or food processing, there are multiple tiers involved. This more complex and realistic location problem remains to be investigated. As another example, consider the consequences of process improvement at some stage in an industry to reduce variable costs. The results of such changes can ripple to upstream, downstream and lateral sectors. The tools to analyze such changes do not exist today. . Vertical integration decisions can be analyzed in a manner similar to the example in Corbett and Karmarkar (2001) for the serial chain case. In all these examples, the fast solution of the competitive model is a necessary pre-requisite.

The distributive model can also be combined with the assembly model of Carr and Karmarkar (2004) to study more complex production networks. However, this extension is not trivial, and the solution approach may not be general, since it can depend on the specific structure of the network being considered.

2. Research Review

Our analysis is in the tradition of the Successive Cournot oligopoly literature, though most previous research has been limited to the two tier serial case with only one or two entrants at each tier. In fact, the upstream tier is often taken to consist of a single (monopolist) firm. Furthermore, most of the existing literature is directed towards policy issues related to vertical integration and market foreclosure, often in a setting with the upstream monopolist integrating forward. Our approach is directed at the modeling, analysis and solution of large-scale networks, in order to understand the implications for production decisions (quantities), the resulting prices, and the effects of

changes in network structure, variable cost structure across the network, end demand, and concentration at network stages.

Machlup and Taber (1960) present an early discussion of successive oligopoly and vertical integration. Greenhut and Ohta (1979) and Abiru (1988) show that vertical integration by a monopolist in the supplying sector, by and large leads to higher outputs and lower prices. The seeming paradox here is that a monopolist integrating forward, can drive out competitors from downstream markets, and yet social welfare can be increased. Essentially, this happens because vertical integration avoids double marginalization. Quan and Rogers (2004), follow an approach similar to Corbett and Karmarkar (2004) to examine a two-tier network of a telecommunications firm purchasing software tools from an upstream vendor; the firm then employs the tools to produce both a product (programmed queries) and services.

Tyagi (1999) studies the effects of downstream entry in a two tier serial setting when the upstream tier consists of a monopolist and the downstream tier consists of identical firms. He finds that downstream entry could affect the (upstream) price charged to the downstream firms. Depending on the consumer demand functions, this change of upstream price could have negative or positive effect on the profits of downstream incumbents. This effect occurs for certain demand conditions, and cannot occur for linear demand in a serial chain. In this paper we show that it can occur in distributive chains even when the end market demand is linear, due to an entirely different mechanism that has to do with the distributive structure rather than with the shape of the end market demand curve.

Other related economic literature includes Ziss's (1995) study of horizontal mergers within a setting of two tiers with two entrants in each tier, Vickers's (1995) study of regulation in serial chain competition and Seade's (1980) study on the effects of concentration and entry. As we have mentioned, none of these papers considers a network where there are multiple tiers of distributors or manufacturers, or a distributive structure.

Our paper is closest in methodology and spirit to Corbett and Karmarkar (2001) who study multi-tier serial supply chains. Also closely related is the paper by Carr and Karmarkar (2005) that analyzes multi-echelon assembly networks. The distributive and assembly settings are complementary generalizations of the serial case. There are significant differences in the two generalizations that derive from the different underlying network structures. In the assembly case, a key advance was in representing how quantity matching takes place across supplying sectors (corresponding to bill-of-materials relationships). In the distributive case, an important insight is that upstream firms have to strike a balance between multiple downstream sectors when discrimination is not possible. This compromise then has implications for the consequences of changes in parameters or structure.

The ability to analyze the equilibrium behavior of large-scale distributive networks distinguishes our paper from previous work, and as far as we are aware, this is the first paper to address this setting.

3. The Two-Tier Distributive Model

In the two-tier case, there is a single upstream sector (consisting of several homogenous firms) and multiple sectors in the lower tier (each with several firms) as shown in Figure 2.

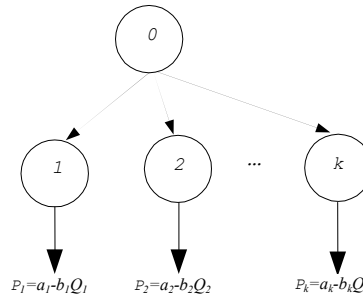


Figure 2 A Two-Tier Case

Firms at each downstream sector i face an independent consumer market, where the price and the aggregate production quantities are linearly related by $p_i = a_i - b_i Q_i$. Here, a_i is the market reservation price, the supremum price at which demand will be positive. The other parameters b_i is price sensitivity of the market. We also define $B_i := 1/b_i$ for convenience.

We use the following notation:

- v_i , the variable cost of production and distribution in sector i , $i=0, 1, \dots, k$.
- n_i , (a positive integer), the number of firms in sector i . For convenience, we also use a parameter N_i defined by $N_i := n_i / (n_i + 1)$.
- p_i , the common price charged by all firms in sector i to all downstream sectors.
- q_i , the quantity chosen by a single firm in sector i . As in a standard one sector Cournot model, all firms within a sector produce the same quantity at equilibrium, so the individual firms' production quantities can (at equilibrium) be expressed as $q_i = Q_i/n_i$.
- π_i , the profit of a single firm in sector i .

We assume that firms in each lower tier sector compete in the Cournot sense, and competition in the network follows the Successive Cournot framework (Machlup and Taber, 1960). That is to say, each firm in each lower tier sector chooses production quantity to maximize its profit, given a demand curve and a price for the input supplied by the upstream sector. For the upstream sector the aggregate quantity across all downstream (lower tier) sectors as a function of the resource price, establishes a demand curve for the resource supplying (upstream) sector. Firms in that sector compete in the Cournot sense by choosing quantities given this demand curve. Costs of resources or inputs at this sector are assumed to be exogenous to the model.

The following two criteria define equilibrium. For every sector:

1. Given the demand curve faced by the sector and the resource price charged by the upstream sector, no firm in the sector has an incentive to unilaterally deviate from its production quantity.
2. The aggregate quantity produced in every sector is balanced with the aggregate quantity of the required resource (i.e., markets clear).

The optimal production quantities and equilibrium prices for this system are as follows.

Proposition 1 *The equilibrium prices, production quantities, and profits for the two-tier distributive network in figure 2 are*

$$\begin{aligned}
p_0 &= (1 - N_0)a_0 + N_0v_0 \\
Q_0 &= B_0(a_0 - p_0) = N_0B_0(a_0 - v_0) \\
\pi_0 &= (1 - N_0)^2 Q_0^2 / (B_0 N_0^2) = B_0(1 - N_0)^2(a_0 - v_0)^2 \\
p_i &= N_i[(1 - N_0)a_0 + N_0v_0] + [(1 - N_i)a_i + N_iv_i], \quad i = 1 \dots k \\
Q_i &= B_i(a_i - p_i) = N_iB_i[a_i - v_i - v_0 - (1 - N_0)(a_0 - v_0)], \quad i = 1 \dots k \\
\pi_i &= \frac{(1 - N_i)^2}{B_i N_i^2} Q_i^2 = (1 - N_i)^2 B_i[a_i - v_i - v_0 - (1 - N_0)(a_0 - v_0)]^2, \quad i = 1 \dots k
\end{aligned}$$

where $a_0 := \sum_{i=1..k} N_i B_i (a_i - v_i) / \sum_{i=1..k} N_i B_i$ and $B_0 := \sum_{i=1..k} N_i B_i$.

The proof is given in the Appendix. An important property of this proposition is that the equilibrium price for the resource supplied by the upstream tier is related to the prices that would be charged in the perfect discrimination case, in a specific way. Suppose that perfect discrimination were possible, i.e. that in the Cournot setting the upper tier could determine the quantities supplied to each downstream sector (node) independently. The system can then be decomposed into k separate serial systems. Let p_{0j} be the resource price in the j 'th such system. Then we have

Proposition 2 *The resource price p_0 is a convex combination of the perfect discrimination prices p_{0j} , $j=1, \dots, k$:*

$$p_0 = \sum_{j=1..k} N_j B_j p_{0j} / \sum_{i=1..k} N_i B_i. \quad (1)$$

The proof is given in the Appendix. The qualitative insight from this result is that the resource price in the distributive case is a compromise between the prices that could have been obtained from each downstream purchasing sector, under perfect discrimination. So for example, the appearance of another potential buyer of the resource will create a price shift, which could be in either direction, depending on the price and the weighting given to the new sector. Note that the weights in the convex combination term depend on the N s which are measures of the concentration of a sector, and on the B s which are a measure of the price sensitivity of the imputed demand curve of the sector. From this result it is straightforward to investigate the impact of changes in concentration, or demand curve parameters in the downstream sectors, on the resource price, and hence on profitability.

4. The Multi-Tier Case

We now consider general distributive supply networks as exemplified by Figure 1. We restrict attention to situations in which the aggregate production quantity along each arc of a given network is strictly positive at equilibrium.

The arborescent structure of distributive networks implies that each network has a single root sector. We label the sectors of network top down with the root sector as sector 1. For each sector i (node i), we define:

D_i as the set of all the sectors downstream of sector i . For example, in figure 1, $D_1 = \{2, 3, 4, 5, 6\}$ and $D_4 = \{5, 6\}$.

S_i as the set of sectors immediately downstream of sector i . In figure 1, $S_1 = \{2, 3, 4\}$.

$\varphi_{i,s}$ as the set of sectors along (i, s) , the path from sector i to sector s . In figure 1, path $(1, 5)$ is the path from sector 1, through sector 4, to sector 5; and $\varphi_{1,5} = \{1, 4, 5\}$.

Proposition 3 For a given distributive network, the derived demand curve for any upstream sector i is

$$p_i = a_i - b_i Q_i, \text{ or } Q_i = B_i(a_i - p_i), \quad (2)$$

where the parameters B_i , a_i , and b_i are computed iteratively tier by tier as

$$B_i = \sum_{s \in S_i} N_s B_s, \quad b_i = \frac{1}{\sum_{s \in S_i} N_s B_s}, \text{ and } a_i = \frac{\sum_{s \in S_i} N_s B_s (a_s - v_s)}{\sum_{s \in S_i} N_s B_s}.$$

The proof is similar to the proof for Proposition 1 and is omitted here. The expressions in (2) provide some interesting properties of the derived demand curves seen by upstream sectors. As in the serial supply chain case (Corbett and Karmarkar, 2001), B decreases going upstream. That is to say, the quantities demanded at upstream sectors are less sensitive to upstream price than sectors which are closer to the markets. Note also that the reservation price a_i seen by a tier i is equal to the weighted average of the reservation prices along i 's downstream arcs, $a_s - v_s, s \in S_i$. In the extreme case when $a_s - v_s$ is the same along each branch, a_i equals $a_s - v_s$. In such situations, a_i does not change with B_s or N_s . This property is crucial for our later discussion of the effect of downstream entry to the prices and profits in upstream sectors.

Using Proposition 3, we can iteratively derive the demand curve for each sector, starting from the sectors facing final consumers. From these curves, the equilibrium price condition for each sector can be derived. All the price conditions together comprise a system of independent linear equations, which is solvable. The equilibrium quantities are then derived by substituting the prices back into demand curves. This solution method can be conveniently expressed in matrix notation, as given in the following proposition.

Proposition 4 Equilibrium prices of sectors in a distributive network are the solution to

$$T \cdot \bar{p} = R$$

where $\bar{p}$ is the vector of prices (one element per sector), R is a column vector (one element per sector) with each element $R_i = (1 - N_i)a_i + N_i v_i$, and T is a lower triangular matrix, populated with element

$$T_{ij} = \begin{cases} 1 & \text{if } i = j \\ -N_i & \text{if } i \in S_j \\ 0 & \text{otherwise} \end{cases}.$$

The proof is omitted as it follows from the above discussion. Note that T can be inverted to give T^{-1} with elements

$$T_{ij}^{-1} = \begin{cases} 1 & \text{if } i = j \\ N_{j,i} / N_j & \text{if } i \in D_j \\ 0 & \text{otherwise.} \end{cases}$$

where $N_{j,i}$ is defined as $N_{j,i} := \prod_{s \in \phi_{j,i}} N_s$. Applying T^{-1} gives the following corollary.

Corollary 4 At equilibrium, the price of sector i in a distributive network is

$$p_i = \sum_{j \in \varphi_{1,i}} (N_{j,i} / N_j) [(1 - N_j) a_j + N_j v_j], \quad (3)$$

where $N_{j,i}$ is defined as $N_{j,i} := \prod_{s \in \varphi_{j,i}} N_s$.

As in Carr and Karmarkar (2005), T is a structure matrix that captures the relationship between the structural features of a distributive network (i.e., the sector connections, concentrations, and demand functions) and the equilibrium competition prices. In the following section we further explore the structural properties of distributive networks using Proposition 4 and Corollary 4.

5. Structural Properties of Distributive Networks

Thus far we have described the structure of distributive multi-echelon networks, a representation method, and the computations required to solve for equilibrium prices through the structure matrix for any such network. We now investigate how changes to a network's structure or to its parameters influence these equilibrium values. We present certain structural properties of distributive networks and address such questions using these properties.

Equivalence: We say that two sub-networks or two sets of nodes are equivalent with respect to the rest of the network if, after substituting one network (set of nodes) for the other, the rest of the network has the same equilibrium prices, quantities, and firm-level profits. Noting that a subnetwork essentially communicates to the rest of the network through the demand curve that is provided to the subnetwork's root node, this means that two sub-networks are equivalent when they show the same demand curve to the rest of the network.

Expandability: Defining dummy sector d as a node that is described by $N_d = 1$ and $v_d = 0$, a network expanded by inserting dummy sectors is equivalent to the original network with respect to all of the non-dummy sectors and customers. Figure 3 illustrates a network (a) and an equivalent expanded version (b).

Network expandability can be established by showing that the equilibrium prices of sectors 1, 2, 3, and 4 in Figure 3(b) are exactly the same as the equilibrium prices of their counterparts in Figure 3(a).

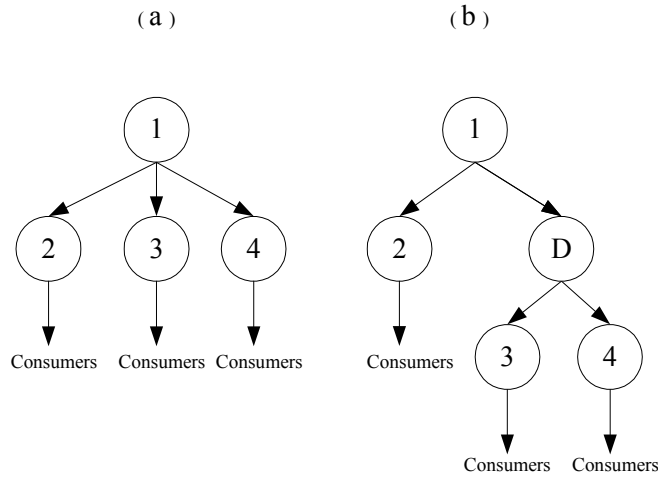


Figure 3 Network Expandability

Compressibility: A sub-network that is downstream of a sector can be compressed into a single market without affecting the equilibrium price, quantity, and firm-level profits of the sector. Specifically, in any network, let sector i be the root node of a subnetwork. If all nodes below sector i are replaced with a market having demand parameters a_i and b_i (or B_i), then the modified network is equivalent to the original network.

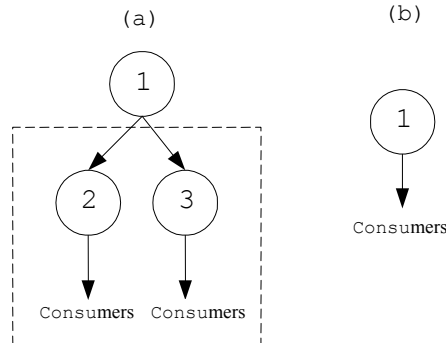


Figure 4 Network Compressibility

Turning to comparative statics, we now consider the sensitivity of a sector's equilibrium prices, profits, and quantities to other sectors' parameters where i will be the sector at which a change occurs, and we consider how this affects another sector s .

Proposition 5 Suppose s is any sector not upstream of sector i , and let u be the first node encountered that is upstream of both i and s . Then, a parameter change at i is completely communicated to sector s through p_u . That is, at equilibrium, p_s increases iff p_u increases (as a result of the change at i) and, equivalently, π_s decreases iff p_u increases.

The proof is omitted. Using this proposition together with compressibility and expansibility allows us to analyze the effect of parametric changes very simply. We only need to examine the sec-

tors along the path $(1, i)$ to discuss the effects of parameter changes in sector i . Using the compressibility property, the rest of the network can be compressed to single sectors without changing the equilibrium solution to the network. Therefore, the general multi-tier distributive network can be compressed to a simple binary tree as shown in Figure 5(b). In the following discussion, we focus on the equilibrium prices, quantities, and profits of the sectors along the path $(1, i)$ in the binary structure shown in Figure 5(b). The other sectors are distinguished by a prime ('). In the figure, we assume the market parameters (a 's and B 's) of the leaf sectors (sector i' , $i-1'$, ..., $2'$ and sector i) are given.

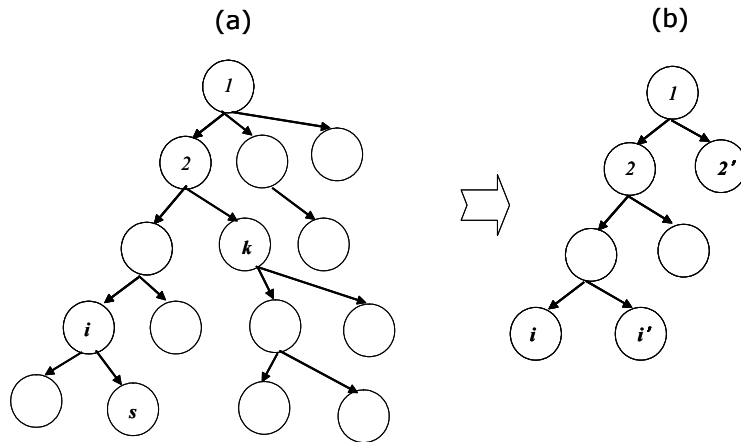


Figure 5 Convert a Distributive Network into a Binary Tree

The following proposition shows how v_i influences equilibrium prices and profits in each sector along the path $(1, i)$.

Proposition 6 (Illustrated by Figure 5(b).) Suppose that v_i , the variable production cost in sector i , increases. At equilibrium:

- 1) p_i increases, Q_i and π_i decrease.
- 2) If sector j is upstream of i ($j \in \phi_{1,i}$), then p_j , Q_j , and π_j decrease.
- 3) If sector j is downstream of i then p_j increases; Q_j and π_j decrease.
- 4) Otherwise (i.e., j is neither upstream nor downstream of i) p_j decreases; Q_j and π_j increase.

The effects of changes in v_i are intuitive in that increased production cost for firms in a sector increases selling prices and lowers profits. It also decreases the prices and firm-level profits of upstream sectors in the whole supply chain, which means the cost increase is passed along the supply chain eventually resulting in lower prices, lower production, and lower profit margins for all upstream sectors. Interestingly, however, for sectors in the network that are not along the path from the root to i , if the resource prices charged by their connecting nodes decrease, the firms in those sectors become more profitable.

Proposition 7 Suppose that a_i increases (at a sector i supplying a consumer market). At equilibrium:

- 1) Q_i , p_i , and π_i all increase.
- 2) If sector j is upstream of i then Q_j , p_j , and π_j all increase.
- 3) If sector j is not upstream of i then p_j increases, Q_j and π_j decrease.

So, increased profit margins can be passed upstream along the chain, causing prices to increase in resource markets and profits to increase in upstream firms. However, to firms in the "substitute channels" of the network, an increase in a_i has negative effects: their prices increase and profits decrease as a result of the change.

6. The Effects of Sector Concentration

The dependence of equilibrium outputs, prices and profits on industry concentration is a fundamental issue in economic analysis. Conventional wisdom holds that with lower concentration (more firms), industry price ought to decline and per firm output and profit ought to decrease. In single tier Cournot competition, this claim holds for most general demand conditions. In multi-tier networks, we might expect that lower concentration in a lower tier would lead to higher market power and higher profits in an upper (supplying) tier. However, these expectations may be violated in distributive networks. The following discussion shows that even with linear demand there exists a range of demand conditions for which an increase in the number of firms in a sector (lower concentration) increases the profits of the sector's existing firms and decreases the profits of upstream firms. This surprising result occurs when entry decreases the potential upstream market, and causes the upstream price to decrease; this then permits the profit margin of the downstream firms to increase. If the effect of upstream price outweighs the effect of increased competition due to the entry, the incumbents' profits in the sector with entry can go up. We note that this seemingly perverse effect is not necessarily a common phenomenon. It occurs for certain parameter ranges, and can disappear with further entry. However, what it underlines is that the distributive structure has characteristics which are specific to that structure, and which lead to consequences not seen in the pure serial and assembly cases.

In the following discussion of entry effects, we start with two-tier case to derive explicit results. Then, we extend the analysis to the multi-tier case and show that certain properties generalize simply while other effects can be more complex. The following proposition summarizes the effects of sector concentration on equilibrium prices, outputs, and profits for two-tier networks.

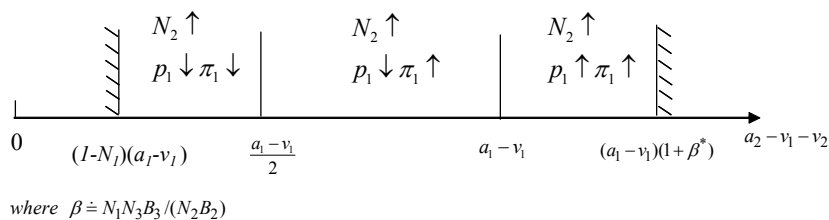


Figure 6 Effect of Increases in N_2 on P_1 and Π_1

Proposition 8 *The effects of concentration changes (entry or exit) in the two-tier network of Figure 4(a) are:*

- 1) *An increase (decrease) in n_1 and N_1 causes p_1 , p_2 , π_1 to decrease (increase), and causes Q_1 , Q_2 , π_2 to increase (decrease).*
- 2) *An increase (decrease) of N_2 due to entry (exit) in that downstream sector causes p_2 to decrease (increase).*
- 3) *However, with an increase of N_2 , p_1 and π_1 could increase, decrease or remain constant depending on the relative demand parameters (as shown in Figure 6):*

For p_1 : if $a_2 - v_2 > a_1$ (i.e., $a_2 - v_2 > a_3 - v_3$), p_1 increases with N_2 ; if $a_2 - v_2 = a_1$ (i.e., $a_2 - v_2 = a_3 - v_3$), p_1 remains constant; if $a_2 - v_2 < a_1$ (i.e., $a_2 - v_2 < a_3 - v_3$), p_1 decreases with N_2 .

For π_1 : if $a_2 - v_2 - v_1 > (a_1 - v_1)/2$, π_1 increases with N_2 ; if $a_2 - v_2 - v_1 = (a_1 - v_1)/2$, π_1 remains constant; if $a_2 - v_2 - v_1 < (a_1 - v_1)/2$, π_1 decreases with N_2 . $a_2 - v_2 - v_1$ is always greater than $(1 - N_1)(a_1 - v_1)$ and smaller than $(a_1 - v_1)(1 + N_1 N_3 B_3 / (N_2 B_2))$ due to the regularity condition.

4) Moreover, π_2 could increase, decrease, or remain constant with the increase of N_2 . Specifically

$$\text{if } a_2 - v_2 - v_1 < \frac{B_1 + (1 - N_2)B_2}{B_1 + (1 - N_2)B_2 - N_1(1 - N_2)B_2} (1 - N_1)(a_1 - v_1), \quad (4)$$

π_2 increases with N_2 . Otherwise, π_2 decreases with N_2 (or remains constant when the above expression holds with equality).

Parts 1) and 2) of Proposition 8 state that lower concentration or an increased number of firms in a sector, leads to lower prices in the sector. More interesting and quite counter-intuitive findings are the effects of N_2 on p_1 , π_1 , and π_2 as stated in parts 3) and 4) of Proposition 8. Contrary to conventional wisdom, reduced concentration (entry) in a downstream sector can cause the resource price charged by the upstream suppliers to go up under certain demand and cost conditions. Moreover, for a certain range of demand parameters, the profit of upstream suppliers could go down as a result of the downstream entry. Similarly, incumbents in the same sector (sector 2 in our analysis) could see profits increase.

The last phenomenon is not pervasive. It only happens when the effect of resource price decrease overwhelms the effect of competition. Furthermore, notice that the right hand side of the inequality condition (4) monotonically decreases in N_2 . With continued entry in sector 2, the anomalous effect goes away. However, it illustrates a characteristic of distributive systems. The underlying reason for these effects is the nature of upstream resource price, which as shown in Proposition 2, is a compromise between the resource prices that would be seen with perfect discrimination. The weight of the balance is controlled by the concentration (N_i). For a sector in which the resource price under perfect discrimination is higher, entry intensifies the weight, and makes the equilibrium resource price higher, and vice versa.

To examine the effect of concentration changes at a sector i in a multi-tier network, we only need to focus on the behavior of sectors along the path $(1, i)$. We note that, the reservation prices for upstream sectors a_j ($1 \leq j \leq i$) play a key role in the changes of prices, outputs and firm-level profits. In the following proposition, we summarize the direction of change of a_j with respect to N_i .

Proposition 9 *The direction of change of the market reservation price a_j at sector j , $j \in \phi_{1,i}$, with respect to N_i can be captured by its first derivative as*

$$\frac{\partial a_j}{\partial N_i} = \frac{N_{j+1,i-1} B_i}{B_j} (a_i - v_{j+1,i} - a_j)$$

where $N_{j+1,i-1} = \prod_{s=j+1}^{i-1} N_s$ (if $j=i-1$, $N_{j+1,i-1} = 1$) and $v_{j+1,i} = \sum_{s=j+1}^i v_s$.

Thus the reservation price for an upstream sector increases, decreases, or remains the same depending on the relative value of the reservation prices along the channel where entry occurs and the reservation price of the market, which is the weighted average value of each downstream channel as discussed earlier. This result, which is different from the cases in serial chains (Corbett and Kar-

markar, 2001) or assembly networks (Carr and Karmarkar, 2005), enables us to examine the price changes of any sector with the change of N_i .

Proposition 10 *In a multi-echelon distributive network, the price at tier i , p_i , decreases monotonically with N_i .*

Using (3), p_j , the price charged by the upstream sectors j , can be expressed as

$$p_j = \sum_{k=1..j} N_{k+1,j} [(1 - N_k) a_k + N_k v_k]$$

Since each individual " a " is a function of N_i , the directive of p_j to N_i can be expressed as

$$\begin{aligned} \frac{\partial p_j}{\partial N_i} &= \sum_{k=1..j} N_{k+1,j} (1 - N_k) \frac{\partial a_k}{\partial N_i} \\ &= \sum_{j=1..j} N_{k+1,j} (1 - N_j) \frac{N_{k+1,i-1} B_i}{B_k} (a_i - v_{k+1,i} - a_k). \end{aligned}$$

Next, profit of sector j can be expressed as

$$\pi_j = B_j (1 - N_j)^2 (a_j - v_j - p_{j-1})^2,$$

and the first differentiation then gives

$$\frac{\partial \pi_j}{\partial N_i} = 2 B_j (1 - N_j)^2 (a_j - v_j - p_{j-1}) \left(\frac{\partial a_j}{\partial N_i} - \frac{\partial p_{j-1}}{\partial N_i} \right).$$

We can thus see that upstream market price and profit could decrease, increase or remain constant with downstream entry. Furthermore, the trends in these strategic variables can be even more complicated since they depend on the changes of any upper tier's reservation price and equilibrium price. For example, a sector's price could increase even when the sector's reservation price decreases.

7. Vertical Integration in Distributive Networks

Corbett and Karmarkar (2001) have examined vertical integration in two tier serial networks, assuming that the numbers of firms in both tiers are the same, to permit comparison of the integrated and un-integrated cases. They find that when each tier has a single firm (monopoly), integration results in higher profits. However, when there are two or more firms in each tier, then the total profits of the network decline.

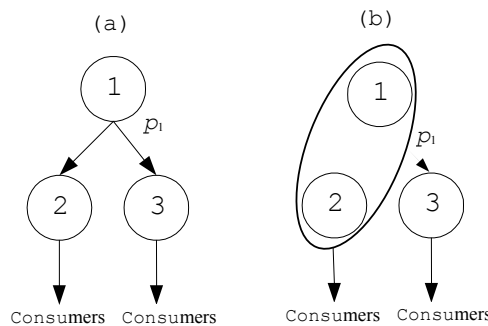


Figure 7 Vertical Integration

In the distributive case, there are many more structural alternatives that might be considered with respect to integration – too many to really consider all. However, as in the serial case, the modeling approach developed here allows for any specific case to be analyzed. What is more, the distributive structure leads to phenomena which do not occur in the serial case. Consider a sector that supplies two downstream sectors (Figure 7). We can then have a situation where the upstream sector might integrate forward with one of the downstream sectors but not the other. As in the serial case, we can look at what happens relative to that downstream market. However, here there will also be lateral effects on the other downstream sector. Recalling the result of proposition 2, one can see that after integration, the upstream sector will no longer have to balance the downstream sectors in its pricing decisions, and will take different action with respect to the second (unintegrated) sector. From the point of profitability, the upstream sector will see two sources of profit changes: that from integrating forward, and that from changing its actions with respect to the second downstream sector. In turn, the second un-integrated downstream sector may see either an increase or a decrease in resource price and therefore its profits could either go up or down. The latter (lateral) effect is of course a characteristic of distributive network structure.

Proposition 11 *Assume there are same number of firms in sector 1 and 2 in the two-tier, three-sector case (as in Figure 7). Vertical integration of sector 1 and sector 2 always causes Q_2 to increase. Moreover, if $a_2 - v_2 > a_3 - v_3$, the resource price p_1 decreases; if $a_2 - v_2 = a_3 - v_3$, p_1 remains unchanged; and if $a_2 - v_2 < a_3 - v_3$, p_1 increases. Q_3 and π_3 increase (decrease) iff p_1 increases (decreases). Finally, the total profit of the integrated firms, $\pi_1 + \pi_2$ increases when $n_2 = 1$; otherwise, $\pi_1 + \pi_2$ decreases when $n_2 > 1$.*

In the case where there are more than two downstream sectors, integration of the upper tier with one of the downstream sectors can lead to a wide range of possible outcomes, depending on the specifics of the system.

8. Conclusion

In this paper, we have analyzed competition in pure distributive multi-echelon supply networks, using the Successive Cournot model for oligopolistic competition with multiple tiers. We developed explicit expressions for equilibrium prices and quantities as the solutions to a set of linear equations that can be derived from the structure of the network. The equilibrium solution is obtained in two steps: 1) Iteratively calculate all the upstream markets' demand parameters; 2) Solve a system of linear equations that involve the demand parameters. We demonstrated certain network transformation principles that allow a network to be compressed or to be expanded to a binary tree structure. These transformations make it straightforward to examine the effects of parametric changes on the equilibrium solution to any distributive network.

Finally, we present some comparative statics results and discuss the effects of entry on equilibrium prices, quantities and firm-level profits. Changes in the variable costs of production have expected effects, as do changes in demand parameters. However, the effects of changes in sector concentration are not as obvious. If the number of firms in a sector increases, the quantity produced in the sector increases and price charged by firms in the sector decreases. Downstream effects are also as expected. However, the upstream consequences are more complicated in that whether upstream prices increase or decrease depends on the demand conditions of the sector where the entry occurs relative to parallel paths. If entry occurs along the channel with less than the average reservation price of the upstream market, the upstream price could decrease rather than increase. With certain demand conditions, the decreased resource price provides a larger profit margin for downstream in-

cumbents and this positive impact on profits can outweigh the competition effect due to entry and thus cause equilibrium profits to increase with entry. Decreased prices in upstream can also cause upstream firms to profit less (although for the two-tier case with a monopoly supplier in the upstream tier, upstream profits always increase with downstream entry). For those firms not along the path between the root sector and the sector with entry, their equilibrium prices, quantities, and profits change according to the change in the price of the connecting node i.e. the sector that connects the firms with the path in question. Thus, we see that some existing intuitions, largely derived either from serial supply chains or from models with a single competitive sector, do not all survive the extension to more complex distributive networks.

The present analysis not only provides results for large-scale distributive supply chains, but also suggests directions for the analysis of other network structures. In ongoing research, we are investigating the analysis of acyclic multi-echelon networks that have a mix of assembly, distributive, and non-arborescent network topologies. The eventual target of this stream of research is to provide robust techniques to analyze competition in large-scale supply chains and networks with general structures.

References

- Abiru, M. 1988. Vertical integration, variable proportions and successive oligopolies. *Journal of Industrial Economics* 36 315-325.
- Carr, M. S., U. S. Karmarkar. 2005. Competition in multi-echelon assembly supply chains. *Management Science* 51 45-59.
- Corbett, C., U. S. Karmarkar. 2001. Competition and structure in serial supply chains with deterministic demand. *Management Science* 47 966-978.
- Greenhut, M. L., H. Ohta. 1979. Vertical integration of successive oligopolists. *American Economics Review* 69 137--141.
- Machlup, F., M. Taber. 1960. Bilateral monopoly, successive monopoly, and vertical integration. *Economica* 27 101-119.
- Quan, V., S. Rogers. 2004. Modeling a vendor-Telco supply network to deliver two types of telephony services. *Computers and Industrial Engineering*, 46 (4) 893-903.
- Seade, J. 1980. On the effect of entry. *Econometrica*, 48 (2) 479-489.
- Tyagi, R.K. 1999. On the effects of downstream entry. *Management Science* 45 59-73
- Vickers, J. 1995. Competition and regulation and vertically related markets. *Review of Economic Study* 62 1-17.
- Ziss, S. 1995. Vertical separation and horizontal mergers. *Journal of Industrial Economics* 43 63-75.

About the Author



Dr. Deming Zhou is an Assistant Professor at Department of Decision Sciences and Managerial Economics, Faculty of Business Administration at the Chinese University of Hong Kong, Hong Kong. His research interests are in the areas of Supply Chain Coordination and Supply Chain Competition Models, and Logistics. He has published numerous journal papers, pertaining to Manufacturing and Service Operations Management, *European Journal of Operational Research*, *European Journal of Operational Research*, *International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems*, *International Journal of Physical Distribution & Logistics Management*, or *Management Science*. Dr. Zhou has consulted on supply chain coordination for several governmental research projects, financed by Research Grants Council.

Appendix

Proof of Proposition 1

Starting with sector i of the downstream tier, the first equilibrium criterion means that each firm in the sector selects a production quantity q_i that maximizes its profits given that the firms in the sector purchase products at a cost of p_0 and incur a variable cost v_i for every unit produced. A single firm thus seeks to maximize revenue of $q_i(p_i - p_0 - v_i)$, where p_i equals $a_i - b_i Q_i$. Differentiation gives us the firm's first order optimality condition which is to select quantity that solves

$$q_i = B_i(a_i - v_i - p_0) / 2 - Q_{-i} / 2, \quad i=1, \dots, k$$

where Q_{-i} is the aggregate quantity produced by all the other firms in sector i . The production decision of each firm in sector i follows this same condition as well due to the identical cost structure of all firms in the sector. This gives us a system of n_i independent linear equations for each sector i . A symmetric solution can be calculated in which every firm produces quantity is

$$q_i = B_i(a_i - v_i - p_0) / (n_i + 1), \quad i=1, \dots, k$$

and the entire sector produces an aggregate quantity,

$$Q_i = n_i q_i = N_i B_i(a_i - v_i - p_0), \quad i=1, \dots, k \quad (A1)$$

We now substitute (A1) into sector i 's demand curve to get the sector i equilibrium price condition

$$p_i = (1 - N_i)a_i + N_i(v_i + p_0), \quad i=1, \dots, k \quad (A2)$$

Next we look at the supplier tier, sector 0. Our second equilibrium criterion requires the supply and demand quantities to be balanced, so the aggregate quantity produced at sector 0 should be equal to the aggregate equilibrium quantities in each of its distributive downstream sector, i.e., $Q_0 = Q_1 + \dots + Q_k$. Taking in the equilibrium aggregate quantity Q_i from (A1), we can derive the demand curve for sector 0 firms as

$$\begin{aligned} Q_0 &= \sum_{i=1..k} N_i B_i(a_i - v_i - p_0) = \left(\sum_{i=1..k} N_i B_i \right) \left(\sum_{i=1..k} N_i B_i(a_i - v_i) / \sum_{i=1..k} N_i B_i - p_0 \right) \\ &\equiv B_0(a_0 - p_0) \end{aligned}$$

where $a_0 := \sum_{i=1..k} N_i B_i(a_i - v_i) / \sum_{i=1..k} N_i B_i$ and $B_0 := \sum_{i=1..k} N_i B_i$.

Now analyzing the production decisions for sector 0 firms gives the equilibrium production quantities as

$$\begin{aligned} q_0 &= (1 - N_0)B_0(a_0 - v_0), \\ Q_0 &= n_0 q_0 = N_0 B_0(a_0 - v_0). \end{aligned}$$

Also, we can derive the sector 0 equilibrium price as

$$p_0 = (1 - N_0)a_0 + N_0 v_0. \quad (A3)$$

Equations (A2) and (A3) taken together are a system of independent linear equations, and can be easily solved to get the equilibrium prices (p_0 is already the equilibrium price),

$$p_i = N_i[(1 - N_0)a_0 + N_0v_0] + [(1 - N_i)a_i + N_iv_i], \quad i = 1 \dots k.$$

Furthermore, substituting these prices into the relevant demand curves gives the equilibrium aggregate production quantity for each sector. Firm level profits can then be derived by substituting back the optimal prices and quantities. Q.E.D.

Proof of Proposition 2

From proposition 1, $p_{0j} = (1 - N_0)a_{0j} + N_0v_0$, where $a_{0j} := a_j - v_j$. Thus, (1) can be derived.

Proof of Proposition 6

We know for the distributive network in figure 5(b), the prices and profits of each individual firm in sector j ($1 \leq j \leq i$) are:

$$\begin{aligned} p_j &= (1 - N_j)a_j + N_j(v_j + p_{j-1}), \\ Q_j &= N_jB_j(a_j - v_j - p_{j-1}), \\ \pi_j &= (1 - N_j)^2 B_j(a_j - v_j - p_{j-1})^2 \end{aligned}$$

Moreover, it is straightforward to derive the following expression,

$$\partial a_j / \partial v_i = -N_{j+1,i} B_i / B_j, \quad \text{for } j \in [1, i-1].$$

To prove 1), note that

$$\begin{aligned} \partial p_i / \partial v_i &= N_i(1 + \partial p_{i-1} / \partial v_i), \\ Q_i &= -N_i B_i(1 + \partial p_{i-1} / \partial v_i), \\ \pi_i &= -2(1 - N_i)^2 B_i(a_i - v_i - p_{i-1})(1 + \partial p_{i-1} / \partial v_i), \end{aligned}$$

we only need to show that $\partial p_{i-1} / \partial v_i > -1$. This can be done by induction. First, for sector 1,

$$\partial p_1 / \partial v_i = -N_{2,i}(1 - N_1)B_i / B_1 > -N_{2,i}(1 - N_1)B_i / B_1 \times N_1 / (1 - N_1) = N_{1,i}(1 - N_1)B_i / B_1 > -1.$$

Assume the condition holds for sector $i-2$. Then, for sector $i-1$, we have

$$\begin{aligned} \partial p_{i-1} / \partial v_i &= (1 - N_{i-1})(\partial a_{i-1} / \partial v_i) + N_{i-1}(\partial p_{i-2} / \partial v_i) \\ &> -(1 - N_{i-1})N_i B_i / B_{i-1} - N_{i-1} = -\frac{N_i B_i + N_{i-1} N_i B_i}{N_i B_i + N_{i-1} B_i} > -1. \end{aligned}$$

Thus, (1) is proved.

Now we use induction to establish (2). Starting from sector 1, we can derive the first derivatives with respect to v_i as

$$\begin{aligned} \partial p_1 / \partial v_i &= (1 - N_1)(\partial a_1 / \partial v_i) = -N_{2,i}(1 - N_1)B_i / B_1 < 0, \\ \partial Q_1 / \partial v_i &= B_1 N_1(\partial a_1 / \partial v_i) = -N_{1,i} B_i < 0 \\ \partial \pi_1 / \partial v_i &= 2(1 - N_1)^2 B_1(a_1 - v_1)(\partial a_1 / \partial v_i) = -2(1 - N_1)^2 N_{2,i} B_i(a_1 - v_1) < 0 \end{aligned}$$

Assuming these properties hold for sector $j-1$, we have the following expressions for p_j , Q_j , and π_j ,

$$\begin{aligned}\frac{\partial p_j}{\partial v_i} &= (1 - N_j) \frac{\partial a_j}{\partial v_i} + N_j \frac{\partial p_{j-1}}{\partial v_i} < 0 \\ \frac{\partial Q_j}{\partial v_i} &= B_j N_j \left(\frac{\partial a_j}{\partial v_i} - \frac{\partial p_{j-1}}{\partial v_i} \right) = B_j N_j \left[\frac{\partial a_j}{\partial v_i} - (1 - N_{j-1}) \frac{\partial a_{j-1}}{\partial v_i} - N_{j-1} \frac{\partial p_{j-2}}{\partial v_i} \right] \\ &= B_j N_j \left[-\left(\frac{N_{i,j+1} B_i}{B_j} - \frac{N_{i,j} B_i}{B_{j-1}} \right) + N_{j-1} \left(\frac{\partial a_{j-1}}{\partial v_i} - \frac{\partial p_{j-2}}{\partial v_i} \right) \right].\end{aligned}$$

Since $N_{i,j+1} B_i / B_j > N_{i,j} B_i / B_{j-1}$, we have $\partial Q_j / \partial v_i < 0$.

As to the profits of sector j ,

$$\frac{\partial \pi_j}{\partial v_i} = 2B_j(1 - N_j)^2(a_j - v_j - p_{j-1}) \left(\frac{\partial a_j}{\partial v_i} - \frac{\partial p_{j-1}}{\partial v_i} \right) < 0.$$

Thus (2) is proved. It is straightforward to derive (3) and (4) from (2) and proposition 5. Q.E.D.

Proof of Proposition 7

The proof is analogously similar to proposition 6, and is omitted here.

Proof of Proposition 8

1) For the three-sector two-tier network of figure 4(a), according to proposition 1, the price and profit of each individual firm in sector 1 and 2 are given by:

$$\begin{aligned}p_1 &= (1 - N_1)a_1 + N_1v_1, \\ p_2 &= (1 - N_2)a_2 + N_2(p_1 + v_2), \\ Q_1 &= N_1B_1(a_1 - v_1), \\ Q_2 &= N_2B_2(a_2 - v_2 - p_1), \\ \pi_1 &= b_1q_1^2 = (1 - N_1)^2 B_1(a_1 - v_1)^2, \\ \pi_2 &= b_2q_2^2 = (1 - N_2)^2 B_2(a_2 - v_2 - p_1)^2.\end{aligned}$$

Treating N_1 as a continuous variable and taking the first derivative of these expressions with respect to N_1 , we can easily show 1).

2) Differentiating p_2 with respect to N_2 , we get

$$\begin{aligned}\frac{\partial p_2}{\partial N_2} &= -(a_2 - v_2 - p_1) + N_2 \frac{\partial p_1}{\partial N_2} \\ &= -[a_2 - v_2 - p_1 - (1 - N_1)(a_1 - v_1)] + (1 - N_1)N_2B_2[(a_2 - v_2 - v_1) - (a_1 - v_1)] / B_1 \\ &= -(N_3B_3 + N_1N_2B_2)(a_2 - v_2 - v_1) / B_1 + (1 - N_1)N_3B_3(a_1 - v_1) / B_1\end{aligned}$$

Due to the regularity condition, $Q_1 > 0$, $Q_2 > 0$, and $Q_3 > 0$. Taking Q_1 , Q_2 , and Q_3 from proposition 1 and simplifying the expressions, we have

$$\begin{aligned}
a_1 - v_1 &> 0 \\
a_2 - v_2 - v_1 &> (1 - N_1)(a_1 - v_1) \\
a_2 - v_2 - v_1 &< [1 + N_1 N_3 B_3 / (N_2 B_2)](a_1 - v_1)
\end{aligned}$$

Therefore,

$$\begin{aligned}
\frac{\partial p_2}{\partial N_2} &< -\frac{N_3 B_3 + N_1 N_2 B_2}{B_1} (1 - N_1)(a_1 - v_1) + \frac{N_3 B_3}{B_1} (1 - N_1)(a_1 - v_1) \\
&= -\frac{N_1 N_2 B_2}{B_1} (1 - N_1)(a_1 - v_1) < 0.
\end{aligned}$$

3) To show the effect of N_2 on p_1 , we take the first derivative of p_1 with respect to N_2 as

$$\frac{\partial p_1}{\partial N_2} = (1 - N_1) \frac{\partial a_1}{\partial N_2} = (1 - N_1) \frac{N_3 B_2 B_3}{B_1^2} [(a_2 - v_2) - (a_3 - v_3)].$$

Thus, if $a_2 - v_2 > a_3 - v_3$, $\partial p_1 / \partial N_2 > 0$; $a_2 - v_2 < a_3 - v_3$, $\partial p_1 / \partial N_2 < 0$; $a_2 - v_2 = a_3 - v_3$, $\partial p_1 / \partial N_2 = 0$.

To show the effect of N_2 on π_1 , we have

$$\begin{aligned}
\frac{\partial \pi_1}{\partial N_2} &= B_2 (1 - N_1)^2 (a_1 - v_1)^2 + 2 B_1 (1 - N_1)^2 (a_1 - v_1) \frac{\partial a_1}{\partial N_2} \\
&= B_2 (1 - N_1)^2 (a_1 - v_1)^2 + 2 B_1 (1 - N_1)^2 (a_1 - v_1) \frac{B_2}{B_1} (a_2 - v_2 - a_1) \\
&= B_2 (1 - N_1)^2 (a_1 - v_1) [2(a_2 - v_2 - v_1) - (a_1 - v_1)]
\end{aligned}$$

Therefore, if $a_2 - v_2 - v_1 < (a_1 - v_1) / 2$, $\partial \pi_1 / \partial N_2$ is negative, i.e., π_1 decreases with N_2 . If $a_2 - v_2 - v_1 > (a_1 - v_1) / 2$, π_1 increase with N_2 .

4) To show the effect of N_2 on π_2 , we take the first derivative of π_2 with respect to N_2 ,

$$\begin{aligned}
\frac{\partial \pi_2}{\partial N_2} &= -2 B_2 (1 - N_2)(a_2 - v_2 - p_1)^2 - 2 B_2 (1 - N_2)^2 (a_2 - v_2 - p_1) \frac{\partial p_1}{\partial N_1} \\
&= -2 B_2 (1 - N_2)(a_2 - v_2 - p_1) X,
\end{aligned}$$

where X is defined as

$$\begin{aligned}
X &:= (a_2 - v_2 - p_1) + (1 - N_2)(1 - N_1) \frac{B_2}{B_1} [(a_2 - v_2 - v_1) - (a_1 - v_1)] \\
&= [a_2 - v_2 - v_1 - (1 - N_1)(a_1 - v_1)] + (1 - N_2)(1 - N_1) \frac{B_2}{B_1} [(a_2 - v_2 - v_1) - (a_1 - v_1)] \\
&= [1 + (1 - N_2)(1 - N_1) \frac{B_2}{B_1}] (a_2 - v_2 - v_1) - [1 + (1 - N_2) \frac{B_2}{B_1}] (1 - N_1)(a_1 - v_1).
\end{aligned}$$

Notice that $[1 + (1 - N_2)(1 - N_1)B_2 / B_1]$ is always smaller than $[1 + (1 - N_2)B_2 / B_1]$. Therefore, if $a_2 - v_2 - v_1$ is very close to its lower bound $(1 - N_1)(a_1 - v_1)$, X could be negative, which means $\partial \pi / \partial N_2 > 0$. More specifically,

$$\text{if } a_2 - v_2 - v_1 < \frac{B_1 + (1 - N_2)B_2}{B_1 + (1 - N_2)B_2 - N_1(1 - N_2)B_2} (1 - N_1)(a_1 - v_1),$$

π_2 decreases with N_2 . Otherwise, π_2 increases with N_2 . Q.E.D.

Proof of Proposition 9

Applying proposition 3 iteratively along the path (j, i) gives

$$\begin{aligned} B_j &= N_{j+1}B_{j+1} + N_{(j+1)'}B_{(j+1)'} = N_{j+1,i}B_i + \sum_{j < s < i} N_{j+1,s}N_{s'}B_{s'} + N_{(j+1)'}B_{(j+1)'}, \\ a_j &= \frac{N_{j+1}B_{j+1}(a_{j+1} - v_{j+1})}{B_j} + \frac{N_{(j+1)'}B_{(j+1)'}(a_{(j+1)'} - v_{(j+1)'})}{B_j} \\ &= \frac{N_{j+1,i}B_i(a_i - v_{j+1,i})}{B_j} + \sum_{j < s < i} \frac{N_{j+1,s}N_{s'}B_{s'}(a_{s'} - v_{j+1,s} - v_{s'})}{B_j} + \frac{N_{(j+1)'}B_{(j+1)'}(a_{(j+1)'} - v_{(j+1)'})}{B_j}. \end{aligned}$$

where $v_{j+1,s} := \sum_{k=j+1}^s N_k$. In a_j , only $N_{j+1,i}$ and B_j change with the increase of N_i and all the other parameters remain constant. Therefore,

$$\begin{aligned} \frac{\partial a_j}{\partial N_i} &= \frac{\partial}{\partial N_i} \left(\frac{N_{j+1,i}B_i(a_i - v_{j+1,i})}{B_j} + \sum_{j < s < i} \frac{N_{j+1,s}N_{s'}B_{s'}(a_{s'} - v_{j+1,s} - v_{s'})}{B_j} \right. \\ &\quad \left. + \frac{N_{(j+1)'}B_{(j+1)'}(a_{(j+1)'} - v_{(j+1)'})}{B_j} \right) \\ &= \frac{1}{B_j} (N_{j+1,i-1}B_i(a_i - v_{j+1,i})) + \frac{a_j}{B_j} \frac{\partial}{\partial N_i} (N_{j+1,i}B_i + \sum_{j < s < i} N_{j+1,s}N_{s'}B_{s'} + N_{(j+1)'}B_{(j+1)'}) \\ &= \frac{N_{j+1,i-1}B_i}{B_j} (a_i - v_{j+1,i}) + \frac{a_j}{B_j} (N_{j+1,i-1}B_i) \\ &= \frac{N_{j+1,i-1}B_i}{B_j} (a_i - v_{j+1,i} - a_j) \end{aligned}$$

where $N_{j+1,i-1} = 1$, if $j = i - 1$. Q.E.D.

Proof of Proposition 10

As in (3), $p_i = \sum_{r=1}^i N_{r+1,i}[(1 - N_r)a_r + N_r v_r]$. Note both $N_{r+1,i}$ and a_r change with N_i . Taking first derivative of p_i with respect to N_i and applying (4) give

$$\begin{aligned}
\frac{\partial p_i}{\partial N_i} &= \sum_{r=1}^{i-1} [N_{r+1,i-1}(1-N_r)a_r + N_{r,i-1}v_r] - (a_i - v_i) + \sum_{r=1}^{i-1} N_{r+1,i}(1-N_r) \frac{\partial a_r}{\partial N_i} \\
&= \sum_{r=1}^{i-1} [N_{r+1,i-1}(1-N_r)a_r + N_{r,i-1}v_r] - (a_i - v_i) + \\
&\quad + \sum_{r=1}^{i-1} N_{r+1,i}(1-N_r) \frac{N_{r+1,i-1}B_i}{B_r} (a_i - v_{r+1,i} - a_r)
\end{aligned}$$

This can be further simplified as

$$\frac{\partial p_i}{\partial N_i} = \sum_{r=1}^{i-1} N_{r+1,i-1}(1-N_r)(a_r - v_{1,r}) - (a_i - v_{1,i}) + \sum_{r=1}^{i-1} (1-N_r) \frac{N_{r+1,i-1}N_iB_i}{B_r} [(a_i - v_{1,i}) - (a_r - v_{1,r})]. \quad (A4)$$

To prove that p_i decreases with N_i , we only need to show that $\partial p_i / \partial N_i$ is always negative. We do this in two steps: 1) we construct a series of upper bounds $U_i, U_{i-1}, \dots, U_2$, and show that $\partial p_i / \partial N_i$ is smaller than U_i ; 2) we show that $U_i < U_{i-1} < \dots < U_2 < 0$.

First, we develop a few inequalities used in the relaxation. According to the regularity condition, for a feasible distributive network, $Q_1, Q_2, \dots, Q_i$ are strictly positive. Thus we have

$$\begin{aligned}
Q_i &= B_i(1-N_i)(a_i - v_i - p_{i-1}) \\
&= B_i(1-N_i)(a_i - v_i - \sum_{r=1}^{i-1} N_{r+1,i-1}[(1-N_r)a_r + N_r v_r]) \\
&= B_i(1-N_i)[(a_i - v_{1,i}) - \sum_{r=1}^{i-1} N_{r+1,i-1}(1-N_r)(a_r - v_{1,r})] > 0
\end{aligned}$$

which gives us the following inequality,

$$a_i - v_{1,i} > \sum_{r=1}^{i-1} N_{r+1,i-1}(1-N_r)(a_r - v_{1,r}).$$

Similarly,

$$\begin{aligned}
a_{i-1} - v_{1,i-1} &> \sum_{r=1}^{i-2} N_{r+1,i-2}(1-N_r)(a_r - v_{1,r}), \\
&\dots \\
a_2 - v_2 - v_1 &> (1-N_1)(a_1 - v_1).
\end{aligned} \quad (A5)$$

It deserves to be mentioned that the above inequalities hold only when $a_r - v_{1,r} > 0$, which is true for the distributive network to be feasible.

Moreover, since for any sector $r > 1$, $B_{r-1} = N_r B_r + N_{r'} B_{r'} > N_r B_r$, we can derive the following inequalities:

$$\frac{N_{2,i}B_i}{B_1} < \frac{N_{3,i}B_i}{B_2} < \dots < \frac{N_{i-1,i}B_i}{B_{i-2}} < \frac{N_iB_i}{B_{i-1}} < 1 \quad (A6)$$

1). Using (A5), we relax $\partial p_i / \partial N_i$ by eliminate $a_i - v_{1,i}$ term in (A4) to reach its upper bound U_i . In general, the upper bound is constructed as $\forall j \in [2, i]$,

$$U_j = \sum_{r=1}^{j-1} \left(\sum_{k=1}^{i-1} \frac{N_{k+1,i-1}^2 N_i B_i (1-N_k)}{B_k} - \frac{N_{r+1,j-1} N_{j,i-1}^2 N_i B_i}{B_r} \right) N_{r+1,j-1} (1-N_r) (a_r - v_{1,r}),$$

where we define $N_{k,k+1} = 1$. For $j = i$,

$$U_i = \sum_{r=1}^{i-1} \left(\sum_{k=1}^{i-1} \frac{N_{k+1,i-1}^2 N_i B_i (1-N_k)}{B_k} - \frac{N_{r+1,i-1} N_i B_i}{B_r} \right) N_{r+1,i-1} (1-N_r) (a_r - v_{1,r}).$$

Now, we need to prove $\partial p_i / \partial N_i$ is bounded by U_i . By combining the $a_i - v_{1,i}$ terms in (A4), $\partial p_i / \partial N_i$ can be further expressed as

$$\frac{\partial p_i}{\partial N_i} = [-1 + \sum_{r=1}^{i-1} (1-N_r) \frac{N_{r+1,i-1}^2 N_i B_i}{B_r}] (a_i - v_{1,i}) + \sum_{r=1}^{i-1} N_{r+1,i-1} (1-N_r) \frac{B_r - N_{r+1,i} B_i}{B_r} (a_r - v_{1,r}). \quad (A7)$$

The coefficient of $a_i - v_{1,i}$ in (A7) is

$$\begin{aligned} & -1 + \sum_{r=1}^{i-1} (1-N_r) \frac{N_{r+1,i-1}^2 N_i B_i}{B_r} \\ & = -1 + \frac{N_i B_i}{B_{i-1}} (1-N_{i-1}) + \frac{N_{i-1,i} B_i}{B_{i-2}} N_{i-1} (1-N_{i-2}) + \dots + \frac{N_{2,i} B_i}{B_1} N_{2,i-1} (1-N_1) \\ & < -1 + \frac{N_i B_i}{B_{i-1}} (1-N_{i-1}) + \frac{N_i B_i}{B_{i-1}} N_{i-1} (1-N_{i-2}) + \dots + \frac{N_i B_i}{B_{i-1}} N_{2,i-1} (1-N_1) \\ & = -1 + \frac{N_i B_i}{B_{i-1}} (1-N_{1,i-1}) < -1 + \frac{N_i B_i}{B_{i-1}} < 0, \end{aligned} \quad (A8)$$

where all the inequalities come from (A6). Therefore, we can relax (A7) using (A5) as

$$\begin{aligned} \frac{\partial p_i}{\partial N_i} & < \sum_{r=1}^{i-1} N_{r+1,i-1} (1-N_r) \frac{B_r - N_{r+1,i} B_i}{B_r} (a_r - v_{1,r}) \\ & \quad + (-1 + \sum_{k=1}^{i-1} (1-N_k) \frac{N_{k+1,i-1}^2 N_i B_i}{B_k}) \sum_{r=1}^{i-1} N_{r+1,i-1} (1-N_r) (a_r - v_{1,r}) \\ & = \sum_{r=1}^{i-1} [-\frac{N_{r+1,i} B_i}{B_r} + \sum_{k=1}^{i-1} (1-N_k) \frac{N_{k+1,i-1}^2 N_i B_i}{B_k}] N_{r+1,i-1} (1-N_r) (a_r - v_{1,r}) \\ & = U_i. \end{aligned}$$

2). We use induction to show that U_j increases as j decreases.

i). We prove $U_i < U_{i-1}$. Separating $a_{i-1} - v_{1,i-1}$ term in U_i provides

$$\begin{aligned} U_i & = [-\frac{N_i B_i}{B_{i-1}} + \sum_{k=1}^{i-1} (1-N_k) \frac{N_{k+1,i-1}^2 N_i B_i}{B_k}] (1-N_{i-1}) (a_{i-1} - v_{1,i-1}) \\ & \quad + \sum_{r=1}^{i-2} [-\frac{N_{r+1,i} B_i}{B_r} + \sum_{k=1}^{i-1} (1-N_k) \frac{N_{k+1,i-1}^2 N_i B_i}{B_k}] N_{r+1,i-1} (1-N_r) (a_r - v_{1,r}) \end{aligned}$$

Since $\sum_{k=1}^{i-1}(1-N_k) \frac{N_{k+1,i-1}^2 N_i B_i}{B_k} < \frac{N_i B_i}{B_{i-1}}$ from (A8), the $a_{i-1} - v_{1,i-1}$ term of the above expression is negative. Thus, relaxing it using (A5) gives

$$\begin{aligned} U_i &< \left[-\frac{N_i B_i}{B_{i-1}} + \sum_{k=1}^{i-1} (1-N_k) \frac{N_{k+1,i-1}^2 N_i B_i}{B_k} \right] (1-N_{i-1}) \sum_{r=1}^{i-2} [N_{r+1,i-2} (1-N_r) (a_r - v_{1,r})] \\ &\quad + \sum_{r=1}^{i-2} \left[-\frac{N_{r+1,i} B_i}{B_r} + \sum_{k=1}^{i-1} (1-N_k) \frac{N_{k+1,i-1}^2 N_i B_i}{B_k} \right] N_{r+1,i-1} (1-N_r) (a_r - v_{1,r}) \\ &= \sum_{r=1}^{i-2} \left(\sum_{k=1}^{i-2} \frac{N_{k+1,i-1}^2 N_i B_i (1-N_k)}{B_k} - \frac{N_{r+1,i-2} N_{i-1}^2 N_i B_i}{B_r} \right) N_{r+1,i-2} (1-N_r) (a_r - v_{1,r}) \\ &= U_{i-1} \end{aligned}$$

where the equality comes from collecting and simplifying the $a_r - v_{1,r}$ terms.

ii). We prove $U_j < U_{j-1}$ for $2 \leq j \leq i$. Separating $a_{j-1} - v_{1,j-1}$ term in U_j provides

$$\begin{aligned} U_j &= \left(\sum_{k=1}^{j-1} \frac{N_{k+1,i-1}^2 N_i B_i (1-N_k)}{B_k} - \frac{N_{j,i-1}^2 N_i B_i}{B_{j-1}} \right) (1-N_{j-1}) (a_{j-1} - v_{1,j-1}) \\ &\quad + \sum_{r=1}^{j-2} \left(\sum_{k=1}^{j-1} \frac{N_{k+1,i-1}^2 N_i B_i (1-N_k)}{B_k} - \frac{N_{r+1,j-1} N_{j,i-1}^2 N_i B_i}{B_r} \right) N_{r+1,j-1} (1-N_r) (a_r - v_{1,r}). \end{aligned}$$

Since

$$\begin{aligned} &\sum_{k=1}^{j-1} \frac{N_{k+1,i-1}^2 N_i B_i (1-N_k)}{B_k} - \frac{N_{j,i-1}^2 N_i B_i}{B_{j-1}} \\ &= -\frac{N_i B_i N_{i-1,j}^2 N_{j-1}}{B_{j-1}} + \frac{N_i B_i N_{i-1,j-1}^2}{B_{j-2}} (1-N_{j-2}) + \dots + \frac{N_i B_i N_{i-1,2}^2}{B_1} (1-N_1) \\ &< N_{i-1,j}^2 \left[-\frac{N_i B_i N_{j-1}}{B_{j-1}} + \frac{N_i B_i N_{j-1}}{B_{j-1}} (1-N_{j-2}) + \dots + \frac{N_i B_i N_{j-1,2}}{B_{j-1}} (1-N_1) \right] \\ &= -N_{i-1,j}^2 \frac{N_i B_i N_{j-1,1}}{B_{j-1}} < 0, \end{aligned}$$

we have

$$\begin{aligned} U_j &< \left(\sum_{k=1}^{j-1} \frac{N_{k+1,i-1}^2 N_i B_i (1-N_k)}{B_k} - \frac{N_{j,i-1}^2 N_i B_i}{B_{j-1}} \right) (1-N_{j-1}) \sum_{r=1}^{j-2} N_{r+1,j-2} (1-N_r) (a_r - v_{1,r}) \\ &\quad + \sum_{r=1}^{j-2} \left(\sum_{k=1}^{j-1} \frac{N_{k+1,i-1}^2 N_i B_i (1-N_k)}{B_k} - \frac{N_{r+1,j-1} N_{j,i-1}^2 N_i B_i}{B_r} \right) N_{r+1,j-1} (1-N_r) (a_r - v_{1,r}) \\ &= \sum_{r=1}^{j-2} \left(\sum_{k=1}^{j-2} \frac{N_{k+1,i-1}^2 N_i B_i (1-N_k)}{B_k} - \frac{N_{r+1,j-2} N_{j-1,i-1}^2 N_i B_i}{B_r} \right) N_{r+1,j-2} (1-N_r) (a_r - v_{1,r}) \\ &= U_{j-1}. \end{aligned}$$

Now, if we can show $U_2 < 0$, the proof is completed.

$$\begin{aligned}
U_2 &= \left(\frac{N_{2,i-1}^2 N_i B_i (1 - N_1)}{B_1} - \frac{N_{2,i-1}^2 N_i B_i}{B_1} \right) (1 - N_1) (a_1 - v_1) \\
&= - \frac{N_1 N_{2,i-1}^2 N_i B_i}{B_1} (1 - N_1) (a_1 - v_1) < 0
\end{aligned}$$

Proof of Proposition 11

First, from proposition 1, before integration, Q_2 is $N_2 B_2 [a_2 - v_2 - v_1 - (1 - N_1)(a_1 - v_1)]$. After integration, it is easy to show that Q_2 is $N_2 B_2 [a_2 - v_2 - v_1]$, and thus, Q_2 always increases with integration. Similarly, p_I changes from $(1 - N_1)a_1 + N_1 v_1$ to $(1 - N_1)(a_3 - v_3) + N_1 v_1$, where $a_1 = [N_2 B_2 (a_2 - v_2) + N_3 B_3 (a_3 - v_3)] / (N_2 B_2 + N_3 B_3)$. Therefore, if $a_2 - v_2 > a_3 - v_3$, the resource price p_I decreases; if $a_2 - v_2 = a_3 - v_3$, p_I remains unchanged; and if $a_2 - v_2 < a_3 - v_3$, p_I increases. Q_3 and π_3 increase (decrease) iff p_I increases (decreases). As to the profit $\pi_1 + \pi_2$, before the integration,

$$\pi_1 + \pi_2 = (1 - N_2)^2 [(B_2 N_2 + B_3 N_3)(a_1 - v_1)^2 + B_2 (a_2 - v_2 - v_1 - (1 - N_2)(a_1 - v_1))^2].$$

After the integration, it changes to $\pi_{\text{joint}} = (1 - N_2)^2 [B_3 N_3 (a_3 - v_3 - v_1)^2 + B_2 (a_2 - v_2 - v_1)^2]$. Define $(a_2 - v_2 - v_1) / (a_3 - v_3 - v_1)$ as x . After collect terms, we have

$$\begin{aligned}
\Delta &= \pi_{\text{joint}} - (\pi_1 + \pi_2) \\
&= \frac{(1 - N_2^2)(a_3 - v_3 - v_1)}{(B_2 N_2 + B_3 N_3)^2} \left\{ B_2 N_2 [B_2 N_2 (1 - N_2 - N_2^2) + B_3 N_3 (2 - 3N_2)] x^2 \right. \\
&\quad \left. + 2B_3 N_3 (B_3 N_3 - B_2 N_2^3 - 2B_3 N_2 N_3) x + B_3 N_3 (B_2 N_2^2 + 3B_3 N_2 N_3 - B_3 N_3 - B_3 N_2^2 N_3) \right\} \\
&= \frac{(1 - N_2^2)(a_3 - v_3 - v_1)}{(B_2 N_2 + B_3 N_3)^2} (\tau x^2 + \beta x + \varepsilon).
\end{aligned}$$

where $\tau := B_2 N_2 [B_2 N_2 (1 - N_2 - N_2^2) + B_3 N_3 (2 - 3N_2)]$, $\beta := 2B_3 N_3 (B_3 N_3 - B_2 N_2^3 - 2B_3 N_2 N_3)$, and $\varepsilon := B_3 N_3 (B_2 N_2^2 + 3B_3 N_2 N_3 - B_3 N_3 - B_3 N_2^2 N_3)$.

Note that when $n_2 = 1$ (i.e. $N_2 = 0.5$), we have $\tau > 0$ and $\beta^2 - 4\tau\varepsilon = -B_2 B_3 N_3 / 4 < 0$. Therefore, for any x , $\Delta < 0$. When $n_2 \geq 2$ (i.e. $N_2 \geq 2/3$), we have $\tau < 0$ and

$$\beta^2 - 4\tau\varepsilon = 4B_3 N_3 [B_2 N_2^2 (N_2^2 + N_2 - 1) + B_3 N_3 (1 - 2N_2)^2] > 0.$$

Therefore for any x , $\Delta > 0$.

Enterprise Risk Management (ERM) Framework for Energy Industry

by

Edward W. Sun

BEM Management School Bordeaux, France &
Karlsruhe Institute of Technology (KIT) Germany
Email: edward.sun@kit.edu

Ye Chen

Karlsruhe Institute of Technology (KIT), Germany

and

Svetlozar T. Rachev

Stony Brook University New York, USA
& Karlsruhe Institute of Technology (KIT) Germany

UTCC
*International Journal of
Business and Economics* **IJBE**

Enterprise Risk Management (ERM) Framework for Energy Industry

by

Edward W. Sun

BEM Management School Bordeaux, France &
Karlsruhe Institute of Technology (KIT) Germany
Email: edward.sun@kit.edu

Ye Chen

Karlsruhe Institute of Technology (KIT), Germany

and

Svetlozar T. Rachev

Stony Brook University New York, USA
& Karlsruhe Institute of Technology (KIT) Germany

Abstract

Enterprise risk management (ERM) framework provides the methods and processes used for organizations to manage risks and seize opportunities related to the achievement of their objectives. The risk management approach of ERM involves (1) identifying particular events or circumstances relevant to the organization's objectives (risks and opportunities), (2) assessing those events or circumstances in terms of likelihood and magnitude of impact, (3) determining a response strategy, and (4) monitoring progress. In fact, ERM framework is a risk-based approach to managing an enterprise, integrating concepts of internal control, and strategic planning. In this paper, we describe the approaches that can enhance business management decision making, particularly for the energy industry. By identifying and proactively addressing risks and opportunities, enterprises of energy industry could protect and create value for their stakeholders, including owners, employees, customers, regulators, and society overall.

Keywords: Enterprise Risk Management, Energy Industry, Opportunities

1. Introduction

Enterprise Risk Management (ERM) is the attempt to implement an integrated risk management to a firm. Rather than the conventional risk management approach, which doesn't necessarily encompass the enterprise as whole, this relatively new discipline promotes the management of the different kinds of risk in aggregate. The Enterprise Risk Management Committee of Casualty Actuarial Society (2003, p. 109) defines Enterprise Risk Management as: "The process by which organizations in all industries assess, control, exploit, finance and monitor risks from all sources for the purpose of increasing the organization's short and long term value to its stakeholders." Risk can be simply explained as a state of uncertainty where some of the possibilities involve a loss or undesirable outcome. In this paper we will use the classification of risk types defined by the CAS: hazard, financial, operational, and strategic risk. In order to build the systematic

framework of ERM, Standard & Poor's introduces four risk aggregation terms, which are, risk appetite which reflects the willingness of an investor to hold risky assets; risk Preferences which are risky opportunities considered acceptable or more desirable than other possible choices; risk Tolerance which is described as the willingness or the ability of an investor to accept declines in the prices of investments while waiting for them to increase in value; and risk limits which are the quantitative boundaries to constrain risky activities.

The traditional methods for managing risks are based on the separated management of individual risk categories. This silo-approach leads to inefficiencies in the risk management process due to the lack of coordination between different departments throughout the organization. Consequently, interdependencies between different risk classes might pass unnoticed and the missing integration may lead to duplication of risk management expenditures and poor information on the firm's risk profile. Unlike these traditional models, ERM enables companies to manage a wide array of risks in an enterprise-wide level. Its integrated framework facilitates the identification of interdependencies between various risks, so that the aggregation of risk across various sources can be prevented and thus volatility can be reduced. Academic literature (see, for example, Miccolis and Shah (2000), Cumming and Hirtle (2001), Lam (2001), Meulbroek (2002), Beasley et al. (2006)) point out that ERM benefits organizations by decreasing earnings and stock-price volatility, reducing external capital costs, increasing capital efficiency and creating synergies between different risk management activities. Furthermore, ERM is said to increase risk awareness in the firm, which facilitates decision-making efficiently in both operational and strategic level. Understanding the aggregate risk present in different business activities, firms can allocate their resources more effectively, improving their profitability. The fact that the firm's risk profile is more transparent has also its positive effect on external stakeholders, not only because they have better information on the company, but also because this transparency is a signal of the company's commitment to risk management. Hampton (2009) provides a good survey of fundamentals of ERM.

2. ERM Approaches

The Enterprise Risk Management Committee of Casualty Actuarial Society (2003) defined the following main steps for applying ERM framework.

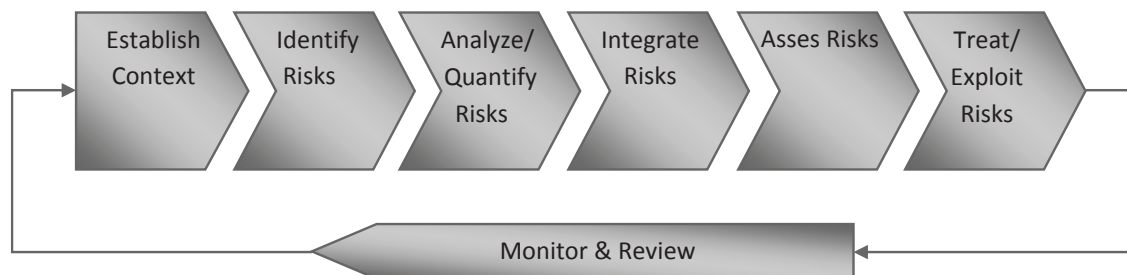


Figure 1 Main Steps for the ERM Models (CAS 2003)

Based on these main steps for ERM framework, several models have been proposed. Deloitte (Segal (2005) proposes the value-based ERM, which is an approach that makes the quantification of value central to all aspects of the ERM process. Being as a synthesis of ERM and value-based management, value-based ERM has two key advantages: (1) Quantifies the impact of ERM on shareholder value, and (2) Creates a common language that unifies ERM processes.

In order to quantify the integrated impact of risk on the enterprise value, the value-based ERM as any other ERM approaches, is first to define a list of internal and external risk drivers to the firm and then, based on this list, identify the items they impact. In order to make this clearer, we show an example graphically:

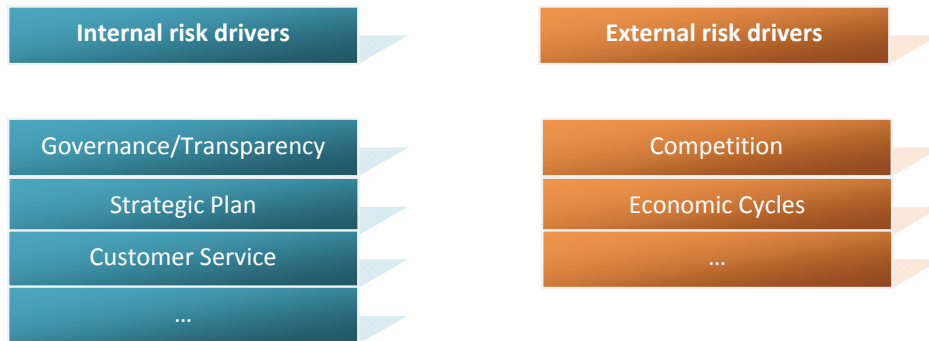


Figure 2 List of Internal and External Risk Drivers to The Firm

The impact items are those derived from the value-based management, e.g. revenue growth and cost of capital and taxes. They are sub-categories of the enterprise value, which is defined as the present value of management-projected distributable earnings discounted with the WACC (weighted average cost of capital). From the impact items we can derive concrete figures based on valuation elements from the balance sheet and income statement. Figure 3 shows an example. The change in Enterprise Value (Δ Value) is a single value-based metric that captures all risks: those impacting the income statement, the balance sheet, the required capital and the WACC.

The Committee of Sponsoring Organizations of the Treadway Commission (COSO) is a voluntary private-sector organization established in the US to provide the executive management with guidance on critical aspects of ERM, internal control, fraud, and financial reporting. In 2001, COSO engaged in a project to develop a framework to evaluate and improve an organization's ERM. The main objective was that this framework should be readily used by the management. The COSO's ERM framework is presented by Figure 4.

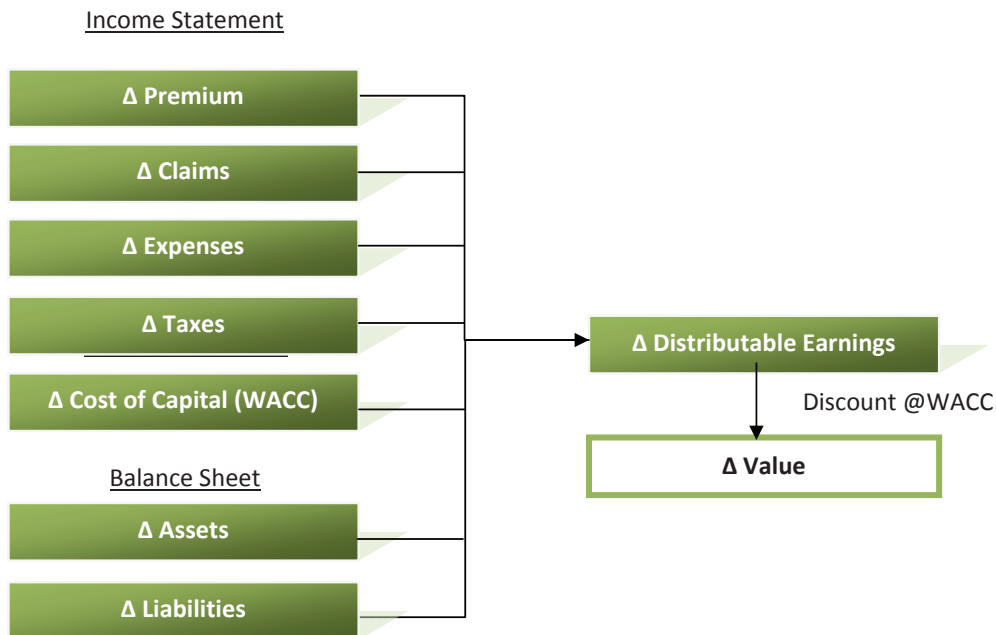


Figure 3 Concrete Figures Based on Valuation Elements from the Balance Sheet and Income Statement

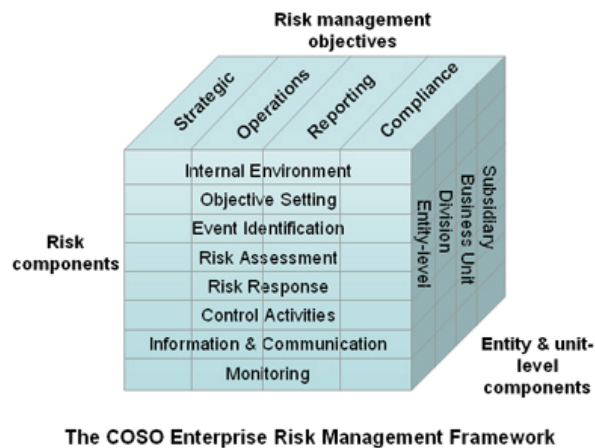


Figure 4 Graphic Representation of the COSO's ERM Framework (COSO 2004)

In addition, Aon Corporation proposes a framework for ERM considering sustainability. This extended approach has a broader view on the ERM framework. Instead of focusing only on economic, strategic, and operational factors, this approach incorporates social and environmental components and expands the economic view on the matter. The adoption of sustainability as a platform for the enterprise's risk management expands the framework to otherwise non-analyzed factors and emerging risks that are of growing importance in our increasingly globalized economy. The understanding of local laws, customs and traditions may be as important as the quality of the firm's goods and services. By taking social and environmental factors into account the organization is not only better prepared in identifying and responding to a broader range of risks, but also more likely to identify new products opportunities and services.

3. ERM in the Energy Industry

Some credit ratings services, like Moody's and Standard & Poor's have added ERM capabilities into their evaluation criteria. S&P acknowledges that a company's ability to anticipate and how ready these companies to react to the changing conditions, not only for a market opportunity but also for a potentially significant business disruption, have the strongest influence in managing hazard risk. Since hazard loss can cause financial and business damage and since energy industry is also faced by climate change and disruptive technology with highly interdependent hazard risk and global impact, ERM as an extension of hazard risk management provides the best way to have a high stability earnings and high credit rating. That is the very reason why the energy industry is an early adopter in the ERM practice and is already a step ahead compared to the other industry.

Deloitte found out that it is rare to find companies that intelligently manage the full spectrum of risks (Deloitte 2006a). They called these rare companies as risk intelligent enterprises. Even though many energy companies have superior risk management models and analysis, only a few of them put the indirect potential hazard risks from threats like terrorist attacks, computer hacking, natural disasters and the increasing stakeholder & shareholder expectations into account. Energy companies have difficulties in implementing ERM because of the following reasons (Deloitte 2006b, p. 2):

- Resistance to the perceived centralization of responsibilities: the avoidance to acknowledge that the various kinds of risks are correlated and should be handled as a whole, not separately.
- Lack of well-defined objectives
- Fragmented accountability
- Lack of resources, inadequate data, systems and infrastructure

Although ERM is still hard to implement and still lack of an appropriate framework, the pressure coming from stakeholders, shareholders and credit rating agencies makes the development for a mature ERM capability essential.

Fox et al. (2004) summarize the Progress Energy ERM approach, which contains:

- Align risk appetite and strategy
- Protect against unforeseen losses
- Ensure earnings stability
- Provide independent & transparent risk assessment
- Maximize share price & shareholder protection
- Risk management adds value
- Process is continual and evolving
- Risk should be viewed holistically
- Risk management is everyone's responsibility
- Avoiding risk could mean avoiding opportunities that are not understood

Figure 5 illustrate the ERM government in Progress Energy (see Fox et al. (2004)):

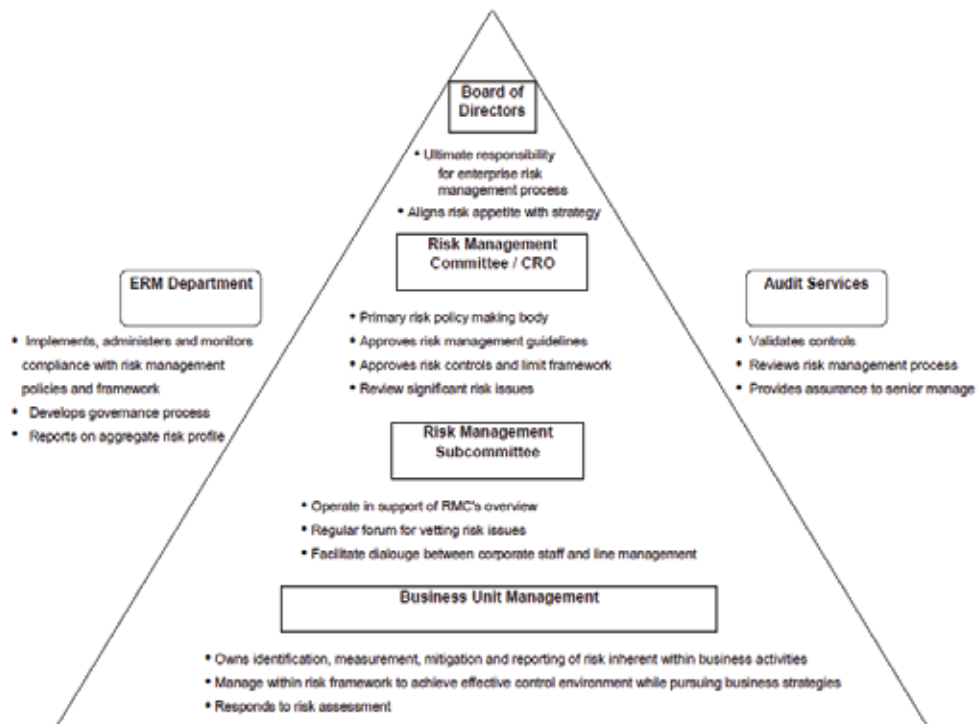


Figure 5 ERM Governance in Progress Energy (Fox et al.(2004))

Hahncock (2009) points out that the ERM should be implemented to guarantee it works best to provide the information required for management and the board to make better, more risk-informed, strategic decisions.

4. Conclusion and Recommendation

Puccia et al. (2008) state that being as a philosophy and a discipline, ERM is a necessity but not an option for the enterprise management. ERM practices improve the financial profiles from companies by helping to inform, direct and guide management decisions. Sound ERM practices can also help organizations to optimize their returns related to the level of risk they are willing to take and to function as an analytical tool for financial and ratings analysts to better understand the connections among the firm's risks.

However, implementing the ERM methodologies does not guarantee that the enterprise can predict or avoid losses, it is also not a method to eliminate all risks. The above mentioned economical events revealed limitations and shortcomings in many organizations' risk management. Such losses point to the need/trend for improvements in measuring and monitoring risk. Furthermore, finding ways to create and embed such a structure and culture throughout a firm and into its underlying values continues to be a challenge for the organizations.

Aon's Global Enterprise Risk Management Survey 2010 states that nowadays the awareness of the need to manage and leverage risk has never been higher due to the significantly increasing uncertainty in the global economy (AoN 2010, p. 3). During the implementation and maturing process the firm's managements will be customizing the process continually and they will also be

learning from their experiences on how to implement and conduct ERM the best way. This way ERM will mature and grow gradually. ERM will be able recognize the emerging risks and can sharply reduce the possibility of outsize losses. The management will be then able to determine the most effective ways to control them in order to bring more value for both the shareholders and stakeholders. As one conclusion also stated in Aon's survey it is believed that as the implemented ERM program matures, the organization's value will also increase significantly.

References

- AoN (2010), "Global Enterprise Risk Management Survey 2010," Chicago: AoN.
- AoN (2007), "Sustainability – Beyond Enterprise Risk Management," Chicago: AoN.
- Beasley, M. S., Pagach, D. & Warr, R. (2006), "The Information Conveyed in Hiring Announcements of Senior Executives Overseeing Enterprise-Wide Risk Management Processes," *Working Paper*, North Carolina State University.
- COSO (2004), "Enterprise Risk Management – Integrated Framework. Executive Summary," COSO.
- Cumming, C. M. & Hirtle, B. J. (2001), "The Challenges of Risk Management in Diversified Financial Companies," *FRBNY Economic Policy Review*, March.
- Deloitte. (2006a). *The Risk Intelligent Enterprise: ERM Done Right*. United States: Deloitte Development LLC.
- Deloitte. (2006b). "The Risk Intelligent Enterprise: ERM For the Energy Industry," *Risk Intelligence Series*, Issue No. 3. United States: Deloitte Development LLC.
- CAS (2003), "Overview of Enterprise Risk Management," Enterprise Risk Management Committee of Casualty Actuarial Society, *Casualty Actuarial Society*, Summer 2003: 99 – 163.
- Fox, D., McCallister, J. & Phillips, R. (2004), "Launching ERM: Experiences from Progress Energy," *ERM Roundtable Discussions*, North Carolina State University, April 16, 2004.
- Hampton, J, J. (2009), *Fundamentals of enterprise risk management: how top companies assess risk, manage exposure, and seize opportunity*. New York: American Management Association.
- Hancock, B. (2009), "Effective Enterprise Risk Management Starts With A Conversation," *Audit Committee Brief*, September 2009.
- Lam, J. (2001), "The CRO is here to Stay," *Risk Management*, April: 16 – 20.
- Meulbroek, L.K. (2002), "Integrated Risk Management for the Firm: A Senior Manager's Guide," *Journal of Applied Corporate Finance*, 14: 56 – 70.
- Miccolis, J. & Shah, S. (2000), *Enterprise Risk Management: An analytic approach*. Tillinghast: Towers Perrin.
- Segal, S.(2005), "Value-Based Enterprise Risk Management," *The Actuary*, June/July 2005: 33 – 36.

About the Author

Supply Chain Collaboration: A Case Study of Thai Textile-Apparel Industry

by

Ekkprawatt Phong-arjarn and Chawalit Jeenanunta

School of Management Technology,

Sirindhorn International Institute of Technology,

Thammasat University, Thailand

Tel: (662) 501-3505-20 Ext 2112, Fax: (662) 501-3507 Ext 2101,

Email: ekkeman@gmail.com

UTCC
*International Journal of
Business and Economics* **IJBE**

Supply Chain Collaboration: A Case Study of Thai Textile-Apparel Industry

by

Ekkprawatt Phong-arjarn and Chawalit Jeenanunta

School of Management Technology,
Sirindhorn International Institute of Technology,
Thammasat University, Thailand
Tel: (662) 501-3505-20 Ext 2112, Fax: (662) 501-3507 Ext 2101,
Email: ekkeman@gmail.com

Abstract

Due to the high competition in the world market, companies have to improve their business management to increase the competitiveness. Although the supply chain management (SCM) concept is well-known in Thailand and believed that it can improve the business advantage, the implementation of SCM in Thai textile and apparel (T/A) industry is still rare. To start implementing SCM, the collaboration in the supply chain has to be constructed first. The supply chain collaboration offers the promise for improving the supply chain performance and the competitive advantage. This study aims to examine how to build SCC in Thai T/A supply chain. The forms of collaboration, the major factors affecting SCC, and the major collaborative activities are discussed in the paper. We proposed the collaborative index and classification of SCC. We selected the garment company for studying the status of SCC, the drivers and barriers of building the collaboration. The result shows the level of SCC, the drivers, and the barriers of building SCC.

Keywords: Supply Chain Management, Supply Chain Collaboration, Collaborative Factors, Collaborative Activities, Levels of Supply Chain Collaboration

1. Introduction

Textile and Apparel (T/A) industry plays a major role in Thai economy. The export value of this industry is approximately 6,000 million US\$ per year, and account for approximately 4% of the total GDP of Thailand. There are more than 4,000 establishments in this industry that employ over a million workers (THTI, 2007). Thai T/A industry has been greatly affected by the rapid change of globalization and high competition in the world market. To increase the competitiveness, the collaboration in the T/A supply chain has to be formed first.

The objective of this study is to examine how to build SCC in Thai T/A supply chain. First, we reviewed the forms of collaboration, the major factors affecting SCC, and the major collaborative activities. Then we proposed the collaborative index and classification of SCC. The garment company was selected for studying the status of SCC, the drivers and barriers for building the collaboration.

2. Literature Review

Supply Chain Collaboration (SCC) can be described as an inter-organizational relationship in supply chain which the participating parties agree to invest resources, mutually achieve goals, share information, resources, rewards and responsibilities as well as jointly make decisions and solve problems (Soosay et al., 2008). Supply chain members who had higher levels of collaboration practices are able to achieve better operational performance and innovation activities. (Simatupang & Sridharan, 2005; Whipple & Russell, 2007; Soosay et al., 2008).

There are four types of business relationship; Arm's length, Collaboration, Joint venture, and Vertical integration (Kampstra et al., 2006). Arm's length is a purely transactional relationship that does not have any degree of collaboration. Collaboration is not the same as joint venture and strategic alliance, which normally entail some degree of shared ownership across the party. Collaboration is also different from vertical integration that all the members in the supply chain belong to the same owner. There are four forms of organizational coordination in supply chain; Dyadic, Channel integration, 3P-hub chain, and Vertical integration (Cooper et al., 1997; Cao et al., 2008).

2.1 Factors of SCC

There are many factors influencing the formation of collaboration between supply chain partners. From the extensive review of the recent published articles related to supply chain collaboration the factors that influence the formation of SCC are grouped into 3 categories; Internal factors, Inter-organizational factors, and External factors (Kasouf & Celuch, 1997; Maloni & Benton, 1997; Spekman et al., 1998; Anthony, 2000; Boddy et al., 2000; Mentzer et al., 2000; Moses & Seshadri, 2000; Handfield & Bechtel, 2002; Barratt, 2004; Kwon & Suh, 2004; Cetindamar et al., 2005; Chen & Chen, 2005; Corsten & Felde, 2005; Min et al., 2005; Myhr & Spekman, 2005; Angerhofer & Angelides, 2006; Kampstra et al., 2006; Attaran & Attaran, 2007; Sanders, 2007; Fawcett et al., 2008; Leat & Revoredo-Giha, 2008; Madlberger, 2008).

The internal factors are the factors within the organization which include Internal alignment, Information technology, Human resource, Top management support, Strategy and Policy, Attitude and Vision, Financial resource, Organizational culture, and Equipment.

The inter-organizational factors are the factors between the organizations in the supply chain which include Trust, Benefits (Advantage), Goodwill, Commitment and Intention, Communication and Coordination, Willingness and Mutual interest, Intense interaction, Leadership, Collaborative approaches, Dependency and Interdependence, Partner's readiness, and Location.

The external factors are from the entities outside the supply chain and the special entities which include Customer push, Competition, Social influence, Long term pay back, and Uncertainty.

2.2 Dimensions of SCC and the Collaborative Activities

There are five major elements of SCC; information sharing, decision synchronization, incentive alignment, shared supply chain process (planning, forecasting, inventory, ordering, and selling), and collaborative performance system (Simatupang & Sridharan, 2004). The key collaboration activities are classified into five categories which are information sharing, joint planning, joint problem solving, joint performance measurement, and leveraging resource and skill (Min et al., 2005). SCC includes with alignment mechanism, cross-functional process change,

information system, people empowerment, alliance design, and performance measurement (Fawcett et al., 2008). We proposed four dimensions of SCC activities; Information sharing, Decision synchronization, Joint business process, and Skill and resource sharing. Each dimension consists of various SCC activities (as shown in Table 1).

Table 1 Dimensions of SCC

Dimensions of SCC	Sample of SCC Activities
Information Sharing	Sharing of production schedule
	Order tracking
	On-hand inventory level monitoring
Decision Synchronization	Joint planning
	Joint decision making
	Joint problem solving
Joint Business Process	Joint sourcing
	Joint performance measurement
	Joint transportation
Resource and Skill Sharing	Skill and knowledge sharing
	Joint research and development (R&D)
	Financial support

2.3 Collaborative Indices and Levels of SCC

Simatupang proposed the collaborative index consisted of three interrelated dimensions; information sharing, decision synchronization, and incentive alignment (Simatupang & Sridharan, 2005). Kampstra introduced the ladder of collaboration that shows five levels of collaboration; arm's length, communication, coordination, intensive collaboration, and partnership (Kampstra et al., 2006).

The levels of SCC and the collaborative indices were developed according to the proposed dimensions of SCC. There are four levels of SCC; Pure transaction, Initial level, Developed level, and Advanced level. In the Pure transaction level, the supply chain partners only do the ordinary business activities and do not have any collaborative activities. In the Initial Level, the partners have one or two collaborative activities of the four dimensions. In the Developed level, the partners have at least 3 dimensions of SCC and the activities in each dimension reach the degree level 2. In the Advanced level, the partners have all SCC dimensions and the activities in every dimension reach the degree level 3. The levels of SCC are classified by two related elements; Number of dimensions of SCC that partners collaborate and Degree of each dimension (as shown in Table 2).

3. Case Study

The Oriental Garment Company (OGC) was selected to be the case study. We interviewed the CEO and the department managers to study the SCC in this company and collect related information. This company is a medium-sized garment manufacturing that was established more than 10 years ago and employs more than 2,000 workers. The main product of OGC is sportswear that 100% exported. OGC has good quality management system and is certified the ISO9001 and ISO14001 standard. The main partner of the company is the customer, Adidas. They coordinate in

the form of “Chanel Integrator” that many processes are controlled by the customer who is the powerhouse in the supply chain. Raw material and suppliers are also selected by the customer.

Table 2 Degrees of SCC Dimensions

Degrees of each dimension	Dimensions			
	Information Sharing	Decision Synchronization	Joint Business Process	Resource and Skill Sharing
Level 3	Competitive information - The information that highly affecting the competitiveness - Confident information - Yearly (or more) plan - Development or Marketing policy	Competitive decision - Joint development policy - Joint marketing policy - Joint long-term planning - Consulting in pricing policy - Joint human resource development policy	At least 5 processes	Competitive knowledge sharing - New formula or production method of new products that have highly confidential - Develop shared R&D center - Financial resource sharing
Level 2	Strategic information - Monthly or Three month plan - Demand Forecasting - Order information - Short-term development	Strategic decision - Joint strategic problems solving - Joint monthly (or Three month) planning/scheduling - Joint orders accepting - Joint demand forecasting - Joint decision on inventory requirement	3-4 processes	Supply chain resource sharing (ex. Inventory, equipment, etc.) except money - Personal exchange - Mutual learning
Level 1	Operational information - Daily or Weekly plan or schedule - Order tracking - On-hand inventory level - Price change	Operational decision - Joint operational problems solving - Joint weekly planning/scheduling	1-2 processes	Operational know how - Skill sharing - Seminar

Level 0	Basic trading information such as invoice, order, etc.	None	None	None
---------	--	------	------	------

3.1 SCC Activities and Levels

We found the major collaborative activities between the partners as followed.

Information Sharing: OGC has been developed the efficient IT system for supporting their business. This IT system is linked with the partner's system for sharing information. The shared information is such as product information, order tracking, production plan, and demand forecasting information. This can be classified to the degree level 2 of information sharing dimension.

Decision Synchronization: OGC and Adidas have jointly made the suppliers selection plan in the sourcing processes. They also have joint planning and joint problems solving in the production processes. This dimension is classified to the degree level 1.

Joint Business Processes: To reduce cost, time and to keep the quality standard, the partners have the joint inspection. All products have to be inspected and meet the Adidas's standard before packaging and sending to the retailers. Because there is only one joint process, this dimension is graded to the degree level 1.

Resource and Skill Sharing: Adidas has shared production techniques and operational know how with OGC. They also share IT knowledge to construct the linked information system. This dimension is also classified to the degree level 1.

In summary, the SCC level of the case study is at level 1, the initial level, because the Decision Synchronization, Joint Business Process, Resource and Skill Sharing are all at level 1, and Information Sharing is at level 2.

3.2 Drivers and barriers for building SCC

Top management support and high competition in the market highly affect to OGC. The CEO gives priority to develop IT and quality management system. Therefore OGC has high efficient business processes and produces high quality products and was chosen to be Adidas' partner. The readiness of OGC that includes internal alignment, IT system, high skilled human resource, and sufficient budgets are also the drivers of building SCC.

However, there are some barriers of SCC, the knowledge of supply chain management and collaboration in OGC staff is not clear. The high resistance from the employees affects to implementation of new management concepts and information systems. Although OGC have many collaborative activities with their customer, they are not yet successfully making collaboration with their suppliers due to the inadequate readiness of the suppliers, such as the inefficient information system. In addition, the selection of suppliers is controlled by the brand owner who specifies the raw material.

4. Conclusion and Recommendation

In this paper, we reviewed the forms of collaboration, the major factors affecting SCC, and the major collaborative activities. We proposed the levels of SCC and the collaborative index. The garment company was selected for studying the status of SCC, the drivers and barriers for building the collaboration. The case study has the SCC level 1 referred to our proposed SCC levels. The major drivers of SCC are top management support and vision, the competitive pressure, the internal alignment, and the organization readiness, while the major barriers are the knowledge in SCC, the change resistance, the partners' readiness, and form of coordination.

For the further study, an empirical survey will be conducted to study the status of SCC and test our collaborative index in other garment companies and the companies in other industry such as construction industry, automotive industry, and computer industry.

References

- Angerhofer, B. J. and Angelides, M. C. (2006), "A Model and a Performance Measurement System for Collaborative Supply Chains", *Decision Support Systems*, Vol. 42, No. 1, pp. 283-301.
- Anthony, T. (2000), "Supply Chain Collaboration: Success in the New Internet Economy", *Achieving supply chain excellence through technology*, Vol. 2, No. pp. 41-4.
- Attaran, M. and Attaran, S. (2007), "Collaborative Supply Chain Management: The Most Promising Practice for Building Efficient and Sustainable Supply Chains", *Business Process Management Journal*, Vol. 13, No. 3, pp. 390-404.
- Barratt, M. (2004), "Understanding the Meaning of Collaboration in the Supply Chain", *Supply Chain Management: An International Journal*, Vol. 9, No. 1, pp. 30-42.
- Boddy, D., Macbeth, D. and Wagner, B. (2000), "Implementing Collaboration between Organizations: An Empirical Study of Supply Chain Partnering", *Journal of Management Studies*, Vol. 37, No. 7, pp. 1003-1018.
- Cao, N., Zhang, Z., To, K. and Ng, K. (2008), "How Are Supply Chains Coordinated?", *Journal of Fashion Marketing and Management*, Vol. 12, No. 3, pp.
- Cetindamar, D., Tatay, B. and Basmaci, O. (2005), "Competition through Collaboration: Insights from an Initiative in the Turkish Textile Supply Chain", *Supply Chain Management: An International Journal*, Vol. 10, No. 4, pp. 238-40.
- Chen, T.-H. and Chen, J.-M. (2005), "Optimizing Supply Chain Collaboration Based on Joint Replenishment and Channel Coordination", *Transportation Research Part E: Logistics and Transportation Review*, Vol. 41, No. 4, pp. 261-285.
- Cooper, M., Ellram, L., Gardner, J. and Hanks, A. (1997), "Meshing Multiple Alliances", *International Journal of Business Logistics*, Vol. 18, No. 1, pp. 67-89.

- Corsten, D. and Felde, J. (2005), "Exploring the Performance Effects of Key-Supplier Collaboration", *International Journal of Physical Distribution & Logistics Management*, Vol. 35, No. 6, pp. 445-61.
- Fawcett, S. E., Magnan, G. M. and McCarter, M. W. (2008), "Benefits, Barriers, and Bridges to Effective Supply Chain Management", *Supply Chain Management: An International Journal*, Vol. 13 No. 1, pp. 35-48.
- Handfield, R. B. and Bechtel, C. (2002), "The Role of Trust and Relationship Structure in Improving Supply Chain Responsiveness", *Industrial Marketing Management*, Vol. 31, No. 4, pp. 367-382.
- Kampstra, R., Ashayeri, J., Gattorna, J. and Bedfordshire, M. (2006), "Realities of Supply Chain Collaboration", *International Journal of Logistics Management*, Vol. 17, No. 3, pp. 312.
- Kasouf, C. J. and Celuch, K. G. (1997), "Interfirm Relationships in the Supply Chain: The Small Supplier's View", *Industrial Marketing Management*, Vol. 26, No. 6, pp. 475-486.
- Kwon, I.-W. G. and Suh, T. (2004), "Factors Affecting the Level of Trust and Commitment in Supply Chain Relationships", *The Journal of Supply Chain Management*, Vol. 40, No. 2, pp. 4-14.
- Leat, P. and Revoredo-Giha, C. (2008), "Building Collaborative Agri-Food Supply Chains", *British Food Journal*, Vol. 110, No. 4/5, pp. 395-411.
- Madlberger, M. (2008), "Interorganizational Collaboration in Supply Chain Management: What Drives Firms to Share Information with Their Trading Partners?", *Proceedings Hawaii International Conference on System Sciences*, Proceedings of the 41st Annual,
- Maloni, M. J. and Benton, W. C. (1997), "Supply Chain Partnerships: Opportunities for Operations Research", *European Journal of Operational Research*, Vol. 101, No. 3, pp. 419-429.
- Mentzer, J. T., Min, S. and Zacharia, Z. G. (2000), "The Nature of Interfirm Partnering in Supply Chain Management", *Journal of Retailing*, Vol. 76, No. 4, pp. 549-568.
- Min, S., S. Roath, A., J. Daugherty, P., E. Genchev, S., Chen, H., D. Arndt, A. and Glenn Richey, R. (2005), "Supply Chain Collaboration: What's Happening?", *International Journal of Logistics Management*, Vol. 16, No. 2, pp. 237.
- Moses, M. and Seshadri, S. (2000), "Policy Mechanisms for Supply Chain Coordination", *IIE Transactions*, Vol. 32, No. 3, pp. 245-262.
- Myhr, N. and Spekman, R. E. (2005), "Collaborative Supply-Chain Partnerships Built Upon Trust and Electronically Mediated Exchange", *Journal of Business & Industrial Marketing*, Vol. 20, No. 4-5, pp. 179-186.
- Sanders, N. R. (2007), "An Empirical Study of the Impact of E-Business Technologies on Organizational Collaboration and Performance", *Journal of Operations Management*, Vol. 25, No. 6, pp. 1332-1347.
- Simatupang, T. and Sridharan, R. (2004), "Benchmarking Supply Chain Collaboration: An Empirical Study", *Benchmarking: An International Journal*, Vol. 11, No. 5, pp. 484-503.

Simatupang, T. and Sridharan, R. (2005), "An Integrative Framework for Supply Chain Collaboration", *International Journal of Logistics Management*, Vol. 16, No. 2, pp. 257.

Simatupang, T. and Sridharan, R. (2005), "The Collaboration Index: A Measure for Supply Chain Collaboration", *International Journal of Physical Distribution & Logistics Management*, Vol. 35, No. 1, pp. 44-62.

Soosay, C., Hyland, P. and Ferrer, M. (2008), "Supply Chain Collaboration: Capabilities for Continuous Innovation", *Supply Chain Management: An International Journal*, Vol. 13, No. 2, pp. 160-169.

Soosay, C. A., Hyland, P. W. and Ferrer, M. (2008), "Supply Chain Collaboration: Capabilities for Continuous Innovation", *Supply Chain Management: An International Journal*, Vol. 13, No. 2, pp. 160-169.

Spekman, R. E., Jr, J. W. K. and Myhr, N. (1998), "An Empirical Investigation into Supply Chain Management a Perspective on Partnerships", *International Journal of Physical Distribution & Logistics Management*, Vol. 28 No. 8, 1998,, Vol. 28, No. 8, pp. 630-650.

THTI, T. T. I. (2007), *Thai Textile Statistics 2006/2007*, Ed., Bangkok, Thailand Textile Institute.

Whipple, J. M. and Russell, D. (2007), "Building Supply Chain Collaboration: A Typology of Collaborative Approaches", *The International Journal of Logistics Management*, Vol. 18, No. 2, pp. 174-196.

About the Author

C-Lope Model as Relationship Model between Job Satisfaction and Customer Satisfaction

by

Janez Stare

Assistant Professor, University of Ljubljana, Faculty of Administration
Gosarjeva ulica 5, 1000 Ljubljana, Slovenia, Europe
E-mails: janez.stare@fu.uni-lj.si

Mitja Dečman

Senior Lecturer, University of Ljubljana, Faculty of Administration
Gosarjeva ulica 5, 1000 Ljubljana, Slovenia, Europe
E-mails: maja.klun@fu.uni-lj.si

and

Maja Klun

Associate Professor, University of Ljubljana, Faculty of Administration
Gosarjeva ulica 5, 1000 Ljubljana, Slovenia, Europe
E-mails: mitja.decman@fu.uni-lj.si

UTCC
*International Journal of
Business and Economics* **IJBE**

C-Lope Model as Relationship Model between Job Satisfaction and Customer Satisfaction

by

Janez Stare

Assistant Professor, University of Ljubljana, Faculty of Administration
Gosarjeva ulica 5, 1000 Ljubljana, Slovenia, Europe
E-mails: janez.stare@fu.uni-lj.si

Mitja Dečman

Senior Lecturer, University of Ljubljana, Faculty of Administration
Gosarjeva ulica 5, 1000 Ljubljana, Slovenia, Europe
E-mails: maja.klun@fu.uni-lj.si

and

Maja Klun

Associate Professor, University of Ljubljana, Faculty of Administration
Gosarjeva ulica 5, 1000 Ljubljana, Slovenia, Europe
E-mails: mitja.decman@fu.uni-lj.si

Abstract

Although electronic means have taken over the many spheres of our lives and businesses the relation between customer and provider stays in many ways the same. Customers, even more demanding than before, expect quality, user friendliness, respect, quick response and other. In customer-employee interactions the employee at the providers point is a key factor to a customer satisfaction, beside the product or service that the customer demands. The paper discusses a C-LOPE model, focused on the services offered by providers, which claims that the level of customer satisfaction is indirectly dependant on four factors, namely leadership, organisational climate, performance and electronic business, making a providers person, influenced by these factors, directly connected to customer satisfaction. The parameters of four factors are presented in the paper and tested in the empirical research. Preliminary results are presented and C-LOPE model modifications and improvements are suggested.

Keywords: C-Lope Model, Job Satisfaction, Customer Satisfaction

1. Introduction

Although online e-business is taking an important place in customers' way of getting services or products, in majority of cases there is, directly or indirectly, almost always a person (employee) to person relationship in such a process. Sometimes maybe just in the case of complain, support or something similar. Customer's power of getting and buying more is a primary reason of treating her/him as a "king". Customer's satisfaction plays an important role in making strategies in further

development of business or public policies and strategies. These also include organisational changes, and relate to a changing culture in the operation and conduct of employees.

The satisfaction of the customer is therefore not only based on formal qualities (e.g. timeliness, correctness, price), but also on interaction between employee and customer, especially in the case of provider offering different services to customer. This process then has a major influence on the final quality assessments of service and satisfaction of the customer, even for the employees that customers never see or see for only a very short time (Wangenheim, Evanschitzky, & Wunderlich, 2007). While it is mostly the properties of a product that influence customer satisfaction with a product (technical quality), elements of the interaction process mostly have an impact on customer satisfaction with services (functional quality). Therefore the employees are one of the most significant factors of customer satisfaction and as claimed by Luo & Homburg (2007), customer satisfaction should be used as an index to attract and retain high-quality employees and leaders. Gaining a true understanding of the functional quality assessment of observed services is a specific challenge in the field of measuring customer satisfaction.

There is and evidence in research and theory that there is a strong link between employee and customer satisfaction. Brown & Lam (2008) indicate statistically significant and substantively important relationships linking employee satisfaction to customer satisfaction and perceived service quality, based on personal versus non-personal service contexts, organizational versus individual level of analysis, and global versus by facet measurement of employee satisfaction. Vilares and Coelho (2003) show on the basis of several empirical studies (Schmit and Allscheid (1995), Heskett et al. (1997)) that it is impossible to maintain a satisfied and loyal customer without satisfied and loyal employees. They claim that an improvement in employee satisfaction is positively correlated to the improvement of customer satisfaction. Crosby et al. (1994, p. 21) also points out: "If employees are truly motivated by a desire to do quality work that meets customer needs, then achievement of that outcome (customer satisfaction) should contribute to their own satisfaction as well."

2. Defining the Model

The C-LOPE model (C: Customer, L: Leadership, O: Organisation Climate, E: E-business), addresses the correlation between the aspects of the process that influence customers' quality assessment of the provided service.

Organisational Climate

The organisational climate is defined as how employees see their own organisation, the understanding of their personal opportunities and working conditions. This climate is affected by factors that occur as a result of known and unknown, past and present influences from the internal and external environment. The climate influences relations in organisations, the conduct of members and their positions and behaviour.

The formation and changing of an organisational climate requires two things: the influence on an occurrence or the cause of a situation, and the influence on people. Both are difficult since people do not welcome change, much less changing themselves (if that is actually possible). Measuring the organisational climate involves studying its typical dimensions, the causes of its occurrence, and its consequences on people's conduct or the utilisation of their abilities. Determination of the organisational climate will include:

- Internal relations;
- Internal communication and information provision;
- Motivation;
- Career development;
- Loyalty to the organisation.

Leadership: the leadership competence model

As stated by Zaccaro and Klimoski (2007, p. 23) although a number of theorists and researchers have offered countering notions or evidence, the predominant view, supported by empirical findings, is that “top executives matter”. Some perspectives of organisational leaders emphasise the connections between leader attributes and organisational effectiveness. The result of this tradition is a focus on leader assessment, selection, training, and the development of systems that enhance these attributes.

To represent differences in organisational effectiveness one must focus on competences, which is an internal psychological characteristic that enables the individual to perform above the average. They are based on proper physical, social, mental and spiritual potential, knowledge, skills, values, beliefs and result mainly in the capability of efficient use of available resources (Stare et al., 2007). The leadership competence model (based on Slovenian public administration competence model) consists of seven competences:

- First competence: flexibility at work;
- Second competence: creativity;
- Third competence: leadership;
- Fourth competence: organisational climate;
- Fifth competence: organising;
- Sixth competence: networking and influencing;
- Seventh competence: realisation skills.

Performance

Measuring performance of businesses in its first stages included accountancy information connected with efficiency, productivity, profitability and risk. Performance measurement is now more widely understood, since include also customer satisfaction, employee satisfaction and organizational climate. Therefore the whole model is performance measurement of the company. Nevertheless we wanted to overcome possible negative influences of bad financial indicators on the other variables included in the model. Therefore the surveys were made in companies with stable financial performance in last five years.

For our case the main source of data was AJPES (The Agency of the Republic of Slovenia for Public Legal Records and Related Services) webpage, which include complete financial statements and the most important financial indicators about companies, together with credit ratings of the companies. In the sample we include only companies with net profit in last five years and with credit rating from 1-4.

E-Business

In relation to the most significant factors studied in this research and emphasised by employees and customers, e-business and information technology can significantly influence performance and employee's working conditions, and on the other hand require the professional development and training of employees and adjustment to ever changing conditions at their workplace. In relation to factors mentioned by customers, e-business can significantly change service accessibility, responsiveness and quality. In terms of performance, e-business offers improvements to cost efficiency, greater responsiveness, greater availability, etc. Working conditions may also be improved, with the complexity of employees' work being reduced, better working premises being provided, and a better general satisfaction because of it. The bad side of the story is a constantly evolving and changing technology, forcing employees to undertake training and education. The e-business group of C-LOPE model is therefore focused on:

- Improvement of working conditions for employees;
- Satisfaction with software and hardware;
- Easiness of use;
- Reliability and trust in information technology;
- Satisfaction with knowledge of technology usage.

2. Empirical Research And Analysis

The C-LOPE model is based on the realisations of the existing domestic and foreign studies that are indicated as referential in an individual field of study (leadership competence model, measuring the organisational climate, the quality barometer of customer satisfaction, applicability of ICT) by experts in Slovenia and other close-by European countries. We wish to connect and check the findings of the mentioned realisations in a test group of companies. Since each individual content set is rather extensive in the original variant, a reduction of the number of questions (factor analysis, $n=126$ organisations) according to individual content sets was made for the needs of the model. The model that was formed on this basis consists of two questionnaires:

- Questionnaire for employees at companies that deal with customers
- Questionnaire for customers of the employees in the same companies /organisations.

The primary objective of testing the C-LOPE model is to define individual elements (variables) that influence the positive perception of an organisation's operations in the eyes of a customer.

Method of operations

The theoretically designed model was verified on a sample of companies ($n=16$) that were collected on the basis of the performance of previous cooperation (net profit in last five years and with credit rating from 1–4). The questionnaire “for employees” was completed by 251 respondents, whereas the questionnaire “for customers of the employees” in the same companies/organisations was completed by 320 customers. The analysis was carried out separately (see Figure 1) for **each questionnaire separately and then together** for both questionnaires (aggregated base of arithmetical means).

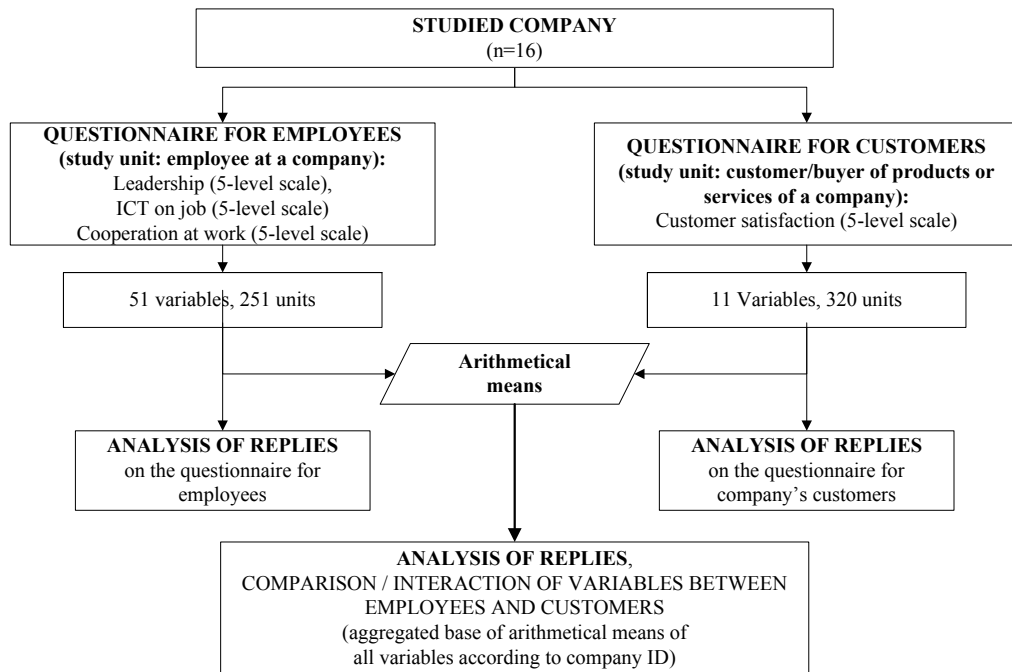


Figure 1 The flowchart of the course of analysis

The questionnaires were **aggregated by company/organisation's ID and average values** of each of the variables. The analysis was performed in three steps:

- Analysis 1: tables of average values
- Analysis 2: correlation matrices of arithmetical means (Pearson's correlation coefficient)
- Analysis 3: regression model of leaders' influence, use of ICT at work and the cooperation of employees at work to the satisfaction of customers.

Analysis of average values of estimates

The analysis of average values of estimates given by respondents in individual fields (compared to comparable previous studies) shows higher average estimates. The leadership that was studied in the model was estimated with an average grade of 3.87 (in comparable research studies between 2.8 and 3.4), applicability of ICT with an average grade of 3.70 (in comparable research studies between 2.7 and 3.4) and organisational climate with the rating of 3.74 (in comparable research studies between 3.1 and 3.9). The average estimate of customer satisfaction amounts to 3.99 and is comparable to customer satisfaction estimates in comparable research studies.

The results of the first analysis show that there is an above-average “internal” quality of operations (if we study individual elements of operations: leadership, organisational climate, ICT) perceived in the studied companies.

Analysis of the interaction of indicators

The second analysis refers to the interaction of indicators, namely: leadership (of employees) and customer satisfaction, influence of ICT on employees' work and customer satisfaction and cooperation of employees and customer satisfaction. The results show that there is a statistically

typical interaction ($p < 0.05$) of customer satisfaction variables (it is composed of the availability of information, speed of performed job, the quality of an employee's work, the employee's attitude, the tidiness of premises, equipment and surroundings and the comprehensibility of relevant information) with variables:

- **Leadership** of employees is detected in 6 out of the 20 studied behaviours of leaders. Interaction is recognised at element: “tidiness of premises, equipment and surroundings”,
- Applicability of **ICT** is detected in only one of the 6 defined ICT characteristics. Interaction is recognised at element: “tidiness of premises, equipment and surroundings”,
- **Organisational climate** is perceived in 2 out of 18 studied aspects of organisational climate. Interaction is detected in two customer satisfaction elements: “estimate of the quality of work of the employee serving you” and “estimate of an employees’ attitude to you as his/her customer”).

Regression model

In the third analysis, a regression model was carried out. By factor analysis, weights (components, factors) were generated, whereby the method of main components (VARIMAX) was used. “Customer satisfaction” was selected as a dependent variable and as independent variables, “leader’s estimate”, “applicability of ICT at work” and “organisational climate” were chosen.

Table 1 Model Summary^b

Model	R	R Squa	Adjusted R Square	Std. Error or the Estimate	Durbin-Watson
1	,969^a	,940	,849	,38842239	2,068

a. Predictors: (Constant), Organisational Clime Comp 1-4, Leadership Comp 1-4, IKT Comp1

b. Dependent Variable: Cust: Comp1

Based on this, four components were formed for the variable “leadership”, one component for the ICT variable and four components for the variable “organisational climate”.

Table 2 ANOVA^b

	Model	Sum of Squares	df	Mean Square	F	Sig.
	Regression	14,095	9	1,566	10,380	,005^a
1	Residual	,905	6	,151		
	Total	15,000	15			

a. Predictors: (Constant), Organisational Clime Comp 1-4, Leadership Comp 1-4, IKT Comp1

b. Dependent Variable: Cust: Comp1

The regression model explains 94% of the variability in customer satisfaction (Table 1) and the presupposition of the linear model has been confirmed (Table 2). The regression analysis also shows certain legalities.

Table 3 Regression analysis (parameters)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	-6,827E-16	,097		,000	1,000
LeadComp 1	-,326	,241	-,326	-1,353	,225
LeadComp 2	,030	,367	,030	0,81	,938
LeadComp 3	,672	,306	,672	2,199	,070
LeadComp 4	,066	,211	,066	,310	,767
IKTComp 1	-1,493	,324	-1,493	-4,603	,004
OKComp1	,872	,283	,872	3,077	,022
OKComp2	095	,218	0,95	,435	,679
OKComp3	-1,043	,225	-1,043	-4,625	,004
OKComp4	-,144	,143	-,144	-1,007	,353

a. Dependent Variable: Cust: Comp1

Based on the parameters of regression analysis, we can conclude (Table 3) that customer (buyer) satisfaction is statistically typically:

- **Increased** with the strengthening of factors that form the first component of the organisational climate (mutual cooperation, proposals for improvements are given by everybody (not only leaders), willingness to make additional efforts, acceptance of company's objectives, understanding of one's own position at the company, accountability for the quality of work, learning from each other, independence in the performance of work, satisfaction with current personal development, commitment to one's work when outside the organisation, talking positively about it, cooperation, proposals for improvements, additional efforts at work, Comp1):

- **Decreased** with growing satisfaction of ICT at work

- **Decreased** with implemented regular meetings or regular annual structured interviews at the company.

3. Conclusion

The results of the test study that was carried out show that it was not possible to detect the interaction between the leadership of employees and customer satisfaction or rather, the perception of successful operations of employees by customers (other research has observed a rather large influence of leadership on satisfaction at work, cooperation and the shaping of the organisational climate).

Positive interaction is shown by some elements of organisational climate, whereas on the contrary (unexpected), some others decrease customer satisfaction as a result. More than the absolute validity of the result, the question of studying the rationality of "routine" working sessions, the

professionalism of realised meetings and the “correct” realisation of annual structured interviews remains unanswered.

A number of new questions are brought to light by the influence of available and usable ICT at work. It seems that companies oriented towards services that are based (only) on ICT do meet the demands of an ever more demanding customer (from one to another transaction), but at the same time, they cause alienation from customers. “Is the ‘migration’ of customers the cause or the consequence of ICT use?” is certainly one of the questions that would be worth studying in subsequent studies and activities of designing C-LOPE models.

References

Brown, S. P., & Lam, S. K. (2008). “A Meta-Analysis of Relationships Linking Employee Satisfaction to Customer Responses,” *Journal of Retailing*, Vol. 84, No. 3, pp. 243-255.

Crosby, L.A., Grisaffe, D.B. & Marra, T.R. (1994), "The impact of quality and customer satisfaction on employee organisational commitment", *Marketing and Research Today*, February, pp.19-30.

Heskett, J.L., Sasser, W.E. & Schlesinger, L.A. (1997), *The Service Profit Chain: How Leading Companies Link Profit and Growth to Loyalty, Satisfaction and Value*, New York: Free Press.

Luo, X. & Homburg, C. (2007). “Neglected Outcomes of Customer Satisfaction,” *Journal of Marketing*, Vol. 71, No. 2, pp. 133-149.

Schmit, M.S. & Allscheid, S.P. (1995), "Employee attitudes and customer satisfaction: making theoretical and empirical connections", *Personnel Psychology*, Vol. 48 pp. 521-36.

SIBIS, (2003), *SIBIS Pocket Book 2002/03: Measuring Information Society in the EU, the EU Accession Countries, Switzerland and the US*. SIBIS project and European Communities, <http://www.sibis-eu.org/publications/pocketbook.htm>, 13.4.2011.

Sorber Bram: “Performance Measurement in the Central Government Departments of the Netherlands”. V: Halachmi A., ed.: *Performance and Quality Measurement in Government. Issues and Experiences*. Burke: Chatelaine Press, 1999, pp. 23–33.

Stare, Janez, Frančeškin, Andrej, Kozjek, Tatjana, Mayer, Janez, Tomaževič, Nina & Tomažič, Egon (2007), *Kompetenčni model vodenja v državni upravi: ciljni raziskovalni program (CRP) "Konkurenčnost Slovenije 2006-2013"*. Ljubljana: Faculty of Administration.

Vilares Manuel José & Coelho Pedro Simões (2003), “The employee-customer satisfaction chain in the ECSI model,” *European Journal of Marketing*, Publisher: MCB UP Ltd, Vol. 37, No. 11/12, pp. 1703-1722, ISSN: 0309-0566.

Wangenheim, F. v, Evanschitzky, H., & Wunderlich, M. (2007), “Does the employee-customer satisfaction link hold for all employee groups?,” *Journal of Business Research*, Vol. 60, No. 7, pp. 690-697.

West Darrell M. (2007), “Global E-Government, 2007,” Brown University, <http://www.insidepolitics.org/egovt07int.pdf>, 24.3.2011.

Zaccaro, Stephen, J. & Klimoski, Richard J., (2007), "The Nature of Organizational Leadership", http://media.wiley.com/product_data/excerpt/07/07879529/0787952907.pdf, 2.4.2011.

About the Author



Dr. Janes Stare is currently is an Assistant Professor and a Chair of Organisation and Informatics at Faculty of Administration, University of Ljubljana, Slovenia. He has involved in academic and professional associations; including selected programme and workshop appearances: Slovene Association for Human Resource Management and Industrial Relations, and a member of professional bodies of Slovene Association for Human Resource Management and Industrial Relations. Dr. Stare was a head of numerous research projects such as "Leadership Competence Model for Public Administration", and "A Better Work Environment", funded by Slovenian Research Agency (SRA) and Ministry of public administration, and European Social Fund and Ministry of Labour, Family and Social Affairs of the Republic of Slovenia, respectively.

Perceived Effectiveness of Fear-Related and Social Disapproval Message Themes in Anti-Smoking Campaign Among the Youth in Kazakhstan

by

Kim-Choy Chung

Kazakhstan Institute of Management,
Economic and Strategic Research
2 Abai Avenue, Almaty, Kazakhstan

Tel: +7 (727) 2704440 Ext 2162, Email: kimchung@kimep.kz

and

Liza Rybina

Kazakhstan Institute of Management,
Economic and Strategic Research
2 Abai Avenue, Almaty, Kazakhstan

Tel: +8 700 410 0261, Email: liza.rybina@gmail.com

UTCC
*International Journal of
Business and Economics* **IJBE**

Perceived Effectiveness of Fear-Related and Social Disapproval Message Themes in Anti-Smoking Campaign Among the Youth in Kazakhstan

by

Kim-Choy Chung

Kazakhstan Institute of Management,
Economic and Strategic Research
2 Abai Avenue, Almaty, Kazakhstan
Tel: +7 (727) 2704440 Ext 2162, Email: kimchung@kimep.kz

and

Liza Rybina

Kazakhstan Institute of Management,
Economic and Strategic Research
2 Abai Avenue, Almaty, Kazakhstan
Tel: +8 700 410 0261, Email: liza.rybina@gmail.com

Abstract

Kazakhstan has a large smoker population among its youth. Increasing realizations of health, social and economic costs of tobacco use lead many activists groups and commercial organizations to support both government and private-led anti-smoking campaigns. This study examines the effectiveness of message theme in anti-smoking campaign in Kazakhstan using semi-structure interview. Data from 189 students revealed both fear-related (disease and death) and social-disapproval themes are perceived effective in reducing smoking behavior among the non-smoking youth in Kazakhstan. However, there is inconclusive evidence to indicate similar finding among the smoking youth. A possible explanation for this observation may be the denial effect as indicated in Witte's (1994) Extended Parallel Process Model which suggested that when individual is exposed to fear, he/she is highly motivated to control the danger by lessening their at-risk behavior (not observed in this study) or control the fear through denial. Limitations of research and issues for future research are discussed.

Keywords: Anti-Smoking Campaign, Message Themes

1. Introduction

The World Health Organization (2008) estimates that smoking kills 5.4 million people every year, making it the world's leading killer. Smokings cause cancer, emphysema and bronchitis, and are a leading cause of heart attacks and strokes. Passive smoke also damages non-smokers health. Despite the numerous studies that explored the efficacy of anti-smoking advertisements (eg. Flay, Ditecco & Schlegel 1980; Harris, Connolly & Davis 1996; Goldman & Glantz 1998), the results on the impact of its message theme on anti-smoking habits remained variables. For example, studies by Flay et al. (1980) and Goldman and Glantz (1998) found anti-smoking advertisements are effective in reducing cigarette consumption. However, evidence from Wallack and Corbett (1987) and Harris

et al. (1996) suggested anti-smoking advertisement messages are not an effective mean to decrease smoking.

In Kazakhstan, there is a gap of knowledge on the effectiveness of message theme in anti-smoking campaign, a gap addressed in this study. In particular, this study examines:

i) The perceived effectiveness of fear-related (disease and death) and social disapproval themes in reducing smoking behavior among non-smoking youth in Kazakhstan.

ii) The perceived effectiveness of fear-related (disease and death) and social disapproval theme in reducing smoking behavior among smoking youth in Kazakhstan.

2. Relevant literature and hypothesis development

Anti-smoking message themes

In general, message themes in anti-smoking campaigns or advertisements can be classified as either fear-related (disease and death) or social disapproval-related (Uusitalo & Niemela-Nyrhinen 2008). Fear appeal has been a popular approach in anti-smoking campaigns in most developed countries, especially those related to health messages such disease and death (Beaudoin 2002). Disease and death themes describe how smokers suffer from diseases caused by smoking. The intent is to raise the perceived health risk severity ranging from serious diseases to eventual death as a result of smoking. This approach conformed to Witte's (1994) Extended Parallel Process Model which suggest that when individual is exposed to fear, he/she is highly motivated to control the danger by lessening their at-risk behavior or control the fear through denial when they feel that the threat is severe (that smoking leads to disease or death); feel vulnerable to the threat (the consequences of smoking will affect them personally); feel capable of changing their at-risk behavior (quit smoking); and perceive the behavior change is effective in averting the threat (quitting smoking effectively eliminates the risk. Consequently, this study proposed:

H1: Messages related to fear-related (disease and death) theme is effective in reducing smoking behavior among the non-smoking youth in Kazakhstan.

H2: Messages related to fear-related (death) theme is effective in reducing smoking behavior among the smoking youth in Kazakhstan.

In contrast, Uusitalo (2008) argues that social disapproval theme is more effective in anti-smoking campaign. Pechmann and Knight (2002) reveal that cigarette advertising shown in conjunction with anti-smoking advertising evoked unfavorable impressions about smoking. Similarly, Pechmann and Ratneshwar (1994) indicate anti-smoking campaigns affect non-smoking teenagers' perceptions of peers who smoke, reinforcing preexisting beliefs that smokers foolishly endanger their health and are relatively immature or unglamorous, a perception absent among smokers. As such, this study proposed:

H3: Messages related to social disapproval theme is effective in reducing smoking behavior among the non-smoking youth in Kazakhstan.

H4: Messages related to social disapproval theme is effective in reducing smoking behavior among the smoking youth in Kazakhstan.

3. Methodology

A sample of 189 students at the Kazakhstan Institute of Management, Economics and Strategic Research (KIMEP) was interviewed to study the effectiveness of message theme in anti-smoking campaign. KIMEP features the first smoke-free campus in Kazakhstan. The respondents comprised of 65.1% female and 31.7% male with age ranging from 17 to 23 years old. Each respondent was presented with two anti-smoking campaign advertisements, namely: disease and death theme with graphic depicting the formation of tumors in the lung airways and arteriolosclerosis in the aorta; and social disapproval theme with picture of lighted cigarette and coughing children in the playground (to emphasize that other people may suffers from second-hand smoke), before being asked to response to a semi-structured questionnaire which comprised of 6 sets of scales: The first two scales asked respondent about the perceived effectiveness of the respective presented anti-smoking advertisements in reducing smoking behavior, namely: i) "I think the 'disease and death' anti-smoking advertisement (poster A) is effective in reducing smoking behavior" (1- strongly disagree to 5 – strongly agree); ii) "I think the 'social disapproval' anti-smoking advertisement (poster B) is effective in reducing smoking behavior" (1- strongly disagree to 5 – strongly agree). The third asked respondent to indicate whether they are smokers or non-smokers while fourth and fifth question asked their reasons for smoking and non-smoking respectively. The sixth scale relates to demographic variable (age, gender, number of cigarette smoked per day).

4. Findings

The study found that 24.3% of the samples identified themselves as smokers (more than three cigarettes daily), 67.7% identified themselves as non-smokers while 7.9% are not sure of their status. The main reasons for smoking were habit (20.6%), for relieving stress (17.5%) and inability to quit smoking (10.1%). The main reasons for non-smoking include: does not like cigarette smell (24.9% of respondents), thinks that smoking is bad for health (57.9%), does not think it is cool to smoke (29.6%) and are dissuaded by parents (10.6%). The Analysis of Variance indicated significant within group difference in terms of the perceived effectiveness of fear-related ($F=18.88$, $\text{sig}=0.0$) and social-disapproval themes ($F=10.56$, $\text{sig}=0.0$) in reducing smoking behavior among the youth in Kazakhstan at the 5% significant level. The Post-Hoc test (Bonferroni) revealed significant difference between smokers and non-smokers; and between smokers and 'not sure' status with regards to both anti-smoking message themes (Table 1).

Table 1 Post-Hoc statistics

Multiple Comparisons								
Bonferroni								
Dependent Variable	(I) Q3	(J) Q3	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval		
						Lower Bound	Upper Bound	
disease & death theme	smokers	non-smokers	-1.206*	.199	.000	-1.69	-.72	
		notsure	-.970*	.345	.016	-1.80	-.14	
	non-smokers	smokers	1.206*	.199	.000	.72	1.69	
		notsure	.236	.316	1.000	-.53	1.00	
social-disapproval theme	smokers	non-smokers	-.891*	.202	.000	-1.38	-.40	
		notsure	-1.058*	.349	.008	-1.90	-.21	
	non-smokers	smokers	.891*	.202	.000	.40	1.38	
		notsure	-.167	.320	1.000	-.94	.61	
	notsure	smokers	1.058*	.349	.008	.21	1.90	
		non-smokers	.167	.320	1.000	-.61	.94	

*. The mean difference is significant at the 0.05 level.

Compared to smokers (mean=2.63 out of max 5), non-smokers are more likely to find disease and death theme (mean= 3.84) effective in reducing smoking behavior (Table 2). Similarly, the social-disapproval theme are perceived more effective in reducing smoking behaviour among the non-smokers (mean=3.50) than smokers (mean=2.62). Thus, both hypotheses *H1: Messages related to fear-related (disease and death) theme is effective in reducing smoking behavior among the non-smoking youth in Kazakhstan*, and *H3: Messages related to social disapproval theme is effective in reducing smoking behavior among the non-smoking youth in Kazakhstan* were supported in this study. This also implied that there is insufficient evidence to support both hypotheses *H2: Messages related to fear-related (death) theme is effective in reducing smoking behavior among the smoking youth in Kazakhstan*, and *H4: Messages related to social disapproval theme is effective in reducing smoking behavior among the smoking youth in Kazakhstan*. In other words, there is inconclusive evidence to indicate both fear-related (disease and death) and social-disapproval themes are perceived effective in reducing smoking behavior among the smoking youth in Kazakhstan. A possible explanation for this observation may be the denial effect as indicated in Witte's (1994) Extended Parallel Process Model which suggested that when individual is exposed to fear, he/she is highly motivated to control the danger by lessening their at-risk behavior (not observed in this study) or control the fear through denial.

Table 2 Descriptive statistics

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
disease & death theme	smokers	46	2.63	1.306	.193	2.24	3.02	1	5
	non-smokers	128	3.84	1.135	.100	3.64	4.03	1	5
	not sure	15	3.60	.828	.214	3.14	4.06	2	5
	Total	189	3.52	1.261	.092	3.34	3.70	1	5
social-disapproval theme	smokers	46	2.61	1.201	.177	2.25	2.97	1	5
	non-smokers	128	3.50	1.177	.104	3.29	3.71	1	5
	not sure	15	3.67	1.047	.270	3.09	4.25	1	5
	Total	189	3.30	1.232	.090	3.12	3.47	1	5

5. Conclusions and Limitations of Study

This study revealed fear-related (disease and death) and social-disapproval themes are perceived effective in reducing smoking behavior among the non-smoking youth in Kazakhstan, but insufficient evidence to suggest similar conclusion among the smoking youth. Given that this study's samples are collected only at one institution of higher learning in Kazakhstan, further research is needed to revalidate this research finding. Future research should examines the boomerang or denial effects of anti-smoking advertising (including promotion of nicotine replacements as quit smoking tool) and other social marketing campaigns (asking people not to smoke in public areas) among smokers in Kazakhstan.

References

- Beaudoin, C. E. (2002). Exploring antismoking ads: appeals, themes, and consequences. *Journal of Health Communication* 7, 123-137.
- Flay, B. R., Ditecco, D., & Schlegel, R. P. (1980). Mass media in health promotion: An analysis using an extended information-processing model. *Health Education Quarterly* 7(2), 127-147.
- Goldman, L. K. & Glantz, S. A. (1998). Evaluation of antismoking advertising campaigns. *Journal of the American Medical Association* 279(May), 772-777.
- Harris, J. E., Connolly, G. N. & Davis, B. (1996). Cigarette smoking before and after an excise tax increase and an antismoking campaign-Massachusetts, 1993-1996. *Morbidity and Mortality Weekly Report* 45, 966-970.
- John, D. R. (1999). Consumer socialization of children: A retrospective look at twenty-five years of research. *Journal of Consumer Research* 26 (December), 183-213.
- Kim, S. & Shanahan, J. (2003). Stigmatizing smokers: Public sentiment toward cigarette smoking and its relationship to smoking behavior. *Journal of Health Communication* 8(4), 343-376.
- Lemieux, P. (2001). World Bank's Tobacco Economics. Regulation(Fall), 18-21.
- Netemeyer, R. G., Andrews, J. C. & Burton, S. (2005). Effects of antismoking advertising-based beliefs on adult smokers' consideration of quitting. *American Journal of Public Health* 95 (6).
- Pechmann, C. & Knight, S. J. (2002). An experimental investigation of the joint effects of advertising and peers on adolescents' beliefs and intentions about cigarette consumption. *Journal of Consumer Research* 29, 5-19
- Pechmann, C. & Ratneshwar, S. (1994). The effects of antismoking and cigarette advertising on young adolescents' perceptions of peers who smoke. *Journal of Consumer Research* 21, 236-251.
- Rogers, R.W. (1983). Cognitive and physiological processes in fear appeals and attitude change : A revised theory of protection motivation. In J. Cacioppo & R. Petty (Eds.), *Social Psychophysiology* (pp. 153-176). New York: Guilford.
- Stipek, D., Sota, A. & Weishaupt, L. (1999). Life lessons: An embedded classroom approach to preventing high-risk behaviors among preadolescents. *The Elementary School Journal* 99(5), 67-73.
- Uusitalo, O., Niemela-Nyrhinen, J. (2008). Exploring message themes in antismoking advertising targeted at teenagers. *Young Consumer* 9(2), 29-36.
- Wallack, L. M., & Corbett, K. (1987). Alcohol, tobacco and marijuana use among youth: An overview of epidemiological, program and policy trends. *Health Education Quarterly*, 14(2), 223-249.
- Weinstein, N. D. (1998). Accuracy of smokers' risk perceptions. *Annals of Behavioral Medicine* 20(2), 135-140.

Witte, K. (1994). Fear control and danger control: An empirical test of the extended parallel process model. *Communication Monographs* 61, 113-134.

World Health Organization (2008), *Report on the Global Tobacco Epidemic*, June 2008.

About the Author



Kim Choy Chung is a faculty member at the Bang College of Business, KIMEP University, Kazakhstan. Kim holds a Doctor of Business Administration from Southern Cross University, Australia and a PhD (marketing) from the University of Otago, New Zealand. Kim has been involved in marketing courses at every level, most prominently in the area of Consumer Behavior and Marketing Research. His research interests are tertiary branding, cross-cultural marketing, social marketing and choice modeling. Kim is a board member of the Chinese American Scholar Association.



Liza Rybina is a Senior Lecturer in Marketing and Management at the KIMEP University, Almaty, Kazakhstan. She has an MBA degree and currently is pursuing a doctorate in business administration. Ms. Rybina has a fifteen year experience of teaching Marketing. She has consulted Kazakhstani and Russian companies on sales management and selling techniques. Her industry experience comes from engineering and marketing fields. Her research interests cover social marketing, health communications, consumer ethnocentrism, information communication technologies, business ethics and business education. Currently, she is working in the area of social media antismoking communications.

A Competitive Management Model for Thai Small and Medium Garment Entrepreneurs

by

Kornkanok Jarathiranpreeda

Doctor of Philosophy in Management Program
Building 19 Siam University 235 Petchkasem Road,
Phasi-charoen, Bangkok 10163
E-mail: kornkanok_jr@hotmail.com

and

Somchai Harnhirun

Director of Industrial Economics Information Center and
Director of Center for Industrial Economics Research of Office of Industrial Economics,
75/6 Rama VI Road, Rajathevee, Bangkok, Thailand
E-mail: somchai@oie.go.th

UTCC
*International Journal of
Business and Economics* **IJBE**

A Competitive Management Model for Thai Small and Medium Garment Entrepreneurs

by

Kornkanok Jarathiranpreeda

Doctor of Philosophy in Management Program
Building 19 Siam University 235 Petchkasem Road,
Phasi-charoen, Bangkok 10163
E-mail: kornkanok_jr@hotmail.com

and

Somchai Harnhirun

Director of Industrial Economics Information Center and
Director of Center for Industrial Economics Research of Office of Industrial Economics,
75/6 Rama VI Road, Rajathevee, Bangkok, Thailand
E-mail: somchai@oie.go.th

Abstract

The objective of this study is to develop a competitive management model for Thai small and medium garment entrepreneurs. This is a quantitative research, using questionnaires as a tool for collecting samples from 360 entrepreneurs, supporting with elaborate interviews with experts in garment business. The analysis will use technical statistic information. The result shows that Innovation Product, Human Resource Management, Customer Relationship Management, Total Quality Management, Marketing Management, and Finance Management factors have a positive relationship with competitive ability of Thai garment entrepreneurs in a statistic significant way. The result will be used for developing management model and offering strategies for developing five categories of garment entrepreneurs in beneficial and practical ways, including for topping up the academic knowledge of the business and of other industries as well.

Keyword: Competitive, Model, Strategies

1. Introduction

Garment industry is a very important industry in Thai economic. Regarding the whole structure of the industry, the garment industry is in a by-product section that uses intensive labors, basic technologies, and has a process of highly add-value to the products. However, news and information technologies in present days play an important role in business. The environments also rapidly change in every aspect; politics, economics, society, technology, and demography. This directly affects the competitive ability of Thai garment entrepreneurs such as in World Trade Organization (WTO), in Free Trade Area (FTA), and in Asian Free Trade Area (AFTA), including in the aspect of changing behavior of the customers and new entry supplier countries that provide lower cost such as Cambodia, Vietnam etc. The changing of factors and environment inevitably affects the decreasing of competitive ability of Thai garment entrepreneurs. As can be seen from the growth rate from 2005-2008 that were continually decreasing. For example, in U.S. market shows the rates 1.48, -1.31, -2.72, and -4.68. In Asian market shows the rates 17.23, 4.29, 15.14, and 10.73. And in

Chinese market shows the rates 6.16, -11.61, 5.88, and -4.14. (Textile statistics, Thailand Textile Institute, 2010)

In present, the garment entrepreneurs face many problems such as high cost, outdated machines, high labor cost, slightly low opportunity of owning a brand, marketing, short of skilled personnel, and financial flow. The sign calls for changing forces Thai garment entrepreneurs consider about improving and developing marketing strategies, both in domestic and foreign markets, in order to be able to compete in the dramatically changed environment of the world stage. This study will explore opinions of Thai entrepreneurs about the competitive ability of Thai garment entrepreneurs comparing with other competitors' ability and the factors that will determine the competitive ability that finally conclude and offer a suitable management model for a competitive garment industry.

The next section of the study contains the second part which is Conceptual / Theoretical Framework. The third part is Results of research. The forth part is the Presentation of the Suitable Management Model and Strategies. And the final part is the Conclusion and Suggestions.

The frame work for this research is shown in the following figure;

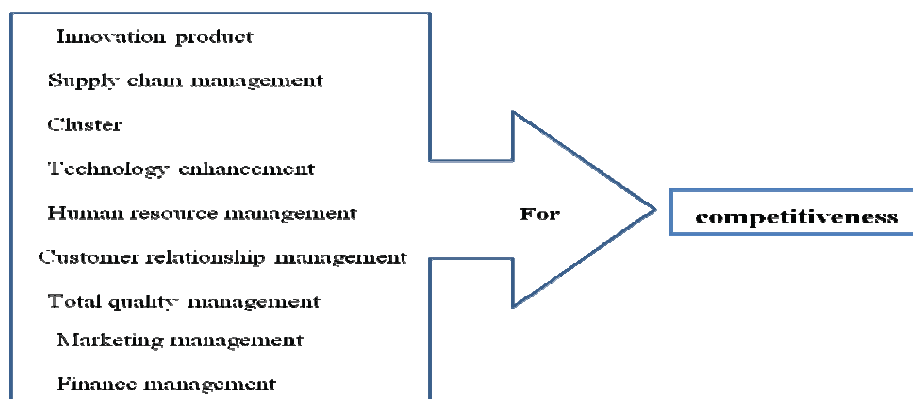


Figure 1 Framework

The concept of studying the competitive ability in industrial level will use the concept of Five Force Analysis of Michael E. Porter (1985), which is an effective tool widely used for analyzing the competitive ability in firm and entrepreneurs' level. It defines a competitive firm as a firm that is able to manufacture effective products and services equally or better than competitors. The success indicates by profit, export rate, and international or regional markets share. The idea divides the indicator of competitive ability into five parts which are rivalry among firms, bargaining power of buyers, bargaining power of suppliers, threat of substitute products, and threat of new entrants. The idea is widely used in many analysis of competitive ability studies such as Purmlarb Tippa (2002) studied about the competitive ability of Thai textile industry, Rungjarurnpattanakij Teerana (2002) studied about the factors that influence the success of Thai textile industry, and Kamphangtong Sinapsorn (2004) studied about measure and requirement of Thai textile industry in order to prepare for the free trade in 2005.

For this study of the competitive ability in firm level will use the idea of Value Chain of Porter E. Michael (1980) which said that the advantage or disadvantage of competition depends on

the effectiveness of the firm's internal activities comparing with other competitors. It is necessary to understand the role of each department in the way of providing benefits to customers. Good cooperation of main activities founded on good supportive activities. By exploring 360 Thai small and medium garment entrepreneurs' opinions whether they believe that they have competitive ability comparing with competitors, including analyzing the importance of each factor that the entrepreneurs believe affecting their competitive abilities. There are nine categories of factor which are Innovation Product, Supply Chain Management, Cluster, Technology Enhancement, Human Resource Management, Customer Relationship Management Total Quality Management, Marketing Management, and Finance Management. In each category, there are subcategories that will be tested for the relationship between the factors and the competitive ability of Thai garment entrepreneurs by Chi-Square method, both in categories and subcategories' levels. Then, the result will be analyzed for determining the suitable management that compatible with Michael E. Porter's idea, which is later used in the study and offering strategies for developing garment entrepreneurs.

3. Results of Research

3.1 The result of the analysis of rivalry among firms in garment industry

From the domestic analysis of rivalry among firms in garment industry by using Five Forces Analysis shows that the rivalry among firms in present days depends on number of competitors and expanding rate of the new market. The economy has an effect on the changing of customer's behavior to buy products from competitors, both domestic and foreign competitors, faster and easier. Bargaining power is also higher, since there are many competitors in the market and there are many trade confederations which assign regulations for increasing restrictiveness in import and export. There are quality control, quantity control, and varied raw material price. This increases bargaining power of supplier and affect the competitive environment, also there is a threat of substitute products from new competitors as well.

3.2 The result of the analysis of Thai small and medium garment entrepreneurs' opinions and competitive abilities

From determining factors by Value Chain idea in order to analyze the competitive ability, by dividing garment entrepreneurs into five categories because each category has different business and products; prefabricated clothing, brassiere, sock and stocking, fabric glove, and others (bedding, fabric bag, tie, hat), the conclusion of importance level of the nine competitive factors and competitive ability level comparing with other competitors in the market are shown in Table 1:

Table 1 Results of the Nine Competitive Factors and Competitive Ability Level comparing with other Competitors of the Five Categories of Garment Entrepreneur

Factors	Importance Mean	Competitive Mean	Competitive Mean				
			clothing	brassiere	sock and stocking	fabric glove	others
Innovation product	3.91	0.62	0.73	0.62	1.00	0.86	0.77
Supply chain management	3.76	0.62	0.60	0.64	0.72	1.02	0.70
Cluster	3.95	0.69	0.68	0.72	0.87	0.93	0.45
Technology enhancement	3.86	0.63	0.61	0.66	1.04	0.84	0.70
Human resource management	3.78	0.24	0.27	-0.06	0.39	0.02	0.02
Customer relationship management	4.01	0.70	0.74	0.33	0.66	0.31	0.25
Total quality management	3.90	0.89	0.98	0.14	0.72	0.22	-0.02
Marketing management	3.98	0.54	0.53	0.50	0.95	0.38	0.35
Finance management	3.83	0.46	0.53	-0.08	0.33	-0.27	-0.10
Total Mean	3.88	0.60	0.63	0.39	0.74	0.48	0.25

From the table considering average of the importance of the nine competitive factors found that the average is in 3.41-4.20 points, which means that the nine competitive factors are essential toward competition of the Thai small and medium garment entrepreneur and can be concluded by the following figure.

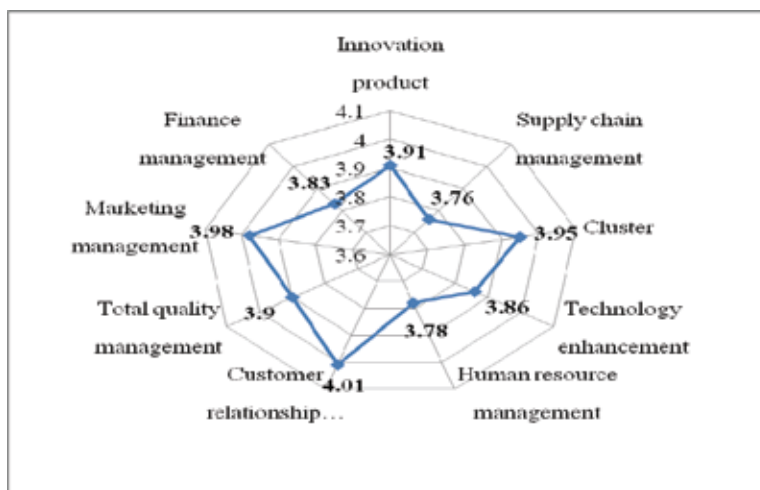


Figure 2 Summary of Importance of the Nine Competitive Factors in a Whole Picture

Figure 2 explain the whole picture of the importance of the factors that the most important factors is Customer Relationship Management, the next ones are Marketing Management, Cluster, Innovation Product, Total Quality Management, Technology Enhancement, Finance Management, Human Resource Management, and Supply Chain Management respectively.

Considering the average of the competitive ability comparing with other competitors in the market found that the best ability better than competitors is Total Quality Management, the next ones are Customer Relationship Management, Cluster, Technology Enhancement, Supply Chain Management, Innovation Product respectively. The Marketing Management, Finance Management, and Human Resource Management are equal with other competitors in the market as can be seen in figure 3.

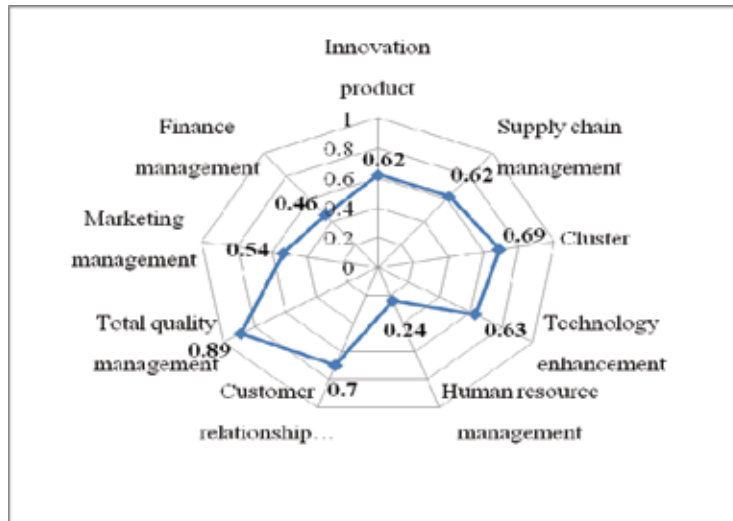


Figure 3 Summary of Competitive Ability comparing with other Competitors in the Market

However, if we consider each activity separately, each activity has a different competitive ability comparing with competitor, varied by the type of the activity. In other words, prefabricated clothing business has competitive abilities in Customer Relationship Management and Total Quality Management better. Sock and stocking business has competitive abilities in Innovation Product, Technology Enhancement, Innovation Product, and Marketing Management better. Brassiere and other business have less competitive abilities as can be seen in the following figure.

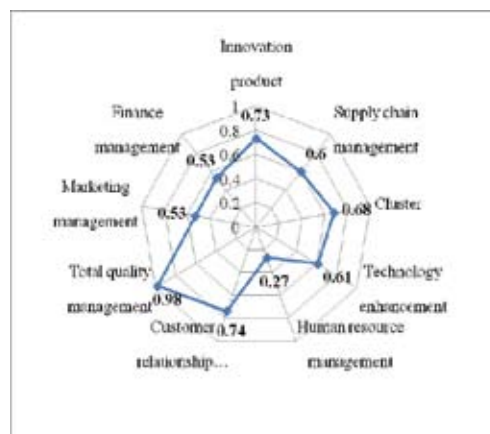


Figure 4 Clothes

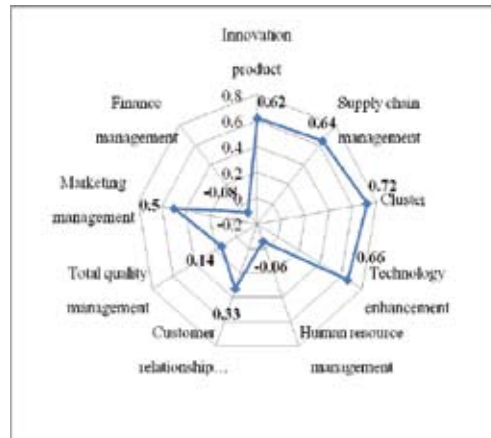


Figure 5 Underwear and Bathrobes

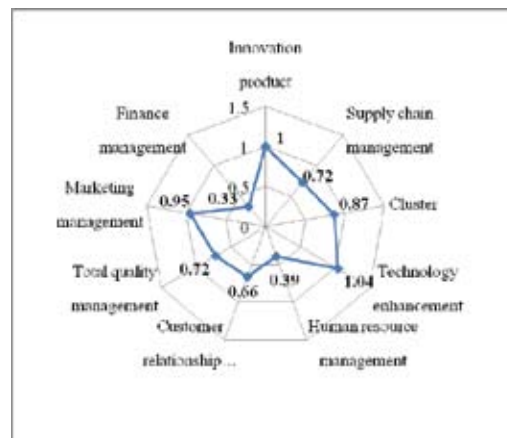


Figure 6 Panty hose, stockings socks

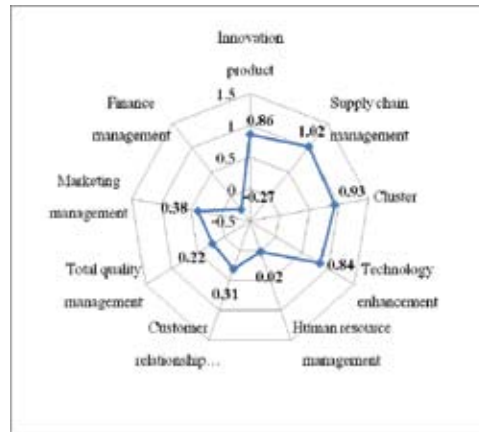


Figure 7 Gloves

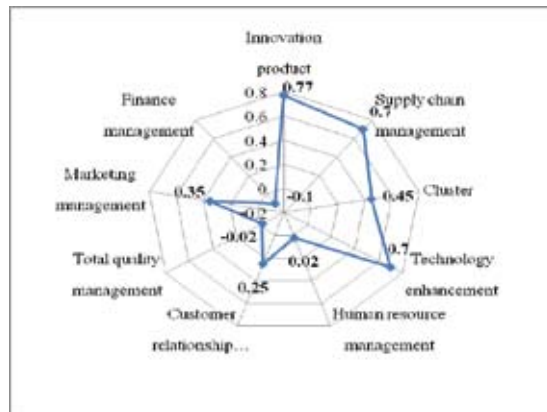


Figure 8 Other Garments

3.3 Results from Verifying Hypothesis

From the hypothesis that all nine factors affect the competitive ability of Thai small and medium garment entrepreneur, the result shows that the Innovation Product factor agreed with the hypothesis with 90% of reliability and Customer Relationship Management, Total Quality Management, Human Resource Management, Marketing Management, and Finance Management agreed with the hypothesis with 95% of reliability. Supply Chain Management, Cluster, and Technology enhancement disagreed with the hypothesis with 95% of reliability as the following table.

Table 2 Results from Verifying Research Hypothesis

Hypotheses	Chi-Square	Sig.	Results
Innovation product	57.40	.085**	Supported
Supply chain management	38.75	.526	Unsupported
Cluster	50.72	.225	Unsupported
Technology enhancement	31.56	.680	Unsupported
Human resource management	77.19	.032*	Supported
Customer relationship management	132.94	.000*	Supported
Total quality management	165.11	.000*	Supported
Marketing management	220.24	.000*	Supported
Finance management	215.36	.000*	Supported

** indicates the significance at the 90 percent level

* indicates the significance at the 95 percent level

4. The Development of Management Model and Strategies

From the study of external factor found that unstable political factor delays the economic and social development policy. Meanwhile, the worldwide information technology has dramatically developed in a fast pace, making communication becomes easier and others affect the adjustment of the entrepreneurs. Including the internal garment industry factor itself has a highly competitive environment in present days, since there are many competitors, both domestic and foreign, compete in the product quality, service, and low cost aspects.

From the uncontrollable external pressure and the open system of the firm that must consider the environment, the garment entrepreneurs must understand about the role of each department in the firm, focusing on the main activities that provide benefits to customers such as Total Quality Management, Marketing Management, and Customer relationship management. The good coordinated main activities that are valuable build on three supportive activities which are Human Resource Management, Finance Management, and Innovation Product. These activities must support each other, and they will make the business survive and has better competitive ability.

However, the success of the firm comes from practical strategies. The opportunity of the business happens on the strategies basis. If it is not so, it is impossible to identify the reason of the success or the failure (Drucker F. Peter, 2007). This research divides strategies into two categories; the main and the supportive strategies, in order to be compatible with main activities and supportive activities. The firm's strategies that have been planned must be able to measure from Balanced Scorecard, which are a measure tool and an applicably effective strategy. The effectiveness will increase the competitive ability of Thai small and medium garment entrepreneurs. The following is a management model for Thai small and medium garment entrepreneurs in present days, which is shown in figure 9.

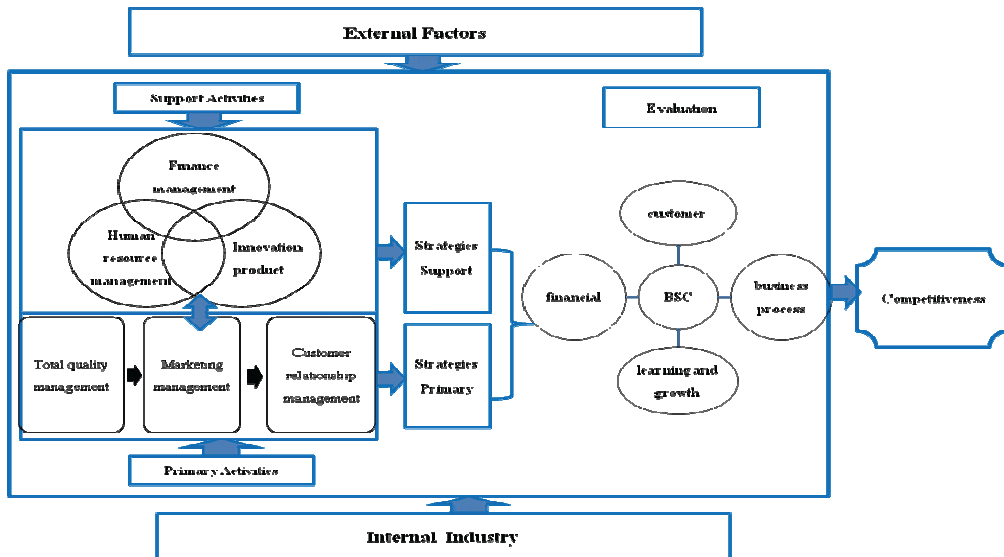


Figure 9 A Management Model for Increasing Competitive Ability of Thai Small and Medium Garment Entrepreneurs

The model will bring offered strategies for developing all five categories of the entrepreneurs. Base on Best Practices of successful garment firms and on elaborate interviews with experts in garment business and all five categories of the entrepreneurs, the conclusion is the following;

Table 3 Summary of Strategies for Developing All Five Categories of the Entrepreneurs

Category	Main Strategies	Supportive Strategies
Prefabricated clothing	- Building brand - Improving products to be different and unique - International standard manufacture - Focus on quick service - Expanding sale opportunity - Joint venture or cooperation with allied business	- Improving human resource to be creative for developing new products - Support group working process - Expertly analyze and plan financial matters - Bring modern information technology to working process
Brassier	- Building brand - Design solution for modern women - Focusing on specific group of customers and Make to order service for women with breast problems and abnormal body - International standard manufacture - Non-toxic materials - Participate in trade fair	- Creating innovation for products - Improving employees to be able to advice customers about human body - Training employees to be able to serve fast and impressive - Creating a website for increasing sale opportunities and nationwide sale

Socks and Stockings	- Building brand - Manufacture quality and unique products - Products has special feature that cannot be copied - Creating new products that helps reducing global warming - Seeking for an expert alliance - Expand the domestic market and new market - Participate in trade fair for expanding sale opportunities	- Provide good and reasonable fee - Improving working skills - Self-evaluation - Seeking sale opportunities via shop windows.
Fabric Gloves	- Building brand - Develop good quality, and durable products - Manage the cost - Recycle materials for the most benefits - Developing various kinds of product that are suitable for everyone - Focusing on quick delivery, in order to serve the customer's need	- Having more flexible payment method - Training employees to be good at sale negotiation - Develop language skills, at least for 2 languages - Promotion for persuading customers - Advertisements in magazines and on Internet
Others (bedding, fabric bag, tie, hat)	- Building brand - Focus on quality products - Design unique products for all kind of customers - Expanding both domestic and international customer bases - Non-toxic materials - Having business alliance network - Participate in public service activities - Collecting data, behavior, and needs of customers	- Focus on great, fast, impressive services - Employees must be experts in fabric details - Regularly evaluate internal and external situations

After that the researchers evaluated the management model and strategies by experts in garment business from three institutes which are 1) Governmental Institute: Director of Business Promotion and Development Office 2) Private Institute: Executives of Grand Sport and 3) NGO: Director of Thailand Textile Institute, found that the experts agree with the model because it is an useful and practical model.

5. Conclusion and Suggestions

From studying collected problems from previous studies, those problems limit the competitive ability. Entrepreneurs must solve the problems quickly before they lead to the crisis. These data came from recent situation, when the situation is changed, there must be new factors and new conditions. The study should be continued and study along with other industries with similar contexts such as upholstery, textile, jewelry, and food industries. It is important to study governmental policy that affects the increasing competitive ability in Thai garment industry that will cause benefits both to academic and practical aspects. There is no only one best solution or strategy that works with all firms. The effectiveness of the management depends on the ability to apply and choose suitable ways for particular situation. The competitive ability can be measured by comparing with competitors' abilities.

References

- Peter, D. F. (1985). *Innovation and entrepreneurship*. New York.
- Porter, E. M. (1980). *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. Harvard Business Review.
- Porter, E. M. (1998). *Clusters and the New Economics of Competition*. Harvard Business Review, November-December.
- Porter, E. M. (2007). *People and Performance: The Best of Peter Drucker on Management*.
- Sinapsorn, K. (2004). Measure and requirement of Thai textile industry in order to prepare for the free trade in 2005. King Mongkut's University of Technology North Bangkok. *Research Policy*.
- Somchart, S. (April, 2010). Director of Business Promotion and Development Office Governmental Institute. Interview.
- Teerana, R. (2002). The factors that influence the success of Thai textile industry. Chulalongkorn University. *Research Policy*.
- Thailand Textile Institute. (2010). Textile statistics: Thai Textile & Clothing Export Classified by Major Supplier, Jan.-Dec.2008. [On-Line] Available: <http://www.thaitextile.org>.
- Tippa, P. (2002). The competitive ability of Thai textile industry. Thammasat University. *Research Policy*.
- Wilawan, P. (April, 2010). Executives of Grand Sport Group. Interview.
- Wirat, T. (May, 2010). Director of Thailand Textile Institute. Interview.

About the Author



Miss Kornkanok Jarathiranpreeda is a Ph.D candidate in management at Siam University, Bangkok, Thailand. She received her Master of Business Administration in management from University of the Thai Chamber of Commerce, Thailand. Her Ph.D dissertation is in management dealing garment industry of Thailand. Currently she is working in a management field as a consultant: KAI solution Co., Ltd. and Resort Bangplat in Bangkok, Thailand.



Dr. Somchai Harnhirun obtained his Ph.D. in Economics from Concordia University, Montreal, Canada. He is now serving the government at Office Industrial Economics, Ministry of Industry as the Director of Industrial Economics Information Center, and also acts as Director of Center for Industrial Economics Research of Office of Industrial Economics. His current researches include “Measuring Economic Production in Steel Industry in Thailand”, and “A Change of Trade Pattern between Thailand-India prior and post FTA”

Identification of Business Risks in Management of Infrastructure Projects in Iran

by

Mohammad Mehdi Mortaheb

Department of Civil Engineering,
Sharif University of Technology, Azadi Avenue,
P.O. Box: 11155-9313, Tehran, Iran
E-mail: mmmortaheb@yahoo.com

and

Alireza Ahmadian Fard Fini

Department of Civil Engineering,
Sharif University of Technology, Azadi Avenue,
P.O. Box: 11155-9313, Tehran, Iran
E-mail: ar_ahmadiyan@yahoo.com

UTCC
*International Journal of
Business and Economics* **IJBE**

Identification of Business Risks in Management of Infrastructure Projects in Iran

by

Mohammad Mehdi Mortaheb

Department of Civil Engineering,
Sharif University of Technology, Azadi Avenue,
P.O. Box: 11155-9313, Tehran, Iran
E-mail: mmmortaheb@yahoo.com

and

Alireza Ahmadian Fard Fini

Department of Civil Engineering,
Sharif University of Technology, Azadi Avenue,
P.O. Box: 11155-9313, Tehran, Iran
E-mail: ar_ahmadiyan@yahoo.com

Abstract

Iran has achieved international recognition as one of the most important countries in the Middle East. Existing poor infrastructure as compared to geopolitical situation, rapid population growth and available rich resources of the country justify the implementation of new infrastructure projects in Iran. Specific focus on risk management process is vital for the success of such projects. This research is aimed to outline some of the crucial business risks associated with execution and management of infrastructure projects in Iran, from contractors' point of view. To meet research objectives, a succinct literature review was conducted for investigation of suitable risk identification methods and exploration of discovered risks from identical contexts in other similar countries. The basic study showed that a comprehensive and effective business risk identification appeals to a combination of more than one method. Therefore, four techniques including; "brainstorming", "review of historical data", "analogy method", and "cause and effect method", were used for recognition of business risks associated with studied environment. The identified nine categories of business risks involved with construction of infrastructure projects were found to be; "Feasibility and Design", "Tendering", "Health, Safety, and Environment (HSE)", "Managerial", "Procurement", "Social", "Construction", "Political and Legal", and "Financial and Economical". Some of the identified risks factors were due to; inadequacy of funding, scarcity of experienced staffs, poor constructability of the design, shortage of construction equipment, and local content law.

Keywords: Business Risks, Risk Management, Infrastructure

1. Introduction

Identification of business risks associated with construction of infrastructure projects in Iran is an important consideration for international contractors to decide on initiating their activities in this country. Rich oil and gas resources, valuable mineral mines, geopolitical situation in the region, and location on the East-West transit path (both for energy and other commodities) are some evidences that introduce Iran as an enticing area for various projects. In addition, rapid population growth and governmental policy to enhance current level of welfare, will urge development of infrastructure of Iran. Furthermore, expansion of such projects is vital to the goals of the politicians for standing in a superior position in the international market. As a result, there is a holistic plan for development of roads and railroads, dams, sewer networks, power plants, energy and water transportation systems, as well as residential buildings in Iran.

Infrastructures are defined in different ways. In some arguments, it is introduced by “the basic physical and organizational structures” which are used to facilitate transaction of society (http://www.askoxford.com/concise_oed/infrastructure). Sullivan and Steven (2003) described infrastructures as services and facilities which are necessary for implementation of big projects, and smooth operation of economy and business. Some examples for infrastructures are roads, energy and water supply and transportation networks, and telecommunication systems, or different organizational structures such as social, institutional, and educational centers (<http://www.dtic.mil/cgi-bin/GetTRDoc>). All of these examples are initial foundations and assets for favorite performance of a modern community.

There are some common characteristics among these types of assets. Long duration of establishment and huge required capitals are two main aspects of such projects. Also their rate of return may depend on other projects and systems in addition to their own direct income, and can harden to value these facilities (Dixit & Pindyck, 1994; Adam, 1996). It should be noted that infrastructures used to enhance public welfare, usually result in governmental ownership, especially in Iran. In this research, the main focus is on infrastructure projects in which construction phase is their overcoming feature. Roads and railroads, dams and water supply networks, energy transportation systems, and sewer collection and treatment projects are included in the area of this study. The general attributes for these projects are their relatively moderate technology. Moreover, to a large extent, tasks and components are constructed on the job-site and it is not possible to perform and assemble them off-site.

2. Research Background

Generally, risk is not described by a unique definition. It could be explained as negative or unwanted impacts of an event (Rowe, 1977) or a combination of hazards and undesirable happenings (Chicken & Posner, 1998). Risk has a two-edged nature that includes threats and challenges (Flanagan & Norman, 1993). Yet, constructive results of risk could not be ignored in some circumstances. However, probability of occurrence is an important aspect of a risk that should be taken into account for evaluation (Association of Project Management). Risk management is a main area of knowledge in project management in which identification, evaluation, mitigation, and monitoring form a permanent process to control different events (PMBOK, 2008). In other words, risk management is a systematic approach toward identification and quantification of all risks during project lifecycle in order to make conscious

decisions about related tasks (Flanagan & Norman, 1993). In conclusion, risk management is a process that is aimed to enhance project success.

3. Risk identification

Recognition is the first and the most important stage of risk management process that would help project team in reaching objectives of project (Lyons & Skitmore, 2004). It is an endless effort within project lifecycle that implies emerging of new risks in various stages of implementation (Zou & Li, 2010).

There are different techniques for risk identification that would be classified into three groups:

Documentation reviews: It refers to study of contract and documents of a project to explore potential risks. It also seeks information from previous similar projects (analogy method) in addition to recorded historical data under comparable context. The findings could be a checklist for next stages of risk management (PMBOK, 2008).

Data collection from project participants: As its name implies, humans' ideas are fundamentals of this group of techniques. One of such is brainstorming in which some meetings, as un-structured or structured sessions, are held between experts from diverse disciplines. When opinions are collected based on separate written viewpoints, it is more probable to reach consensus about risks without bias (Delphi Method, PMBOK, 2008).

In addition, risks could be identified through consultation with experts who have adequate experience in similar projects (Expert judgment). Nevertheless, there is likelihood of bias in this method (PMBOK, 2008).

Diagrammatic illustration: This group includes some tools such as cause and effect diagram, process flow chart, and influence diagram. They intend to analyze causes of happenings, their chronological order, and relationship between different variables (PMBOK, 2008). SWOT analysis is a method that focuses on various aspects of project, including Strengths, Weaknesses, Opportunities and Threats in order to balance those features.

Different researchers may take a combination of techniques for investigation of risks associated with execution of projects. In study of a subway project in China, risks were identified through historical data, review of similar papers, and interview with experts (Zou, Zhang, & Wang, 2007). Another research in the United Arab Emirates was done to examine risks associated with construction industry. Questionnaire survey was used for the purpose of this research and then some experts were interviewed to evaluate the results (El-Sayegh, 2008).

4. Project risk classification

The study shows that there is no specific method of risk classification, and the identified risks are grouped according to the nature of the project and research objectives. For instance, risks associated with a construction project could be categorized under six groups, including geological, planning,



Figure 1 Nine Categories of Risk Factors

The importance of categories along with related risk factors is explained under each group and description of each risk factor is accompanied by its pertaining cause and effect.

Financial and economical risks: Financial support and investment for a project directly depend on its benefit-cost ratio, and therefore risks under different categories could cause inadequacy of its funding. Since majority of projects rely on governmental budget, which is shared among different projects, therefore, current support of a project could oscillate considering change in policies and different external issues. Among other concerns in this field are; instable economic condition, inflation, disordered supply and demand in the markets, and weak and obsolete local insurance and banking systems.

Political and legal risks: Some contractors and experts speculate about risks pertaining to political and legal issues as extremely important threats with unforeseeable range of impacts. Differences in legal systems have produced conflicts between owners and international contractors. Application of local governing law in contracts for litigation of disputes is a major risk factor for international contractors. Furthermore, certain governmental organizations have different legal viewpoints, while regulations are also changing continuously. Various deciding centers may outline dissimilar goals and scope for infrastructure projects. Some other risks are; time consuming payment processes due to bureaucracy, cumbersome customs clearance formalities or local content law that enforces international contractors to hire local subcontractors and utilize local products, sometimes with low quality performance.

Social risks: This group of risks would achieve great recognition from foreign contractors in order to increase their knowledge about local community as a major stakeholder of the infrastructure projects. A challenging aspect is misperception of some local communities about development programs. They may interpret that those projects could increase immorality. Therefore, resistance against change and development emerges. Religious and cultural taboos usually intensify such resistances.

As some contractors may recruit local workers from vicinity of the construction site, tribalism is a significant factor that could complicate human resource management in case of disputes. This type of dependency may potentially expand range of conflicts to out-of-the-project boundaries. If this culture is not smartly analyzed, its negative effects are not predictable in the project context. Some unpleasant ethical characteristics of society may harden correct decision making. Egotism, individualism, rejecting criticism and dissimulation are examples of such habits. An important trouble in Iran is reluctance of some people to do their jobs and to accept responsibilities. Some experts recall it as root cause of low productivity.

Tendering risks: While small group of risks are included in this category, the impacts could damage entire project lifecycle. Owners of infrastructure projects are government agencies with frequent management turnover. Usually, there is a strong tendency to initiate new projects in order to increase reputation of current politicians. This will lead to vague scope definition, undeveloped needs, and short tendering periods. On the other hand, priority of projects' implementation may alter due to frequent changes of executives, after each election, based on the unique policy of different governments. Sometimes, it may contribute to prolonged awarding periods or even cancellation of a project.

Feasibility and design risks: Many experts believe that root causes of major deficiencies in execution of infrastructure projects are resulted from overlooks in feasibility and design phases. A significant inaccuracy is found to be studies based on initial imprecise data which could result in underestimation of real world in the design activities. Considering lags between design and construction tasks and poor communication of the related groups, poor constructability analysis of the designed items is a disturbance of construction period. On the other hand, insufficient involvement of owners, operators and/or users in the engineering works could cause reworks in various stages of a project. Vague scope definitions along with unclear owner needs are reasons for further changes in scope of work, even during construction phase. Multidisciplinary nature of the design increases the risk of inconsistent components.

Health, Safety, and Environmental (HSE) risks: One of the important categories of risks in construction industry of Iran is related to HSE issues. A crucial concern in this category of risks is ineffective safety precautions and shallow apprehension of human health which maybe resulted from public attitude toward these issues in the society. Lack of rigorous and comprehensive rules intensifies the situation. Sometimes, existing rules are not even complied with, because of inefficient supervision. Diversity of climatic condition is an impressive specification of this territory. Furthermore, natural disasters are the undividable part of life in Iran. In addition to possibility of earthquake in many provinces, it is likely to confront with sand storm or flooding. These may interrupt construction phase of projects. Occasionally, limitations imposed by Department of Environment, which tends to preserve natural wildlife and environments, could stop construction work progress and damage productivity.

Construction risks: Risks under this category are more tangible than other groups, due to direct and immediate impact on construction phase. There is a wide range of risks and some of critical threats are discussed here. Quantity of construction equipment is usually not adequate. In addition, existing equipment are sometimes old and obsolete resulting in loss of construction productivity. On the other hand, supply of new modern equipment is not easy due to international limitations. Based on this condition, sometimes traditional methods of construction have to be used that have a broad gap with modern world. Another problem in this field relates to poor or unreliable information databanks. This may lead to errors in estimation of work volumes and dealing with unexpected soil condition resulting in

poor organization of construction operations or even wrong construction methods. Weak workforce planning by local subcontractors is an obstacle for smooth operation of construction process. In these cases, staffs may be suspended due to incomplete requirement for a task. (e.g. drawings, tools, materials, or procedures)

Managerial risks: While international contractors may be moderately affected by the risks under this category, mismanagement of their hired local subcontractors in dealing with such risks could increase adverse impacts for them. One of the challenging issues in this group is scarcity of experienced and skillful staffs in some trades. Furthermore, low productivity of local crew has increased difficulties of project implementation which may reduce profitability. Local owners and contractors usually rely on traditional management. Organizational culture is another issue not stimulating cooperation and communication among its members, leading to unacceptable performance. Frequent management change is a torment that is observed in owner organizations. The frequency of changes gets higher, especially when new governments are elected, that result in adversarial relationship between different parties in the project environment.

Procurement and logistic risks: This category of problems should be highlighted, when infrastructure projects require supply from overseas. In addition to longer delivery time due to bureaucracy and/or limitations, improper local roads, old loading and unloading facilities and poor coordination for transportation of imported heavy equipment and machinery are major bothers in this classification. Low quality and unreliable bulk materials supplied locally is an occasional matter which may damage continuity of implementation process. This trouble arises when numbers of projects escalate in a period of time. One of pivotal risks in this field is inappropriate contractual strategies and restrictive regulations like, minimum local content, that are enforced by governmental owners. Some of risk factors associated with construction of infrastructure projects, such as inadequacy of funding, local content law, shortage of construction equipment, scarcity of experienced staffs, poor constructability of the design, vague scope definition, unreliable bulk materials, lack of rigorous and comprehensive rules in HSE issues and frequent management changes, regardless of their risk category, are depicted in Figure 2.

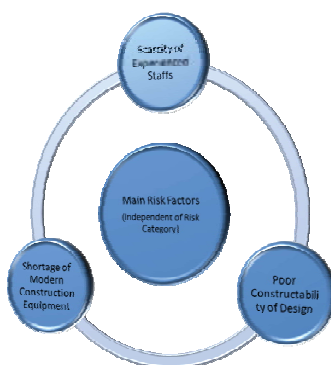


Figure 2 Risk Factors Associated with Construction of Infrastructure Projects

7. Conclusion

Iran is a developing country where infrastructures call for great expansion and revamping. Infrastructure projects usually need huge investment and long time, as well as reputable international contractors to accelerate their implementation process. On the other hand, all projects are associated with different business risks. Business risks of project implementation in Iran are unique due to national and political circumstances of the country. If these risks could be identified comprehensively, it helps contractors to increase probability of success and amount of revenue by taking appropriate strategies. In this way, more than one technique, depending on the context of the project, is applied to explore risks. Using previous experience and past documentations would be a brilliant idea. Although all the identified risks necessitate care, it was found that some categories like political and legal, social, and financial have caused deep concerns in contractors association. Nevertheless, some risk factors, such as inadequacy of funding, local content law, and shortage of modern construction equipment are also major challenging issues in construction of Iran's infrastructure projects.

8. Acknowledgements

The authors wish to thank Parisa Mohammadi, Ehsan Heshmati, and Hossein Sharif, Project Management Graduate Students, for their valuable participation in this study.

References

- Adam C. (1996), "Embedded options in infrastructure Projects," *Journal of Applied Finance and Investment*, 1, pp. 33-36.
- Association of Project Management, Retrieved on 10 September 2010 from: <<http://www.apm.org.uk/RtoT.asp>>.
- Chicken J. & Posner T. (1998), *The philosophy of risk*. Thomas Telford
- Department of Defense Dictionary of Military and Associated Terms, pp. 260, 12 April 2001 (rev. 31 August 2005), Retrieved on 18 November 2010 from <<http://www.dtic.mil/cgi-bin/GetTRDoc?>>
- Dixit A.K. & Pindyck R.S. (1994), *Investment under uncertainty*, Princeton (NJ): Princeton University Press.
- El-Sayegh S.M. (2008), "Risk assessment and allocation in the UAE construction industry," *International Journal of Project Management*, 26, pp. 431-438.
- Flanagan R. & Norman G. (1993), *Risk management and construction*, Victoria, Australia: Blackwell Science Pty Ltd.
- Grimsey D. & Lewis M.K. (2002), "Evaluation of risks of public private partnerships for infrastructure projects," *International journal of project management*, 20, pp.107-118

Lyons T. & Skitmore, M. (2004), “Project risk management in the Queensland engineering construction industry: a survey,” *International Journal of Project Management*, 22, pp. 51-61.

Online Compact Oxford English Dictionary, Retrieved on 18 November 2010 from: <http://www.askoxford.com/concise_oed/infrastructure>

Project Management Institute. (2008), *A guide to the project management body of knowledge (PMBOK Guide)*, 3rd Ed. Newton Square, PA: Project Management Institute.

Rowe W.D. (1977), *An anatomy of risk*. New York: Wiley.

Sullivan A. & Steven M.S. (2003). *Economics: Principles in action*. Upper Saddle River, New Jersey 07458: Pearson Prentice Hall. pp. 474. ISBN 0-13-063085-3.

Zou P.X.W. & Li J. (2010), “Risk identification and assessment in subway projects: case study of Nanjing Subway Line 2,” *Construction Management and Economics*, 28, pp. 1219–1238.

Zou P.X.W., Zhang G., & Wang J. (2007), “Understanding the key risks in construction projects in China,” *International Journal of Project Management*, 25, pp. 601–614.

About the Author

Thailand's Military Logistics Key Performance Indicators: A Case Study of Royal Thai Army's Medical Logistics

by

S.Parapob¹, N. Suthikarnnarunai², and P.Buranaprapa²

¹Ph.D. Student in Logistics, School of Engineering,
University of the Thai Chamber of Commerce
Vibhavadee-Rangsit Road, Dindaeng, Bangkok, 10400, Thailand
Email: supamanat@hotmail.com

and

²Logistics Engineering Department, School of Engineering,
University of the Thai Chamber of Commerce,
Vibhavadee-Rangsit Road, Dindaeng, Bangkok, 10400, Thailand
Tel: 662 697-6705, Fax: 662 275-4892
Email: ssjnsj@yahoo.com, nanti_sut@utcc.ac.th

UTCC
*International Journal of
Business and Economics* **IJBE**

Thailand's Military Logistics Key Performance Indicators : A Case Study of Royal Thai Army's Medical Logistics

by

S.Parapob¹, N. Suthikarnnarunai², and P.Buranaprapa²

¹Ph.D. Student in Logistics, School of Engineering,
University of the Thai Chamber of Commerce
Vibhavadee-Rangsit Road, Dindaeng, Bangkok, 10400, Thailand
Email: supamanat@hotmail.com

and

²Logistics Engineering Department, School of Engineering,
University of the Thai Chamber of Commerce,
Vibhavadee-Rangsit Road, Dindaeng, Bangkok, 10400, Thailand
Tel: 662 697-6705, Fax: 662 275-4892
Email: ssjnsj@yahoo.com, nanti_sut@utcc.ac.th

Abstract

A need to develop the logistics system in Thailand stemmed from a higher competitiveness in consistent with globalization. Free trade agreement has been introduced widely in industrial sectors, resulting in increasing business capability, business cost reduction, and adding more value to satisfy with customer requirements. Managing the procedure of product's delivery and service was accomplished in order to serve the customer throughout supply chain with logistics activities. It was therefore a main objective for entrepreneurs to compete with other opponents in domestic and global markets. Military logistics for Thailand during the war period is operational followed from the tactical order to achieve the mission. Thereby, achievement in such mission is evaluated by key performance indicators whether or not the mission can be accomplished. Likewise, the key performance indicators will be used for evaluating the achievement under the normal situation under a policy of the office of the Public Sector Development Commission. It is certain that military logistics will take some time to achieve, become more expensive, and can result in weakening combat staff prior to military operations. The objectives of this study are: 1) develop the key performance indicators used in logistics medical supplies for Thailand; 2) develop the mathematical model or other appropriate models that are used for logistics key performance indicators, and decision making of commander in different military departments those who will apply to their military operations; and 3) enable relevant military departments to apply the mathematical model to a case study of natural disaster.

Keywords: Military Logistics, Key Performance Indicators

1. Introduction

Under a higher competition due to globalization and free trade among several countries, most of them have gained more awareness in increasing their business competitive advantage in order to compete in the global market. Logistics and supply chain are one of the methods that have been applied to increase its competition capability. It is due to logistics and supply chain focusing on planning, operating, and controlling activities inside supply chain that lead to increasing efficiency and effectiveness. For current Thai parliament, logistics has been pushed forward as a strategic master plan by the support of private sectors in order to fulfil the requirement of increasing business competitive advantage in domestic and international level. Considering the origin of concepts of logistics and supply chain, it is found that the concepts are derived from military purpose in delivering any military supplies. This main purpose is thought to be a key point of country sustainability because the objective of military supplies will fulfil the capability of the soldier to succeed their operations more efficiently. With sufficient military supplies, the operations can be fulfilled with being safe from its opponents in the war field. It is necessary to having systematic planning in a strategic level, tactical level, and operational level as well as clarified procedure creating integrity of cooperation between each department.

Ministry of Defence is one of the departments responsible for country sustainability and directly responds to the governmental policy in improving logistics performance, as well as logistics standard comparable to global benchmarking. However, in order to fulfilling such requirement, it is mandatory to develop clarify and appropriate key performance indicators that capable of measuring or evaluating quantitative data reviewing its performance of logistics operation. In retrospect, any activities involved in military or logistics were exclusively confidential due to military sustainability. Besides that, evaluating the military's operations performance can be indexed with the system of performance monitoring and evaluation. This system has been controlled by the office of the Public Sector Development Commission, Thailand that monitors and evaluates all governmental departments under the same standard regardless of special characteristics of individual operation.

This research study, therefore, will develop key performance indicators in logistics, especially in medical corps logistics. The main objective is to identify the indicators that can be used for developing the model in solving any military logistics problems such as mathematical model or simulation model as a quantitative tool. Military logistics for Thailand during the war period is operational followed from the tactical order to achieve the mission. Thereby, achievement in such mission is evaluated by key performance indicators whether or not the mission can be accomplished. Likewise, the key performance indicators will be used for evaluating the achievement under the normal situation under a policy of the office of the Public Sector Development Commission. It is certain that military logistics will take some time to achieve, become more expensive, and can result in weakening combat staff prior to military operations.

Logistics in military presented in this research study has encountered some problems such as decomposed, delayed, insufficient, and non-continuous medical supplies. There had been several studies aimed at increasing logistics performance, but not successful. This study, hence, proposes the mathematical tool and mechanism to support the theoretical framework by using logistics key performance indicators. It is anticipated that this study could increase Thai military logistics performance, resulting in cost reduction relevance to Thai governmental policy and Thailand as a whole.

2. Literature Review

Military logistics

Some classes of supply have a linear demand relationship—as more troops are added more supply items are needed—as more equipment is used more fuel and ammunition is consumed. Other classes of supply must consider a third variable besides usage and quantity: time. As equipment ages more and more repair parts are needed over time, even when usage and quantity stays consistent. By recording and analyzing these trends over time and applying to future scenarios, the US Military can accurately supply troops with the items necessary at the precise moment they are needed.[1] History has shown that good logistical planning creates a lean and efficient fighting force. Lack thereof can lead to a clunky, slow, and ill-equipped force with too much or too little supply (Wikipedia, 2011).

Logistics Aims of the Royal Thai Army Logistics

- The similar logistics system is used in a normal and abnormal condition during the war as much as possible.
- Standard needs to be similar, but fairly different according to its location, geography, weather condition, and other situations encountered.
- Responsibility is given to the logistics military hub where support to the closest area responsibility. Distributing the equipment, service, and facilities is managed to delivery the items to the logistics military branches.
- Preparing needed equipment may keep them in a good condition ready for use any time. The procurement is made according to the operation policy relevant to military industries.
- Preparing accumulated items used for the future war and other items related to logistics are necessary.
- Preparing service, built items, utilities, and facilities may respond thoroughly to other departments.
- Preparing a logistics department can fulfill the requirement of armed forces by increasing capability of the existing logistics department or new one.
- Developing the logistics department appropriately and more advanced.

The mission of the Royal Thai Army logistics is achieved according to the royal decree made by the Ministry of Defense year 1960, code 14. It assumes to allow the Royal Thai Army to be prepared for armed forces, and prevent the country with the commander of Army from other interventions. Therefore, the mission of the Royal Thai Army is described as follows:

1. Supporting the logistics activity to facilitate other forces of the Royal Thai Army is done to fulfill the mission and benefit the Army.
2. Supporting the logistics activity to facilitate other forces or organizations is done when receiving any requests and allied agreement.

A policy of the Royal Thai Army logistics is described as follows:

- 1) Implementing the logistics activity is done and follows the following steps:
 - Supportive combining means combining the capacity in logistics support and tactical support to fulfill the targeted mission.
 - Supportive two ways direction facilitates the supportive armed force located behind or nearby the logistics locations, including the supportive activity from the North armed forces to supportive force to lower the workload of logistics activity.

- The supportive logistics department needs more reliable in their capacity that allows the supportive force to feel more confident on getting the support at the right time and location followed from the determined plan. It is also necessary to have the supportive resource and backup plan. All commanders need to protect their own resources from being lost due to several reasons.
- Logistics activity in the Royal Thai Army may utilize existing equipment or forces as optimal as possible under the determined budget.

The department responsible for logistics needs to follow the following tasks:

- Information is sent according to the requirement and status of logistics in which a commanding force or supportive force will keep track on the progress.
- Equipment, service, and facility in logistics are necessary according the requirements.
- Implementation of logistics needs to be accurate and follows public sector criteria.

In summary, the supportive logistics department is responsible for assisting logistics activity according to the mission within their own capacity. This responsibility may include conducting inspection, visiting all sites, and considering the support in accordance with a method of logistics as a whole.

Royal Thai Army Medical Logistics

The Royal Thai Army Medical Department is responsible for administering any medical activities in a normal and abnormal situation, returning soldiers from being injured, hiring and training military medical staffs, as well as researching and monitoring any medical departments for Royal Thai Army.

Logistics Key Performance Indicators

Businesses can utilize KPIs to establish and monitor progress toward a variety of goals, including lean manufacturing objectives, MBE (Minority Business Enterprise) and diversity spending, environmental "green" initiatives, cost avoidance (CA) programs and low-cost country sourcing (LCCS) targets. Any business, regardless of size, can better manage supplier performance with the help of KPIs robust capabilities, which include: automated entry and approval functions, on-demand, real-time scorecard measures, single data repository to eliminate inefficiencies and maintain consistency, advanced workflow approval process to ensure consistent procedures, flexible data-input modes and real-time graphical performance displays, customized cost savings documentation (CSD), simplified setup procedures to eliminate dependence upon IT resources.

Main SCM KPIs will detail the following processes: sales forecasts, inventory, procurement and suppliers, warehousing, transportation, or reverse logistics. Suppliers can implement KPIs to gain an advantage over the competition. Suppliers have instant access to a user-friendly portal for submitting standardized cost savings templates. Suppliers and their customers exchange vital supply chain performance data while gaining visibility to the exact status of cost improvement projects and cost savings documentation (CSD). For logistics' point of view, the selection of logistical KPIs for the present study was tightly restricted in some respects – transportation (Mc. Kinnon, 1999); procurement (Karen and Fedele, 2004); and trade logistics activities (Arvis et al., 2007). Cost and time are two crucial elements in logistics operations. Therefore, cost and time are main indicators to measure the performance of the logistics operations in every business (Miller, 2008). Those indicators enhance all businesses the competitive advantages over the competitor. For procurement activity, three measurements – price (total product cost), delivery (performance to schedule), and quality (process variability and consistency) – are used to measure direct suppliers' performance (Karen and Fedele, 2004) and value to the organization. Furthermore, logistics management (2008)

mentioned that logistics is a science of management of handling goods, information, and other resources which even includes energy and people. It is basically caters with the supply of raw materials and produced goods in between the place of production and market or consumers. However in military logistics there are logistics officers who manage the wing, and hence manage the transportation of the resources to the place they needed. However in military this wing plays an important role by maintaining the supply line to the concerned facilities since an armed force without a supply chain is defenseless. However there were several examples of several wars where the defeat of one country was primarily due to the logistic chain failure. This even proves the importance of this field. However another field inside the logistics is the medical logistics. As the name shows it is the wing which is primarily concerned with the transportation of the medical equipments and medicines.

2. Literature Survey

Khemavuk and Hasan (2010) aims to validate a SEM model for measuring warehouse performance using data from an international company in Australia (company G). Moreover, a methodological triangulation method was also adopted to test whether different methodological approaches produce convergent findings about warehouse performance measurement. These three different methods are the SEM model, the multiple case research study and validation of the SEM model using data from 80 companies in Thailand and a company in Australia. With the results from the triangulation method, it is obvious that the SEM model can be used to measure the performance of warehouses in Thailand and Australia. Since the SEM model consists only of significant indicators, it is more appropriate than company G's scorecard. Furthermore, the SEM model can overcome the limitations of traditional models by allowing companies to compare their performance over time.

To present the study conducted in identifying organizational performance, Silptheep and Sirisereewan (2011) proposed the superior firm performance that can be generated in many ways. One of the effective routes to this achievement is the competitive advantage which is gained from appropriate value chain management and market oriented implementation. The value chain concept provides a framework for clarifying how an unitary organization might maintain substantial discretion over the allocation of its resources, create differentiation and effectively manage its costs leading to competitive advantage. Many conceptual and empirical studies on various aspects of market orientation have been published. Recent research has found market orientation to be positively related to competitive advantage and firm performance across a wide range of industry types. These findings generate the essential guideline for businesses to achieve their objective. Although there are many research about the relationship between these variables and show the significant result that firms can adapt it for the operational perspective. There is a few research of value chain concept and market orientation in a holistic manner that affects the firm competitive advantage and superior performance. It also needs the further research to clarify this relationship in terms of the degree of relationship and measurement method. Thus the objective of our study is to investigate simultaneously:(1) how market orientation and value chain management affects the competitive advantage of a firm in terms of differentiation or low cost advantage and (2) how the firm's differentiation or low cost advantage influences firm performance and to reexamines issues surrounding the holistic linkage among value chain, market orientation, competitive advantage and superior firm performance at both conceptual and empirical levels. Shrivastava (2011) then further analyzed the corporate culture that has always been significant for long-term economic performance of an organization. The values of a corporate culture influence the ethical standards within a corporation, as well as managerial behavior. This research emphasizes the importance and impact of corporate culture and cultural conflicts in planning of supply chain management systems in Indian

context. This paper is an attempt to develop a framework for assessing corporate culture compatibility in supply chains using simulation model designed and based on a Multi-Agent System (MAS) approach and investigates cultural conflicts. The paper will help in evaluating and predicting the performance of Supply Chain Management of various organizations of a region and the impact of cultural conflicts on supply chain network.

In the context of logistics and supply chain, Miodrag and Clausen (2011) stated that due to the insufficient systems for forwarders, a performance management system has been developed. The aim is a continuous control of costs, performance and quality taken under consideration of company structure and goals. The system is built modular and contains a performance management system, calculation of profitability and a benchmark module. Every module can be used in combination or in a single use. Several forwarders were involved in the project to achieve a best fit of the prototype. Therefore, special performance indicators are developed. A special focus lies on the needed and available data for the performance indicators. A combination of conventional and weighted indicators ensures the application of the performance management system in practice. Concerning the forwarder requirements, a benchmark platform was developed which contains the main indicators for company comparison. The major challenge is the collection of company data. This lack of information has been closed through the optional participation and anonymous data evaluation. Beside the performance management system, the prototype contains cause-and-effect chains. These cause-and effect chains consist of single indicator groups as well as possible characteristics and sanctions.

Also, Supeekit et al. (2011) said that supply chain management is widely adopted and employed in many industries with an intention to improve the efficiency of the organizations in the supply chain. Hospital or healthcare industry is another industry which adopts the concept of supply chain management to be able to manage hospitals efficiently. However, the hospital supply chain is rather complex, more complex than other supply chains. Supply chain efficiency seems not a sole objective of the hospital supply chain. The previous studies indicated that another important objective of the hospital supply chain is 'patient safety'. It means that to improve the hospital supply chain the two objectives are to be assessed. Accordingly, the process of selecting suitable set of performance measures for hospital supply chain requires an integration to be able to assess the hospital supply chain against the two objectives. This paper presents a review of selected literatures regarding the performance measurement in hospital and hospital supply chain area. Moreover the performance measurement systems of the hospital and hospital supply chain in Thailand are reviewed. Finally, a conceptual framework to develop a new and integrated hospital supply chain performance measurement is proposed. Despite of the fact that Kleemann et al. (2011) proposed the growing importance of services in today's business world is recognized both economically as well as academically. The provision of services is therefore seen as a major growth opportunity for many businesses – both pure service providers as well as manufacturers that expand their offerings into the service sector. However, simply offering services as a side-offer to hardware products does no longer suffice. With companies increasingly wanting to concentrate on their core competencies and source out non-core activities to external providers, they demand an integrated solution, rather than having to compose a combination of products and services to solve their challenges. As a result, full-service concepts have developed, with a specific form of them being called "performance-based contracting". The main idea here is that the customer defines a desired result (or outcome) and only pays for the performance delivered, rather than providing a detailed specification and paying for the resources consumed during service provision. A typical example is to purchase flight hours rather than an aircraft and separate maintenance services. The proposed contribution seeks to introduce the idea of "performance-based contracting" as an evolving service concept, define its characteristics and

analyze its implications on the operations of service providers. This will form the basis for managerial recommendations on how to successfully offer “service solutions”.

3. Methodology

The research presented here was in both qualitative and quantitative type shown as follows:

Qualitative Research

The statistical analysis was selected to investigate the collected data with interviewing commanders and relevant personnel in determining the key performance indicators.

1. Study and compare a method and operation in all military logistics departments.
2. Collect data from documentation of the operational evaluation for Army medical logistics and interview with relevant commanders.
3. Sample from the population selected in the central and field medical sector and 37 Army hospitals.
4. Plan data collection in the field study of those areas that are harmful, especially a combat border and several cross borders.
5. Evaluate the previous logistics efficiency leading to a new pattern of Thai military logistics using the simulation model. This model could proof the results of the study.
6. Implement the research results for future use, and plan to collect data in the areas of natural disaster occurred such as the western part of Thailand nearby coast line (Pang-nga or Phuket province). The objective is to identify the facts proved by survey with the implement of helping those people facing natural disasters more quickly and efficiently.

Quantitative Research

This type of data collection covered the use of a simulation model in investigating and proofing the key performance indicators implemented in actual operations. In order to fulfill the objectives of the qualitative and quantitative research, there were several steps completed as follows:

- Study a method of the operations accomplished for Thai military logistics department.
- Study a pattern of the global logistics key performance indicators.
- Study other Thai military logistics data such as from Navy, Air Force, Navy Medical Department, and Air Force Medical Department in order to analyze and compare with the research study.
- Identify factors of the key success indicators to support the military operations aimed at developing the military logistics in terms of effectiveness, progress, and modernization.

4. Results Analysis

The results were collected by using the designed questionnaire, the field survey in the Army Medical Logistics, and the benchmarking with other departments such as Navy, Air Force, Royal Thai Police, or Ministry of Defense.

Quantitative Results

The research study was a continuous process that collects data by using the developed questionnaire and interviewing with a high ranking of the commanders or those responsible for logistics. The results analyzed were found that in a normal situation, logistics for the Royal Thai Medical Army received the surveyed data of being prompted and limited capacity on a normal basis. It was believed that the Army using the indicators such as Just-In-Time was anticipated to increase effectiveness of the Army Medical logistics due to delivering medical supplies, medicine and equipment. It was necessary to deliver to a right place and a right time in order to assist and cure those soldiers being injured from the war, especially in case of emergency. The medical patient evacuation was found to be vitally essential for soldier's life.

Therefore, a process of the study in a latter step was to increase the effectiveness of the Army Medical logistics by identifying the shortest route to deliver on-time and considering which routing was the most appropriate in patient evacuation and assisting those facing natural disaster. The study was conducted and tested by inserting a value into the national simulation modal. A voyager and transport network model, or even trip and distribution model were chosen to indicate the starting point and stopping point (logistics location). Moreover, it also considered a determination of the tactical location in sustaining for Thailand Military logistics. In case of a normal situation (without the war), Thailand Military logistics was found having no military tactical routings or disclosure. Determining the highest level of confidentiality threatening the country was also achieved. Hence, research analysis and evaluation was identified by using advanced equipment and leading to the highest effectiveness of Thailand public sector. The Office of Transport and Traffic Policy and Planning (OTP), Ministry of Transport proposed the results analysis but has not yet determined the stopping point of the trip (logistics location) followed from the strategic target, or illustrated in any other Thailand public sectors. The analysis completed for this study was divided into 3 scenarios as follows:

Scenario 1: Determining the target started from Bangkok to the stopping point was completed and found to become the military target and logistics location in different parts of Thailand (4 parts). It was anticipated to become threat that was used as an exemplary case study.

Scenario 2: Applying the simulation model in order to indicate the routing caused from natural disaster was achieved such as Phang-nga province, Phuket province, and the province facing the highest level of the natural disaster – Suratthani and Nakornsrihammarat provinces. The objective was to apply the results in considering a selection of the most appropriate routing and determining the logistics location.

Scenario 3: Analysis of the medical logistics in an emergency case and medical patient evacuation

Scenario 1

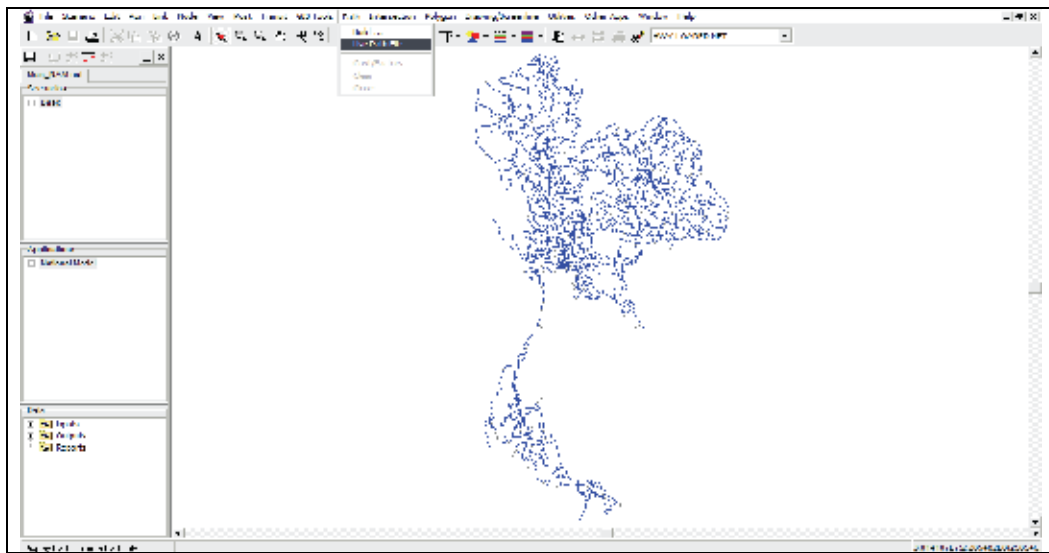
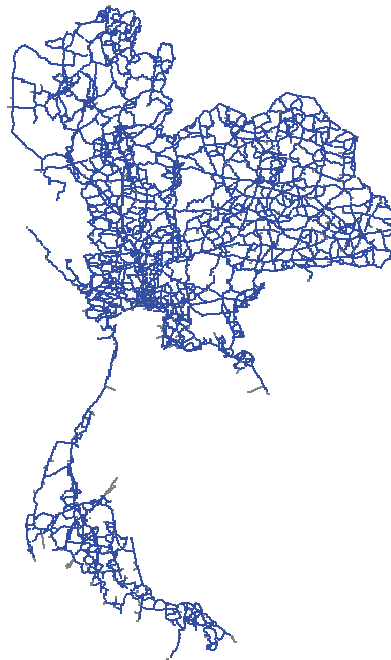
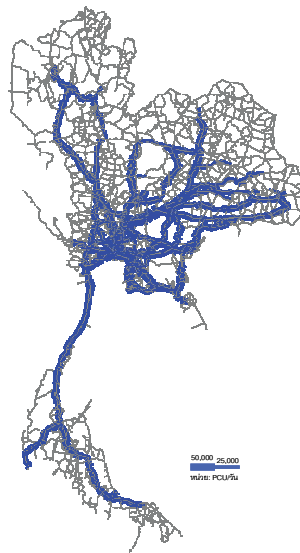


Figure 1 Shortest Routing of Trip Distribution using Cube Cargo Software Program



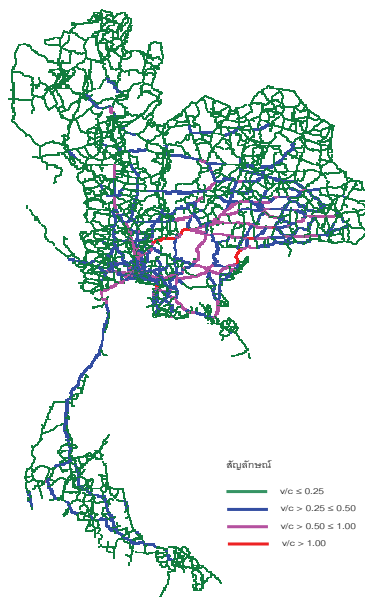
Source: OTP (2011)

Figure 2 Road Network Model Year 2009



Source: OTP (2011)

Figure 3 Traffic Amount on Highway Network Year 2009



Source: OTP (2011)

Figure 4 Ratio of Traffic Amount per Highway Volume
Year 2009 Indicating Shortest Routing in Each Part

Route Alternative

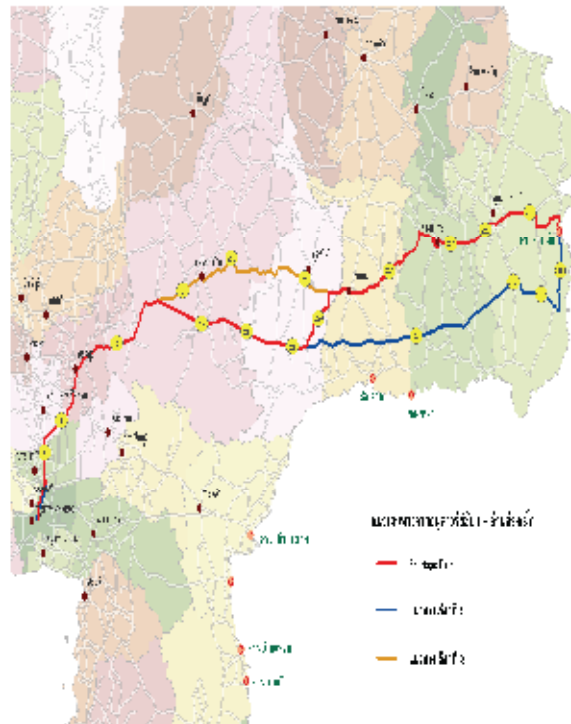
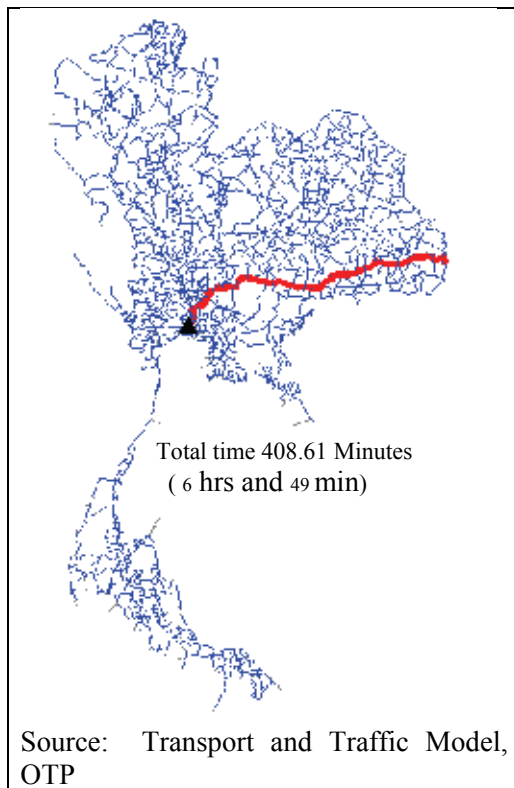
The routing used for analysis was evaluated by using the simulation aimed at determining the military target and logistics location, similar to an actual scenario during the war period. It was differentiated into each part such as the Northeast, the North, the West, and the South by using the Cube Cargo software program. Detailed information on the routing was described as follows:

Part	Routing	Border
Northeast	1. Bangkok – Chongmek Border, Sirinthorn District, Ubonrachathani Province	Laos
	2. Bangkok – Chongsangam, Phusingh District, Srisaket Province	Cambodia
	3. Bangkok – Chongjom, Kabcheong District, Surin Province	Cambodia
North	1. Bangkok – Maesod, Maesod District, Tak Province	Myanmar
West	1. Bangkok – Jedisamong Border, Sangklaburi District, Kanchanaburi Province	Myanmar
South	1. Bangkok – Sungaikolok, Sugaikolok District, Nalathiwas Province	Malaysia

The results analysis indicated the shortest routing and the way in which the routing for the trip was defined summarized as follows:

1. Bangkok – Chongmek, Sirinthorn District, Ubonrachathani Province

Highway Number	Road Lane
1	Victory Monument – Saraburi
2	Saraburi – Srikiew
24 (226)	Nakornrachasima Tri Junction – Warinchamrab Control District
217	Warinchamrab Control District – Chongmek Border



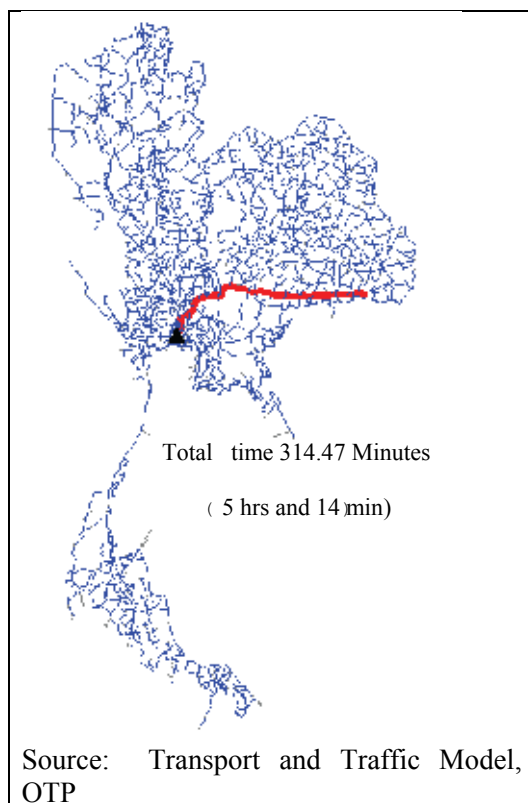
Source: OTP (2011)

Figure 5 Shortest Routing from Bangkok to Chongmek Border, Sirinthorn District, Ubonrachathani Province

The data was verified by using the Cube Cargo software program testing in the Northeastern part of Thailand. Point 1 indicated the military target detailing the area nearby Chongmek border, and became the shortest routing and time spent within 6 hours and 49 minutes.

2. Bangkok – Sangam, Phusingh District, Srisaket Province

Highway Number	Road Lane
1	Victory Monument – Saraburi
2	Saraburi – Highway Number 2 Junction (Srikiew)
24	Highway Number 2 Junction (Srikiew) – Phusingh District
214	Phusingh District – Barndarn
2328	Barndarn – Barnjarn
2201	Barnjarn – Chongsangam



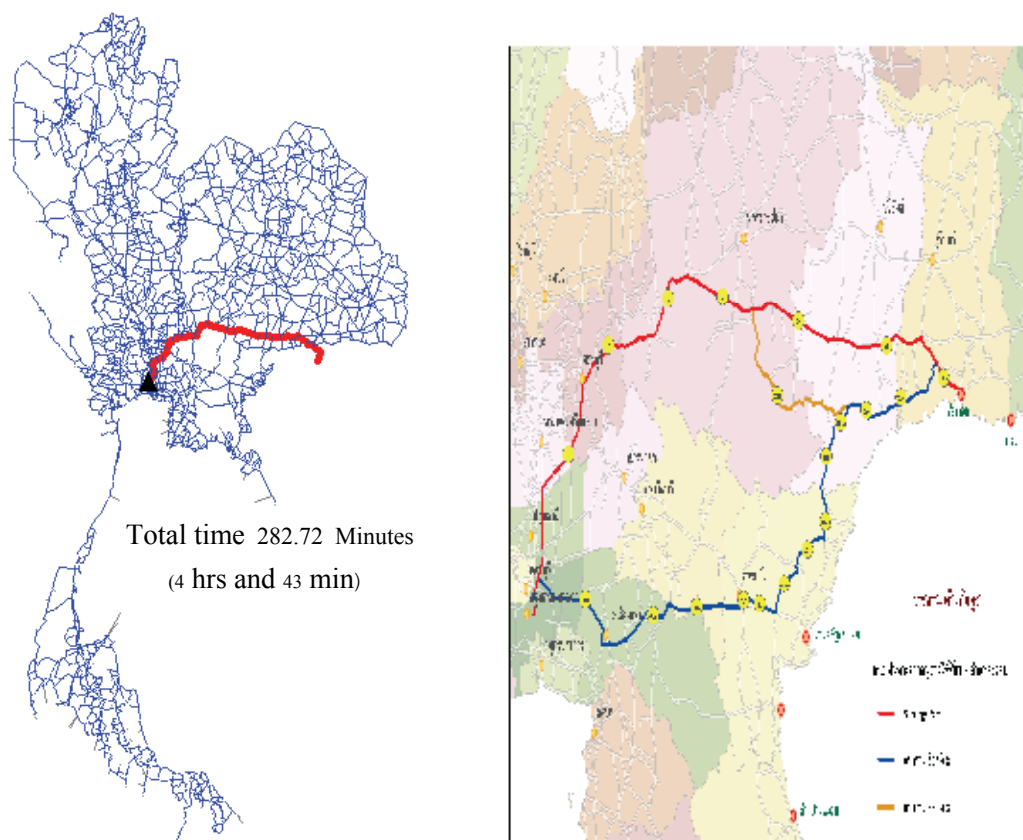
Source: OTP (2011)

Figure 6 Shortest Routing from Bangkok to Chongsangam, Phusing District, Srisaket Province

The data was verified by using the Cube Cargo software program testing in the Northeastern part of Thailand. Point 2 indicated the military target detailing the area nearby Chongsangam border, and became the shortest routing and time spent within 5 hours and 14 minutes. Even if, this routing had several limitations such as Highway Number 2328 located between Barndarn – Barnjarn that was still under construction. This routing was thought to indicate the optimal routing.

3. Bangkok – Chongjom, Kabcheong District, Surin Province

Highway Number	Road Lane
1	Victory Monument – Saraburi
2	Saraburi – Highway Number 2 Junction (Srikiew)
24	Highway Number 2 Junction (Srikiew) – Prasat Junction
214	Prasat Junction - Chongjom



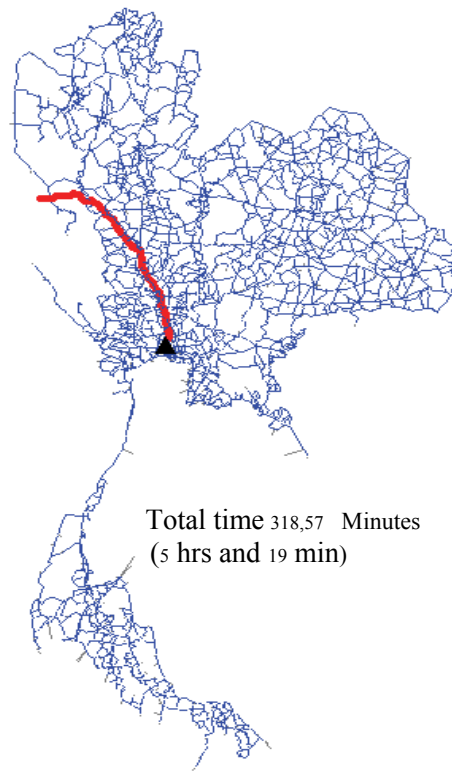
Source: OTP (2011)

Figure 7 Shortest Routing from Bangkok to Chongjom, Kabcheong District, Surin Province

The data was verified by using the Cube Cargo software program testing in the Northeastern part of Thailand. Point 3 indicated the military target detailing the area nearby Chongjom border, and became the shortest routing and time spent within 4 hours and 43 minutes. Movement in this strategic routing was anticipated to become the optimal routing.

4. Bangkok – Maesod, Maesod District, Tak Province

Highway Number	Road Lane
1	Victory Monument – Highway 1 Junction (Bangpain)
32	Highway 1 Junction (Bangpain) – Nakornsawan
1	Nakornsawan – Highway 1 Junction (Tak)
12	Highway 1 Junction (Tak) – Maesod



Source: OTP (2011)

Figure 8 Shortest Routing from Bangkok to Maesod, Maesod District, Tak Province

The data was verified by using the Cube Cargo software program testing in the Northern part of Thailand. Determining the military target nearby the location of Maesod border was achieved; however, the cross border between Myanmar and Thailand was fully closed more than 6 months. A strategic plan in protecting the country disclosed the border of Maesod was found to become more important military target. There was ethic minority living in the surrounding areas. The results indicated that the shortest route and time spent was 5 hours and 19 minutes.

5. Bangkok – Jedisamong Border, Sangklaburi District, Kanchanaburi Province

Highway Number	Road Lane
338	Victory Monument – Nakornchaisri
4	Nakornchaisri – Muangbanpong Bypass
323	Muangbanpong Bypass – Jedisamong

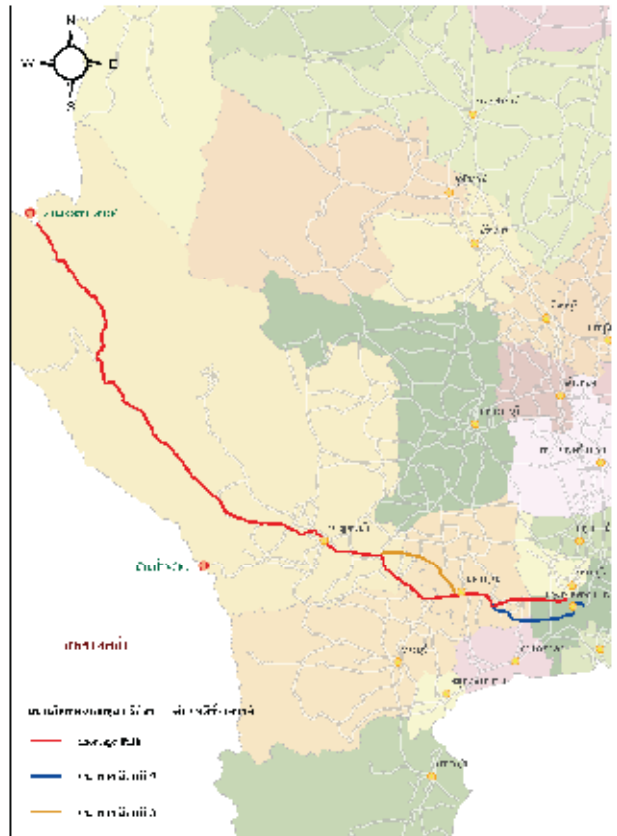
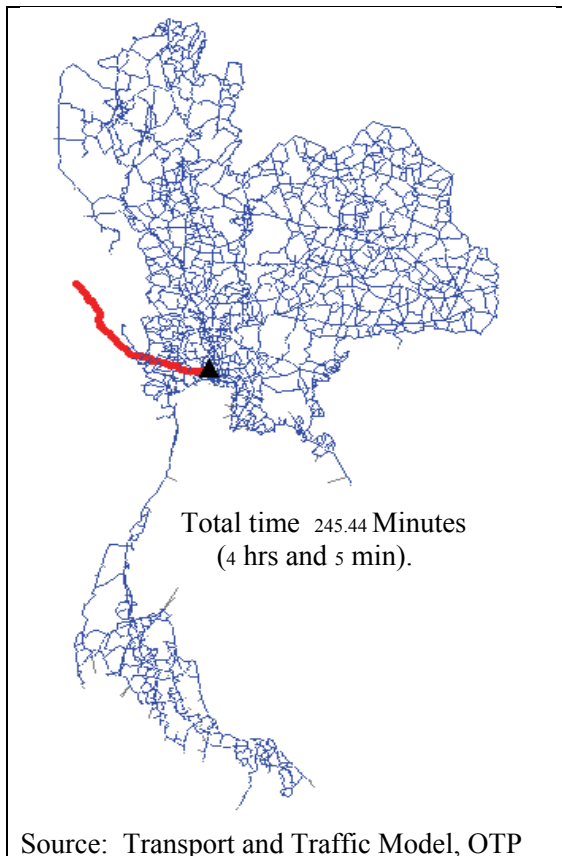
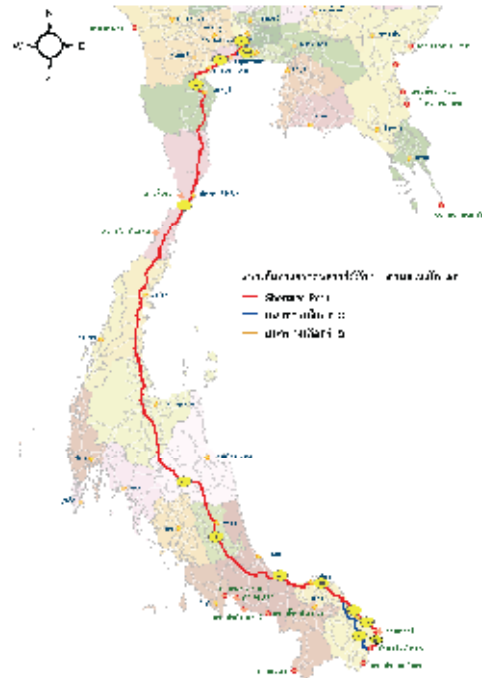
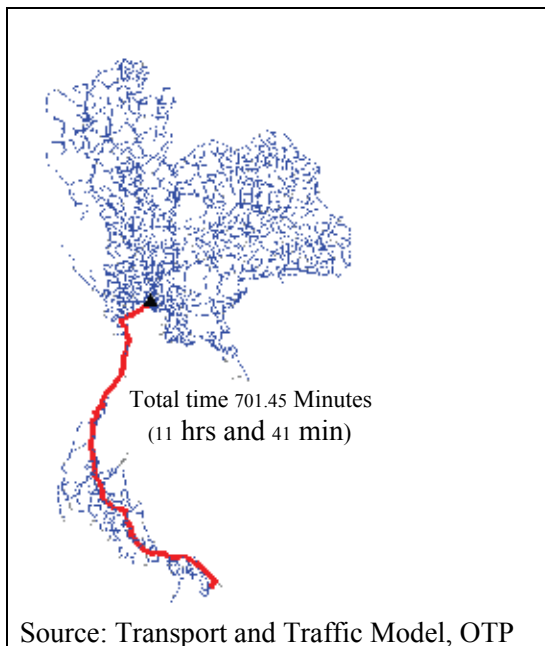


Figure 9 Shortest Routing from Bangkok to Jedismamong Border, Sangklaburi District, Kanchanaburi Province

The data was verified by using the Cube Cargo software program testing in the Western part of Thailand. Determining the military target nearby Jedismamong border was achieved. The results indicated that the shortest route and time spent was 4 hours and 5 minutes.

6. Bangkok – Sungaikolok, Sugaikolok District, Nalathiwas Province

Highway Number	Road Lane
35	Victory Monument – Pakto
4	Pakto – Pathomporn Junction (Chumporn)
41	Pathomporn Junction (Chumporn) – Highway 4 Junction (Pattaloong)
4	Highway 4 Junction (Pattaloong) – Hatyai District
43	Hatyai District - Pattani
42	Pattani - Narathiwas
4084	Narathiwas - Takbai
4057	Takbai – Sungaikolok Border



Source: OTP (2011)

Figure 10 Shortest Routing from Bangkok to Sungaikolok, Sungaikolok District, Nalathiwas Province

The data was verified by using the Cube Cargo software program testing in the Northern part of Thailand. Determining the military target nearby Sungaikolok border was achieved, and thought to be the lowest area of Thailand closer to Malaysia. This routing was on Pechakasem Highway started from Bangkok all the way to the south. Mostly, some routings have been under construction in which the routings were normally rural roads that bring even more convenient and can be applied to this research study. The results indicated that the shortest route and time spent was 11 hours and 41 minutes.

Summary of Identifying Shortest Strategic Routing in Sustaining Military Logistics

In determining the military target, a directorate was essential to occupy the completed data in order for the commanders to make a decision. In case of emergency, strategic, tactic, and operation become very necessary to achieve the military mission and increase the optimal effectiveness. By considering important military target, it was necessitate in integrating to other departments for any mandatory operations and applying to civilian's operations. The military target was vital and confidential. For the scenario of tactical operation in a short period of time, determining the target should be valuable and compete with opponents. Therefore, determining the military target became an obstacle due to limited time. Brainstorming, consultancy, analysis, and plan must be done thoroughly. The military target that has been screened should collate information, target benefit, value from the war with the information limitations of military sustainability. This resarhc study then proposed a case study using the military target with different scenarios in 4 countries. If there was treat encountered, determining the target and appropriate routing would be accomplished under time limitations. The results were then comparable with the actual situation found as follows:

Part	Origin and Destination	Time Consumption
Northeastern	Bangkok – Chongmek Border, Ubonrachathani Province	6 Hours 49 Minutes
	Bangkok – Chongsangam, Srisaket Province	5 Hours 14 Minutes
	Bangkok – Chongjom, Surin Province	4 Hours 43 Minutes
North	Bangkok – Maesod, Maesod District, Tak Province	5 Hours 19 Minutes
West	Bangkok – Jedisamong Border, Kanchanaburi Province	4 Hours 5 Minutes
South	Bangkok – Sungaikolok, Nalathiwas Province	11 Hours 41 Minutes

Scenario 2

Applying the simulation model using the Cube Cargo software program was achieved in analyzing the routing used for those encountering natural disaster such as Tsunami occurred in year 2004. It was occurred in Phangnga and Phuket province or flooding in the Southern part of Thailand in March, 2011 in Suratthani and Nakornsri thammarat province.

The natural disaster found in the country normally occurred without any time and being unpredictable. If there is no plan in making decision was redundant in complicated operations and difficult in assisting those facing natural disaster. It should be noticed that whether or not Tsunami occurred Phangnga and Phuket province year 2004. The situation was not expected to be happened and predicted in the future. When the situation occurred within several departments (i.e., public sector, private sector, foundation, or media), it appeared to help foster in mitigating problems by looking into ethics and moral issues. It was better to look into this problem but it became intervention between each department. Confusion was after that incurred to the responsibly operational department and assistance for those facing the disaster could not be done on a timely fashion.

Therefore, the researcher noticed that if the operations implemented more systematically, clearly, quickly, advance, and effectively, those facing natural disaster would be assisted with more effectiveness by utilizing the Cube Cargo software program. The natural disaster might be as similar as the military target determined. The location found to be used in assistance, so called, “logistics location” (i.e., Muang district in Pangnga province; or Phuket province). Hence, utilizing the Cube Cargo software program would result in determining the routing for movement, trip, and logistics route.

7. Bangkok – Pangnga District, Pangnga Province

Highway Number	Road Lane
35	Victory Monument – Thonburipaktho
4	Thonburipaktho – Pathomporn Junction (Choomporn)
41	Pathomporn Junction (Choomporn) – Highway 401 (Poonpin)
401	Highway 401 (Poonpin) – Panom District
415	Panom District – Pangnga Province

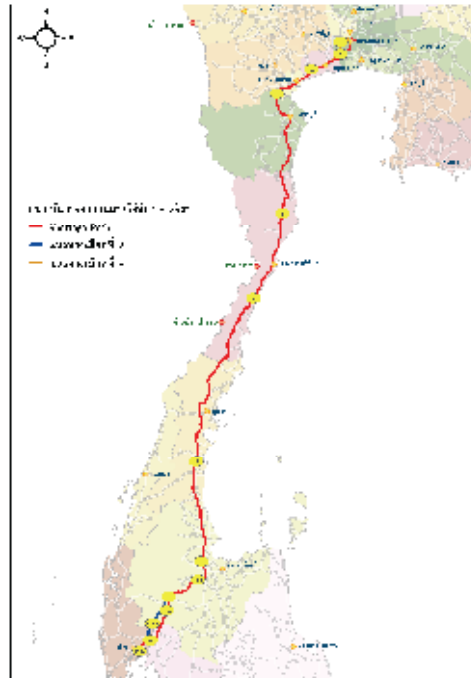
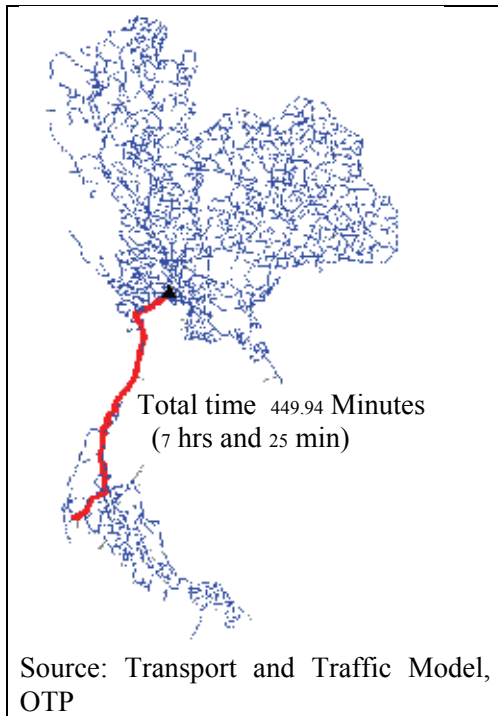
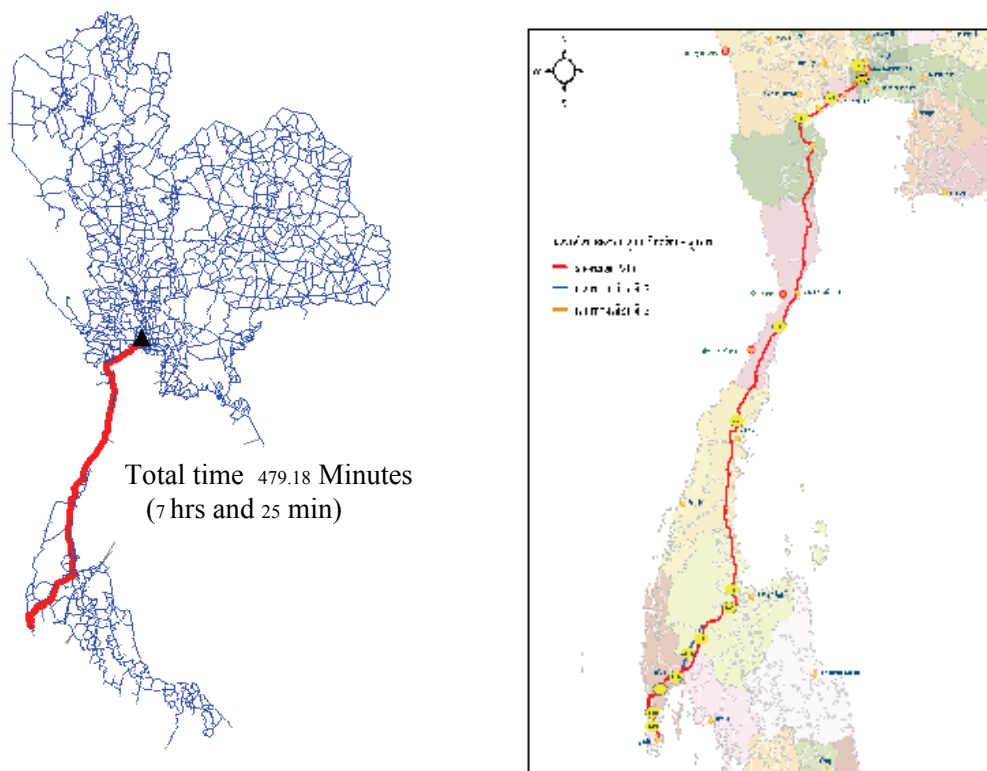


Figure 11 Shortest Routing from Bangkok to Pangnga District, Pangnga Province

The data was verified by using the Cube Cargo software program testing in the Southern part of Thailand. Determining the target of those facing natural disaster in Pangnga province, the shortest route and time spent was 7 hours and 25 minutes. Even though, determining the location of Muang district in Pangnga province was the logistics location or hub of natural disaster assistance. Those responsible directly in operations could manage more efficiently. At the moment, the mentioned routing has been amended according to the data of the Department of Highway year 2011.

8. Bangkok – Muang District, Phuket Province

Highway Number	Road Lane
35	Victory Monument – Thonburipaktho
4	Thonburipaktho – Pathomporn Junction (Choomporn)
41	Pathomporn Junction (Choomporn)- Highway 401 (Poonpin)
401	Highway 401 (Poonpin) – Panom District
415	Panom District – Pangnga Province
402	Pangnga Province – Phuket Province



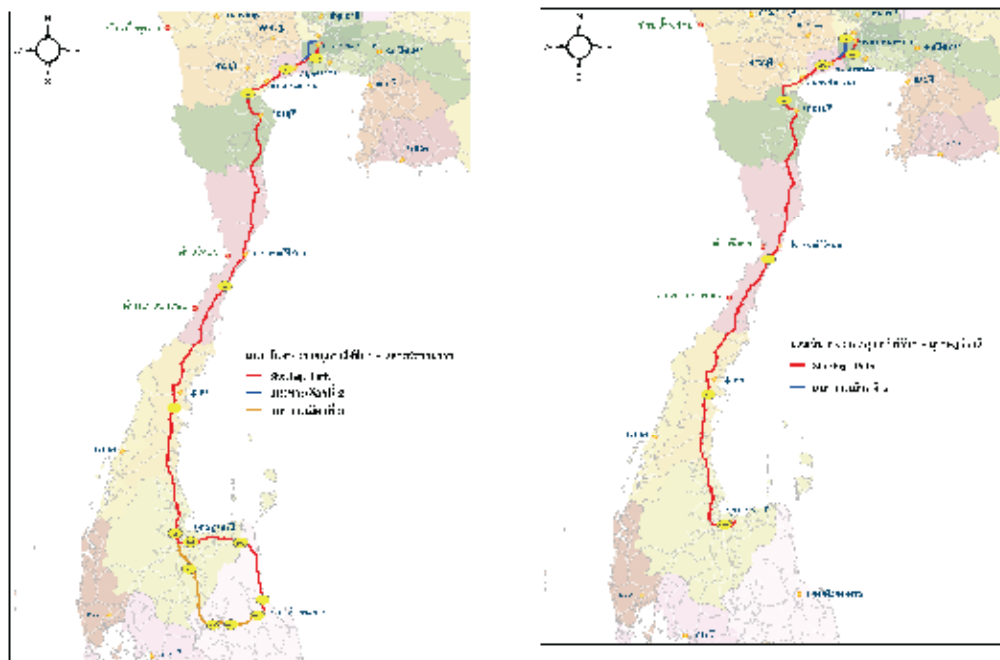
Source: OTP (2011)

Figure 12 Shortest Routing from Bangkok to Muang District, Phuket Province

The data was verified by using the Cube Cargo software program testing in the Southern part of Thailand. Determining the target of those facing natural disaster in Phuket province, the shortest route and time spent was 7 hours and 25 minutes similar to Pangnga province. At the moment, the mentioned routing has been amended according to the data of the Department of Highway year 2011.

In case of emergency in the Southern part of Thailand recently occurred in March 2011, a method of analysis and application was accomplished completely similar to the Tsunami occurred in Pangnga and Phuket province. There was an issue that should be considered which was the flooding causing unexpected landslide and disaster, resulting in a huge damage. More importantly, there was only one routing leading to the Southern part of Thailand. As the natural disaster occurrence in Chomporn, Pangnga, and Nakornsrihammarat province, the strategic location was very important happened to be in the upper part of the South. If the routing was missing, then those facing natural disaster would be needed for assistance and changed to the new target of logistics to the starting point even closer. Accessing into the destination to the occurred natural disaster became more difficult, resulting in those people facing problem and damage even higher.

Highway Number	Road Lane
35	Victory Monument - Thonburipaktho
4	Thonburipaktho – Pathomporn Junction (Choomporn)
41	Pathomporn Junction (Choomporn)- Highway 401 (Poonpin)
401	Highway 401 (Poonpin) – Kanom District/Sichon District
401	Sichon District – Nakornsrihammarat Province (4 th Army Area)



Source: OTP (2011)

Figure 13 Shortest Routing from Bangkok to Suratthani/Nakornsri Thammarat Province

A method of the operations when natural disaster occurred was necessary to determine the missing routing. Hence, the logistics target would be changed to help foster those facing natural disaster in a timely fashion. Analysing and estimating the routing for further decision making (i.e., target determination in logistics) in Choomporn, Suratthani, or Krabi province should be done. Coordination in determining the target could be also made available to other departments responsible for transport, traffic, or movement, even road transportation. Besides that, Navy could forward their fleet for further assistance in Choomporn province. Air Force could also forward their aircraft fleet or logistics plan to the area in which an aircraft is able to land without having any difficulties in weather condition. In retrospect, the Royal Thai Military belonged to the public sector to help foster Thai people facing the disaster. A strategy of the Military was to bridge the gap of the missing link at the 4th Army Area located in Nakornsri Thammarat province. As a result, assistance to those people could not be accomplished provided that the 4th Army Area was needed to be located in the logistics location as expected.

In summary, assisting people facing natural disaster should plan ahead in a long term, and generate a network all over the country. Due to unpredictable circumstance, Thailand might face difficulty in natural disaster in anywhere. If a preventive plan was not systematic, then the natural disaster and the assistance would become more efficiently. For Thailand Military, it included with Royal Thai Supreme Command, Army, Navy, and Air Force. Normally, several military departments in these areas were willing to assist and support those people facing natural disaster or under an emergency situation. Having several locations all over the country may mitigate the problems by Thailand Military.

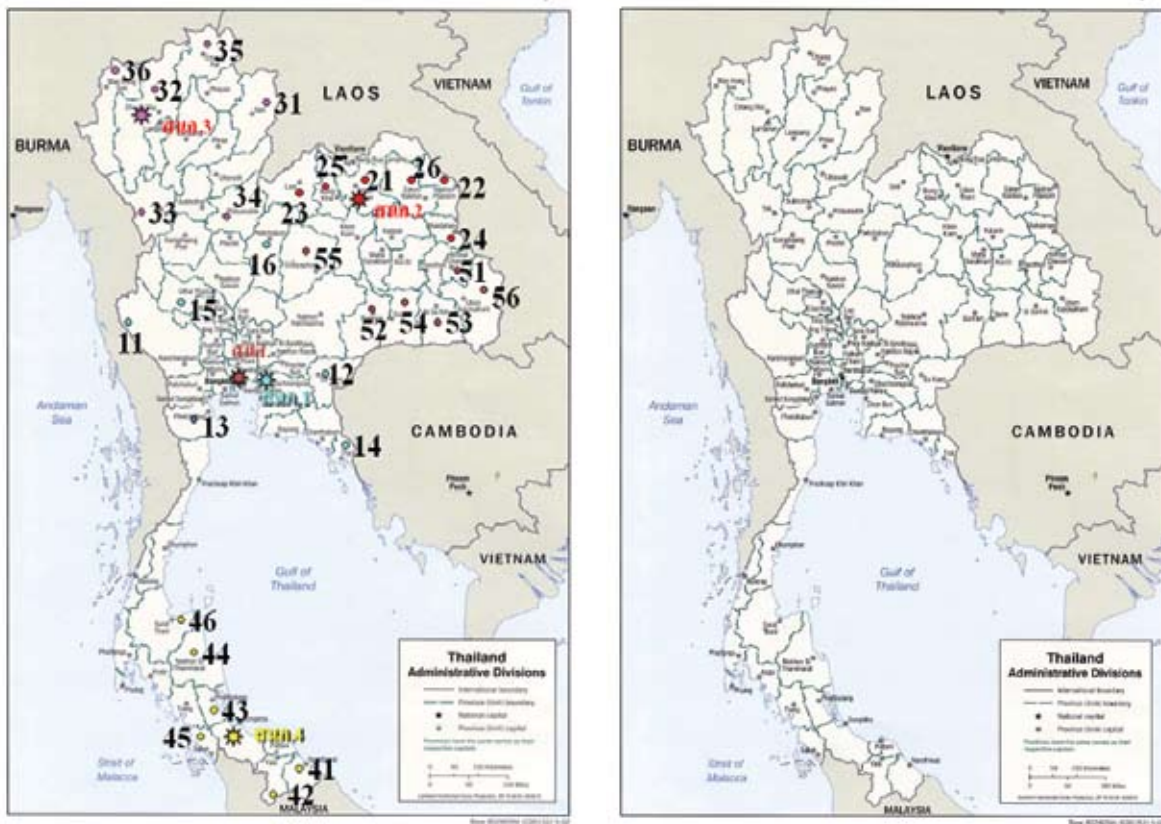


Figure 14 Map of Thai Military Public Danger Alleviation

In case of recent natural disaster, the routing that leads the Southern part and the 4th Army area may lack of capability in supporting and assisting people due to its location of the public danger alleviation. Considering the logistics routing in assisting people, Royal Thai Military may require selecting the appropriate or optimal routing that leads to the 4th Army Area located in Nakornsrithammarat province. Which routing or military force was selected may indicate the logistics location by the use of the Cube Cargo software program.

Scenario 3

An analysis of the medical logistics in case of emergency was conducted using an exemplary case study of the cross border area at the lower North-eastern part of Thailand. This case study was selected and applied from “Integrated Tactical Capacity Plan” by a student from the Joint Staff College, Royal Thai Supreme Command. It cannot be disclosed and can be used only in academia. The analysis used the model in simulating scenarios and threats to the country by evaluating, determining, and considering a method of the operations and the routing used for the medical logistics.

Limitations of Analysis

1. Scenario was assumed; it wasn't real.
2. No capability allocation, capability of combat forces, operational information, or combined forces
3. Analysis and selection of the routing used for logistics and return in general (not specific) by using the transportation date of Thailand logistics system.

Assumed Scenario

Evaluating the tactical environment tends to identify which treats can encounter the country, and may impact benefits, independence, democratic, and land integration. Thailand Military tempts to used any necessary equipments to stop, mitigate, win the invasion from opponents.

Operations

1. Method of Operations
2. Using the tactical invasion in any dimensions focusing on information, tactic, increasing capacity, and initiation occupied from the opponents. The results required were: logistics capability, annihilation, threat, or bargaining competitiveness in psychology covering all 3 levels (i.e., strategic, tactic, and operation)

1. Strategic

First Method – using diplomacy, international laws, information operations, Military potentiality, or border activity to create bargaining power in a governmental level.

Second Method – if the first choice is not effective, then using forces or combined forces will be more applicable.

2. Operations

For the operational level, it was divided into 5 steps illustrated as follows:

2.1 Preparation

Preparing for arm forces, equipment, and strategic routing plan ready for combat was needed. A preparation should be done before the operation no less than 90 percents.

2.2 Restrain

When the opponents aimed at invading Thailand, it was clear to declare the martial law in order to accumulate arm forces, evaluate people, or move forces into the particular war zone. This resulted in creating bargaining power in all levels preventing the invasion from happening.

2.3 Operational Procedure in Winning the War

Coordinating all forces to prevent and keep democratic of the country should be accomplished.

2.4 Sustainability Establishment

Utilizing all forces to push forward the opponents outside of the country to establish the cross border.

2.5 Disagreement Termination and Rehabilitation

When the opponents were retreated from the area, Thailand government must proceed in establishing the international law, righteousness, returning prisoner of war, border prevention, retrieving remaining forces to a normal position, and cancel the martial law.

From the simulation model during the war, it appeared that logistics would be related to all levels of operations started from preparation to disagreement termination and rehabilitation including with patient evacuation forces, equipment, and injured soldiers caused from the combat.

For the application of this research study, it appeared to view the combat and logistics. In case of the medical logistics, the shortage routing was determined using logistics to forward equipment, medical supplies to destination (logistics location) with a concept of Just-In-Time. Nevertheless, determining the stopping point that was the location of logistics could assume to be at Aranyaprathet District detailed as follows:

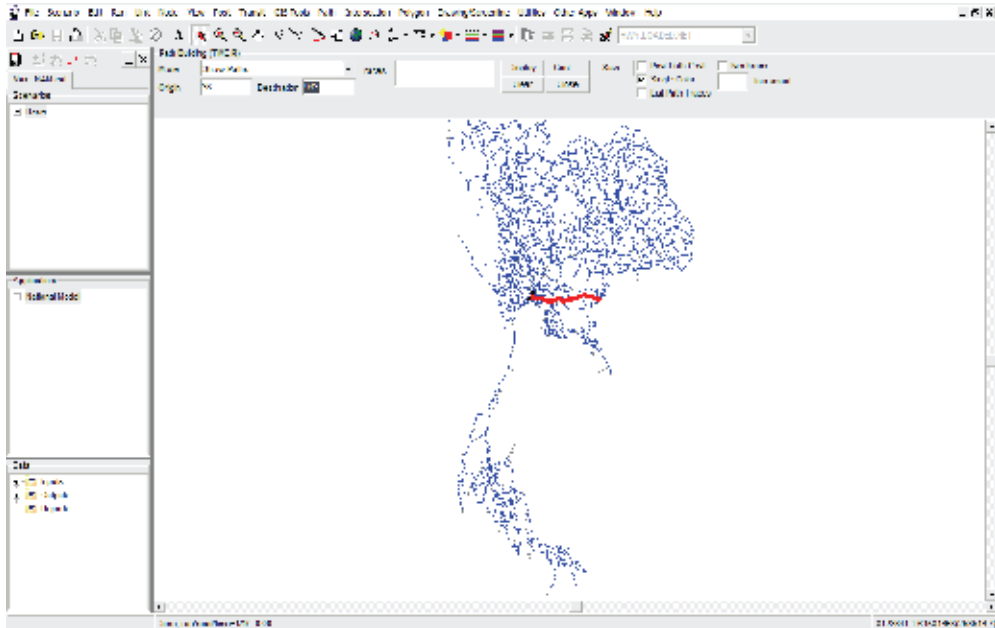


Figure 15 Trip Distribution Analyzed by Cube Cargo Software Program

The shortest routing was illustrated in Figure 5.15 using the Cube Cargo software program. It started from Bangkok to Aranyaprathet border that was found to be the shortest one, and the trip between two zones started from origin and destination as required.

No	Highway Number	Routing Name	Distance (Kilometer)	Starting Kilometer	Province
1	99	Srirat Tollway (2 nd Tollway)	10.72	-	Bangkok
2	7	Srinakarin – Km..41+500	20.86	0000	Bangkok
3	-	Avenue	5.06	-	Bangkok
4	-	Rural Roads Chachoengsao 3001	20.26	-	Chachoengsao
5	314	Bangprakong Tri Junction - Minburi Junction (Chachoengsao)	3.32	0684	Chachoengsao
6	314	Chachoengsao Bypass (South)	5.07	0000	Chachoengsao
7	304	Chachoengsao Control Municipality – Km. 54+700	30.73	0000	Chachoengsao
8	3245	Talad – Sanamchaikhet	4.08	0000	Chachoengsao
9	3245	Talad – Sanamchaikhet	5.30	12618	Chachoengsao
10	304	Panomarakam Bypass	10.65	0000	Chachoengsao
11	304	Chachoengsao Control Municipality –	1.04	34000	Chachoengsao

No	Highway Number	Routing Name	Distance (Kilometer)	Starting Kilometer	Province
		Km. 54+700			
12	304	Chachoengsao Control Municipality – Km. 54+700	5.11	34000	Chachoengsao
13	359	Highway Junction 304 – Srakaew	42.76	0000	Prachinburi
14	359	Prachinburi Province Area/Srakaew – Highway Intersection Number 33 (Klong yang)	18.73	45851	Srakaew
15	359	Prachinburi Province Area/Srakaew – Highway Intersection Number 33 (Klong yang)	11.06	62400	Srakaew
16	33	Chantaburi Junction (Srakaew – Wattanakorn Separation Route)	14.58	250255	Srakaew
17	33	Wattanakorn Separation Route – Border (Aranyaprathet)	28.17	276893	Srakaew
Total Distance			237.50		

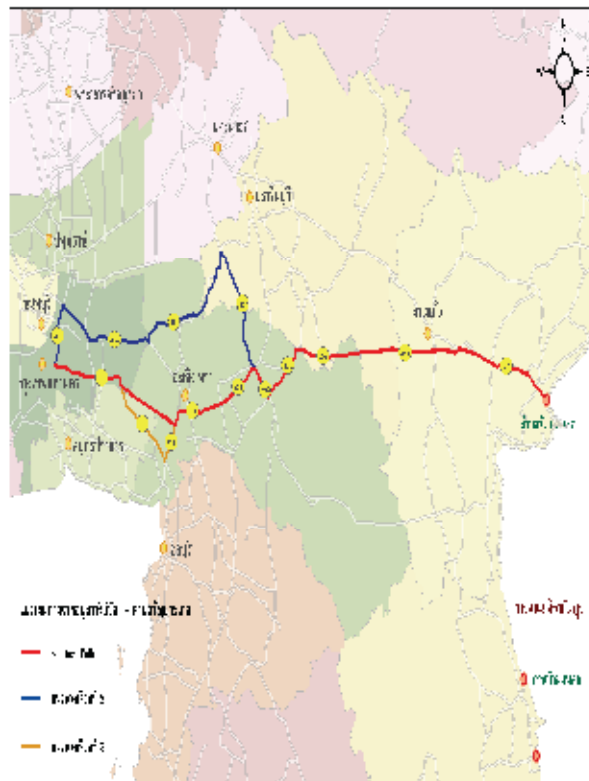
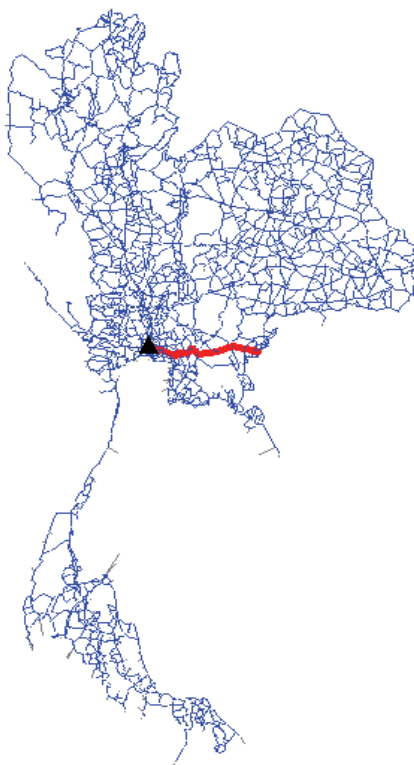


Figure 16 Shortest Route between Bangkok to Aranyaprathet Border, Aranyaprathet District, Srakaew Province

A summary for the tactical routing located in the lower Northeastern part of Thailand was identified. The routing was tested for 3 routes. The shortest route was a route from Bangkok – Thepparat Road – Ladkrabang – Muang District – Chachoengsao Province – Panomsarakam – Srakaew Province – Aranyaprathet. A total time spending was 2 hours and 26 minutes. Other two routes were tested and spent longer time than expected which are:

Route: Bangkok – Ramkamhaeng – Suvinthawong – Muang District – Chachoengsao Province – Pranomsarakam – Srakaew Province – Aranyaprathet Border by spending totally 2 hours and 29 minutes.

Route: Bangkok – Ramkamhaeng – Suvinthawong – Bangnampriew - Muang District – Prachinburi Province – Kabinburi District – Srakaew Province – Aranyaprathet Border by spending totally 2 hours and 38 minutes.

From the evaluation using the Cube Cargo software program, a development of the similar military target was found to be at Aranyaprathet Border that has been adjusted some routing in 3 cases. Even though, adjusting the routing did not make any difference in time spending due to the movement or logistics activity did not occur on a main road. It appeared that the short cut could become obstacle in logistics on both road and routing. A bridge was the load limitations that consumed longer time. Comparing three cases, time spending would not significantly different and it was summarized that the optimal routing could be possibly selected. In conclusion, the Military directorae must process data, information, appropriate environment to support the optimal decision making and effectiveness to a commander.

For the medical patient evacuation, it was one of the important processes in the medical logistics not only for delivering the medical supplies in case of emergency but also the medical patient evacuation should be done properly. This research study did not conduct a study elaborately and in form of one-stop-service, thereby proposing the retuning of medical supplies or the like can be detailed as follows:

Tactical zone should be managed into 4 levels in order to facilitate agility of the medical service and safety of a user

- 1) Unit level such as nurse servicing in the military force
- 2) Division level
- 3) Army level
- 4) Communication zone level

The first three levels were a forefront that provides the tactical medical service, but the last one was a back front. Therefore, the farther location the medical service was sited, the more agility it became. Nevertheless, it depended upon the limitations of the medical service. If the backfront had less agility, it would have increasing capability. Furthermore, the tactical medical service may provide the health safety service to all forces comprising of 5 categories: preventive medicine, hospitalization, evacuation, medical supplies, and other medical service such as dentistry or laboratory, etc.

Medical Patient Evacuation

The medical patient evacuation was found to be a method in moving injured patients from the combat zone. The tactical medical location was located at forefront leading to other nursing area, until the other areas of hospitals.

A Theater Patient Evacuation Policy was applied to determine the longest time spent during the medical department retrieving those injured. It may start from accepting into the medical department or hospital. Any injured patients, who were not given a treatment and could not go back to its function in a determined time, must ask for leave from the tactical zone as quick as possible. After that, the responsible officers would consider the patient evacuation without causing them to have severe condition.

The evacuation log was one of the most important issues in patient evacuation that could be unavowed and used for future medical planning. If it was appropriate, then the patient evacuation would take longer time causing lack of agility. Furthermore, it may cause even severe illness of the injured patient without having to cure on a timely basis. Several delays may cause from opponents action, inefficient transportation of patients, trip stop for curing, disconnection of communication, inefficient patient evacuation, road condition, geography, weather, combat necessitate, accordance with road network and nursing sector, and forces handling.

The patient evacuation starts from the use of bed, vehicle, train, or aero medical evacuation with airplane or helicopter. Whether or not the movement of injured patient was done with any means, the medical officer and medical supplies for the patient evacuation should be provided during handling.

In some cases, the tactical simulation model detailed how movement can be forwarded and back warded quickly without evacuating all patients. This case may need to follow the step such as reducing movement of those supporting and responsible departments to provide opportunity in evacuating the injured patient with existing transportation or service from any other additional medical departments. A plan must be well prepared. Besides that, leaving all medical supplies and personnel in the combat area could also be done dependent upon the decision making from the tactical commander. The medical department would provide information on injured patients and medical conditions of the department in that moment for further decision making.

Medical Supplies

In the combat situation, the medical department may not accumulate all medical supplies because it may lack of agility in movement. In case of the medical service need to exchange between processes of the patient evacuation, substitute's items would be necessary to avoid the shortage.

Other Medical Services

The Military medical operation during the war must be limited by time, medical supplies, location, and operation under hazardous environment all the time. During the war period, the Military medical operation appeared to be different from a normal condition under similar tactics or limited medical facilities to most benefit to all patients.

Therefore, the medical patient evacuation was not necessary to select the similar routing as logistics routing and similar main road or highway. It was mandatory in considering the evacuation routing in several routes by evaluating the tactical evacuation such as speed capacity, road surface, pavement, traffic condition, transport condition, safety from treat. It aimed at supporting decision making by the tactical commander in choosing how to move normal patient, injured patient, or dead patient to any hospitals nearby. This issue should be raised for future research study.



Figure 17 Example of Military Mapping in Medical Patient Evacuation, Army

5. Conclusion and Recommendation

5.1 Conclusion

A need to develop the logistics system in Thailand stemmed from a higher competitiveness in consistent with globalization. Free trade agreement has been introduced widely in industrial sectors, resulting in increasing business capability, business cost reduction, and adding more value to satisfy with customer requirements. Managing the procedure of product's delivery and service was accomplished in order to serve the customer throughout supply chain with logistics activities. It was therefore a main objective for entrepreneurs to compete with other opponents in domestic and global markets.

Most of the time, Thai government or other private sectors including with academia and public communication exposed their willingness to join developing the logistics system. By collecting and analyzing data of the logistics system status, nevertheless, it appeared to indicate a lower standard of the effectiveness of Thai logistics system compared to other competitors. Due to the fact that, a trend of the global trading and economy, and a factor of domestic economy were found to become more increasing in the oil price. This result in lower the cost of running business and the burden found at the Ministry of Finance. Therefore, reviewing a pattern of transportation should be done with the necessity of improving efficiency of movement as well as inspecting the product's origin and improving effectiveness of trade facilitation and logistics.

Espionage between each country might lead to a necessity of being rigorous for safety issue in international products' transport. Treat found between each international company can be lessening by using a better logistics system management. Therefore, the logistics system should be virtually developed. However, a public or private sector nowadays has realized that a development of the effectiveness of the logistics system is a main key in improving the business optimization throughout supply chain. Having done that, it may lead to better business competitiveness that becomes more reality.

Every sector of Thai public sector or the like should pay close attention to develop and improve their management more proficiently. Thai Ministry of Defense was one of the sustainable departments that respond to a governmental policy. By improving the efficiency of the military logistics, it should have a better technological advancement and more international resulting in cost saving of the country. Doing so would need the key performance indicators as a measurement of

effectiveness due to Thai public sector system always clings to the evaluation of other public sectors. This includes 4 dimensions such as effectiveness, service quality, efficiency of the public sector, and transport. All 4 dimensions was evaluated qualitatively that measure a key success in form of the percentage based on determined criteria.

This research study also determined the key success indicators that were used as a measurement of logistics. The indicators used in other countries were applied to Thailand by developing for Thai military logistics. With the limitations of sustainability in Thailand and ability of accessing into data confidentiality, a case of medical logistics was used as an exemplary. The medical logistics was one of the military logistics in which the results were anticipated to be applied to all Thai military departments, as well as Royal Thai Police or other departments responsible for Thailand sustainability.

5.2 Recommendation

The results analysis indicated that the military scheme found in developed countries determines the key success indicators in logistics for a lengthy of time. Having survey, interview, and investigate the outcomes, it appeared to suggest Thai military to apply the logistics measurement used in its system. This research study proposed several issues focusing on the appropriate Thai military logistics as follows:

- 1) Developing the military logistics in a strategic level should be executed to increase effectiveness, so called, “Thai Military Logistics Network Optimization Strategy.”
- 2) Integration of Thai military logistics should be carried out in form of the cooperation of logistics system with others such as police, civilian, or others.
- 3) Determining the key success indicators of Thai military logistics became one of the indicators comparable to globalization. Applying the indicators made a direction or develop tool in a long term planning more effectively and exchangeability to overseas.
- 4) Conducting study and indicate strategic routing to support border sustainability should be done to benefit the military logistics and coordinate logistics.
5. Developing a network of the national military logistics permits a lengthy preventive plan that needs to be adjusted in a continual basis.

Having the data related to transport and traffic assists the acquisition of transport and traffic conditions in a recent year. Applying the National Model may crucially benefit a development of transportation network for the military logistics, as well as integrate a high level of national planning in a long term or ascertain the strategy developed for developing Thai military logistics network system in the near future.

About the Author



Dr. Nanthi Suthikarnnarunai is a lecturer in the department of Logistics Engineering, at University of the Thai Chamber of Commerce, Bangkok, Thailand. She received her degree in Engineering Management from Southern Methodist University, Dallas, Texas, USA. She has a background in Industrial Engineering and Operations Research. Her research interests are in the areas of developing a mathematics model to solve a real world transportation problem. Currently, she is working on many projects for the Ministry of Industry and the Ministry of Commerce, Thailand.

Guide for Authors

University of the Thai Chamber of Commerce International Journal of Business and Economics (UTCC IJBE) is published by University of the Thai Chamber of Commerce, and Thailand Management Association. It is published twice yearly in a spring and fall edition and is directed toward the needs of academia, practitioners, executives, researchers, students, and the general public interested in business management (i.e., Marketing, Service Management, Innovation and Design in Business, Finance, Banking, Accounting, Economics, Insurance and Risk Management, Production, Industrial and Operation Management, Strategic Management and Management, International and Global Business Management, Entrepreneurships, Organization Behaviour, Business Ethics, Business Law, Business System, Hospitality and Tourism Management, Human Resource Management, and Office and Facility Management).

EDITORIAL POLICY

The UTCC IJBE is designed as a forum for current research, opinions, and identification of trends in business management. The opinions expressed are those of the authors and do not necessarily reflect the opinions of the Editors, the Editorial Review Board, or University of the Thai Chamber of Commerce, and Thailand Management Association.

The copyright of all published material belongs to University of the Thai Chamber of Commerce, with future use rights reserved. This, however, does not limit the author's right to use his or her own material.

Objectives

The editorial objectives of UTCC IJBE are to advance knowledge and science and to stimulate greater thought and effort in the fields of business management, and by providing readers with:

- Novel and useful information;
- New business management theory or techniques;
- Research explaining about business management thought and practice;
- Articles in subject areas which have significant current impact on thought and practice in business management.

Content

The UTCC IJBE will mainly consider for publication three types of articles:

1. Articles that report empirical research on business management issues.
2. Articles that report on the development of methodologies and techniques that can enhance business management decision making.
3. Articles that report the application of decision tools to generic or specific business management problems.

Manuscripts should be between 4,000 and 6,000 words, typically 15-20 single-spaced, typewritten pages. Articles of shorter length are also acceptable. Only rarely will it be possible to publish a manuscript of more than 6,000 words.

Review

Articles are considered for publication if they have not been published or accepted for publication elsewhere and are not Articles are considered for publication if they have not been published or accepted for publication elsewhere and are not being concurrently considered elsewhere. Authors will usually be notified of acceptance, rejection, or need for revision within 16 weeks of submission.

No manuscript is accepted for UTCC IJBE until it has been reviewed by the Editor or one of the Associate Editors and at least two outside reviewers who are experts in their respective fields.

All manuscripts are judged on their contribution to the advancement of the science and/or practice of business management. The editors expect all manuscripts to follow accepted standards for scholarly work. Manuscripts are judged not only on depth and scope of ideas presented and their contribution to the field, but also on their clarity, organization, readability, and comprehensibility.

Manuscripts should be written in a manner that is interesting and readable to both practitioners and academics. It is beneficial to include a section regarding managerial implications and discussion of the consequences of applying the proposed ideas. Technical terms should be defined.

MANUSCRIPT PREPARATION

Manuscripts should be typed single-spaced in 12-point type using Times Roman or similar type. Use single spacing in endnote references. Please allow the text to wrap, rather than entering a RETURN or LINEFEED after every line.

Manuscripts should be submitted electronically, preferably in Microsoft Word, to the Editors at the following E-mail address: epxull@yahoo.com or gilbert.nartea@lincoln.ac.nz. It is not possible to submit an electronic copy, send four (4) copies of the manuscript to the Editors. Non-electronic submissions require more time to administer, so authors should be aware that the processing time for their manuscripts will be longer.

The sections of the manuscript should be placed in the following order: Cover page, Title page, Authors, Abstract (on a page by itself) and Body, Illustrations, Citation, References, and Appendices.

Cover Page

The cover page should include the title of the manuscript and the authors' name(s) in the order in which they will be printed. The following information should be provided for each co-author: name, title, university/company name, mailing address, telephone number, facsimile number, and e-mail address. Please indicate which co-author will serve as the primary contact for the Journal.

In addition to any acknowledgment of financial or technical assistance, this page should include each author's title, present position, and complete address and telephone number. Please keep professional titles succinct.

Title Page

Type the title in bold type, all caps, single-spaced, and centered across the top of the first page, in 14 point Times New Roman, as illustrated above.

Authors

The author(s), affiliation(s), mailing address(es), and e-mail address(es) should be single-spaced and centered on the line below the title, in 12 point bold Times New Roman for the author(s), and in normal Times New Roman for the remainders. One line space should be used to separate author(s) from the paper title. Please do not use titles such as Dr., Professor, etc.

Abstract (on a page by itself), and Body

Introduce the paper with an abstract of approximately 100-200 words, in 12 point Times New Roman. Begin with the centered heading "Abstract". All body paragraphs should begin flush left (no paragraph indent) and right justified. Single-space the body of the paper. Use 12 point Times New Roman throughout. Figures and tables should be placed as close as possible to where they are cited. First-level headings state the table or figure number. All tables and images should be embedded into the file and sized appropriately. All photographs should be sampled at 300 dpi (dots per inch). Keep in mind that web graphics are typically sampled at 72 dpi. Photographs must be properly sized and positioned in the body of the paper.

Illustrations (Tables and Figures)

Each illustration should be numbered consecutively within its series type (Table 1, Table 2, Figure 1, Figure 2). If illustrations appear in appendices, they should be numbered consecutively, but separately from body illustrations (e.g., Table A-1, Figure A-1). In the text, refer to tables and figures by their numbers. Avoid using "above," "below," "preceding," and similar terms. All Tables and Figures must have titles. Titles for each Table and Figure should be descriptive but not lengthy. The title should be in bold letters at the top of the Table or Figure.

Tables and Figures should be called "**Table**" or "**Figure**" and should be followed by a blank line and then the title for the table or figure also in bold letters at the top of the table or figure.

For *Journal* purposes, tables and figures are defined as follows: a table is comprised of rows and columns of numbers and/or text; a figure is a chart, graph, diagram, map, drawing, or any other non-text item that is not a table. Tables should be typed in the following style:

General Design

For more effective communication and better quality reproduction when printed, tables and figures should be kept as simple and uncluttered as possible, while conveying all necessary information.

Details

Footnotes should appear directly below illustrations, flush with the left edge, and they should be designated by small letters, rather than asterisks or numerals. Column or row heads should be footnoted only if the footnote applies to all items in the column or row. Complete source information must be provided for illustrations copied or derived from other sources. This complete information should be provided and an author-date citation should be given in a source note on the illustration. (Source notes are sized and placed like footnotes, below any footnotes for the illustration.)

If elements on an illustration are not labelled, but represent certain categories, items, or amounts, a complete key (legend) should be included. Make sure that necessary measures of statistical significance are reported with each illustration. Designate units (percent, dollars, hours, etc.) in column and row headings (tables) or in element labels or keys (figures). Separate from each figure, give numerical values for all points, bars, pie slices, etc., so that they can be readily reproduced by the typesetter, if necessary. Double-check formulae and mathematical terms and equations for consistency, readability, and accuracy. Add extra space between characters to clarify and separate the terms, and be sure that sub and superscript relationships are clear. Check for opening and closing parenthesis and brackets. Write the names of Greek and special characters in the margin.

Use tab indents or column alignment, rather than spaces, to align columns and indent headings.

English (USA) spelling should be used; foreign terms not commonly used in English (USA) should be italicized.

Regarding Mathematical Notation

The percent sign (%) should be used in text and in tables. Mathematical notation must be clear within the text and illustrations. All equations must be very clearly typed. Display (separate line) equations should be aligned to the left margin. Italic type is used for letters in equations, except for trigonometric functions and logarithm abbreviations, which are plain (normal) type. Matrices and vectors are in boldface type. (If these cannot be typed in italic and boldface, italic type can be indicated by a hand-drawn straight underline and boldface by a wavy underline). Unusual and Greek symbols should be typed in the text using the Symbol capability. If no Symbol capability is possible, such special characters should be identified by name in a marginal note. (This is important; the editor may be not familiar with these symbols and may have difficulty producing the correct one without a marginal note.) For equations that might be too long to type in a 6" column, indicate appropriate breaks.

Citation

The UTCC IJBE follows the reference format of Academy of Management Journal. This format is available at the AMJ's website http://aom.pace.edu/amjnew/style_guide.html. The use of footnotes is discouraged.

References

References are to be listed alphabetically, last name first, followed by publication date in parentheses. Use full first name, not just initials. The reference list should be typed single-spaced in 12-point type. Please let the Endnotes wrap rather than using tabs or returns at the end of internal lines. Do not use indents, tabs, or symbols to delineate your paragraphs. Instead, use two hard returns between each reference.

Proceedings/Journal Articles:

Supaporn Kiattisin (2007), "Detection of an Acute Leukemia Using an Active Contour Model," *Proceedings of the 4th International Joint Conference on Computer Science and Software Engineering*, May 3-4, 2007, Hotel Sofitel Raja Orchid, Khon Kaen, Thailand.

Chirapandu, S. & Yoopetch, C. (2009), "Bank Credit Card Adoption Criteria and Marketing Implications," *International Journal of Business in Asia*, Vol.1, No. 1, pp. 1- 20.

Books:

Ekachai Apisakkul & Thasana Boonkwan (2004), *Strategic Management*, 4th Ed. New York: McGraw-Hill Irwin.

Authors are responsible for the accuracy of their references. Check them carefully. Readers' questions and comments about incomplete and inaccurate References will be referred to the article authors with a follow-up by the Editor. All authors of a referenced work should be listed; et al. should not be used in the Reference list. Undefined acronyms should not be used.

Appendices

If any mathematical proof or development is used but not critical to the exposition of the main argument of the manuscript, authors should include it in an appendix. An appendix may also be used for the mathematical material that may be beyond the level of the average reader.

Permissions

Submitting a manuscript to UTCC IJBE constitutes an assignment of copyright to the Journal and a guarantee that the work is original. It also indicates that the author(s) owns it, and that no part of it has been previously published in substantially the same form, that it is not being published or considered for publication elsewhere, and that any use of others' materials is by permission or falls within fair use standards of copyright law. The author(s) is responsible for obtaining any necessary permission from copyright holders and for paying any necessary fees. Extensive paraphrasing is considered disguised copying; permission is required.

Portions of an item, such as some of the data from a table, or part of a graphic representation of a model, can be used without permission if they are properly credited with full and exact source information and do not comprise a significant portion of the submitted article. Copies of written permissions should be submitted with the final manuscript.

Electronic Submission

Manuscripts should be submitted electronically, preferably in Microsoft Word, to the Editors at the following E-mail address: epxull@yahoo.com or gilbert.nartea@lincoln.ac.nz. If it is not possible to submit an electronic copy, send three (3) copies of the manuscript to the Editors. Non-electronic submissions require more time to administer, so authors should be aware that the processing time for their manuscripts will be longer.

When the authors are notified of acceptance, they will be asked to provide the final, accepted version of the article on in electronic format containing the article text files.

MANUSCRIPT SUBMISSION

All correspondence regarding submission of manuscripts should be directed to:

Ungul Laptaned, Editor-In-Chief, School of Engineering, University of the Thai Chamber of Commerce, 126/1 Vibhavadee-Rangsit Road, Dindaeng, Bangkok, 10400, Thailand, Phone: (662) 697-6707, Fax: (662) 275-4892, E-mail: epxull@yahoo.com.

Suthawan Chirapandu, Associate Editor, School of Business, University of the Thai Chamber of Commerce, 126/1 Vibhavadee-Rangsit Road, Dindaeng, Bangkok, 10400, Thailand, Phone: (662) 697-6101-5, Fax: (662) 277-1434, E-mail: ann_gs@hotmail.com.

and

Gilbert Nartea, Guest Editor, Faculty of Commerce, Lincoln University, Ellesmere Junction Road/Springs Road, Lincoln, Canterbury, New Zealand, Phone: +64 3 325 2811, Fax: +64 3 325 3850, E-mail: info@lincoln.ac.nz.

Publishing Agreement

This agreement comes into effect if your Article is accepted for publication.

1. The undersigned thereby transfers any and all rights including all copyright right in the under-captioned paper in full-length version as well as the summary/abstract version(s) to **University of the Thai Chamber of Commerce International Journal of Business and Economics**, known as **UTCC IJBE**.
2. The Author warrants that the Article is the Author's original work, has not been published before, and is not currently under consideration for publication elsewhere; and that the Article contains no libelous or unlawful statements and that it in no way infringes the right of others, and that the Author, as the owner of the copyright, is entitled to make this assignment.
3. If the Article was prepared jointly by more than one author, the Author warrants that he/she has been authorized by all co-authors to sign this agreement on their before behalf. The undersigned represents that he/she has the authority to sign this copyright agreement.

Please sign and date the document in black or blue ink.

Article title: _____

Name (print): _____

Signed by the Author: _____

Date: _____

Please return the completed and signed original form by mail, fax, or mail a scanned copy of the signed original to

Secretariat

Wanrapee Banchuenvijit

School of Business

University of the Thai Chamber of Commerce

Bangkok, Thailand

Tel: +662 697-6101-5 Fax: +662 277-1434

Email: wanrapee_ban@utcc.ac.th

Website : <http://www.utcc.ac.th/utccijbe>

Subscription Form

Please enter my annual subscription to the University of the Thai Chamber of Commerce (UTCC) International Journal of Business and Economics (IJBE), including 2 issues for the year.....
Vol.....No.....

Institutional	US\$ 100.00
Individual	US\$ 50.00
Students	US\$ 25.00
Single Copy	US\$ 15.00



Name:.....

Address:.....

Tel:.....Fax:.....E-mail:.....

City:.....Country:.....

Payment Method

☐ Cash ☐ Cheque Enclosed ☐ Bank Transfer

Payment can be made via our transfer account:

Transfer to Bank: Siam Commercial Bank

Branch: Victory Monument

Account Name: University of the Thai Chamber of Commerce

Account No: 034-227410-3

Type of A/C: Saving Swift Code: SICOTHBK

Please allow 6-8 weeks for delivery.

Please send your receipt to the journal address.

.....
Signature

Secretariat

Wanrapee Banchuenvijit

School of Business

University of the Thai Chamber of Commerce

Bangkok, Thailand

Tel: +662 697-6101-5 Fax: +662 277-1434

Email: wanrapee_ban@utcc.ac.th

Website : <http://www.utcc.ac.th/utccijbe>





KELLOGG COLLEGE
OXFORD

www.kellogg.ox.ac.uk

The University of Oxford is the oldest University in the English-speaking world. Our aim is to remain at the forefront of centres of learning, teaching and research. Oxford's colleges help to foster an intense interdisciplinary approach that inspires much of the outstanding research achievement of the University and makes Oxford a leader in so many fields.

Kellogg College is one of the Colleges of Oxford University. It is Oxford's largest, most international graduate college with students from a wide range of countries and continents. Kellogg College admits a mix of part- and full-time students and supports students who wish to follow their course of learning while working. The College is the base for a number of active research centres looking at the interface between learning, the professions and public life.

We are based in North Oxford with a new dining hall, bar and common room, providing ample space for Kellogg students to meet, network and socialise.



Our learning resource centre, library and seminar rooms are well equipped, offering an up-to-date environment for study and conferencing. Our student accommodation offers easy access to Oxford city centre, and all University departments and facilities.

For applications to study in Oxford, you need to follow the instructions on the University website www.ox.ac.uk , we would be delighted to welcome you to Kellogg College as a student.

If you are looking for a venue in Oxford to run a course or conference, do contact us at college.events@kellogg.ox.ac.uk

University of the Thai Chamber of Commerce, Thailand

In 1940, the Thai Chamber of Commerce founded a non-profit education institution called the College of Commerce to produce graduates in the business field. After the outbreak of World War II in 1941, this institution was closed. In 1963, the College was reopened, and the two-year curriculum was developed into a standard four-year in 1964. In 1970, it was officially accredited under the Private College Act. In 1984, this institution was accredited as a university and the name was changed to the University of the Thai Chamber of Commerce. At present, the University of the Thai Chamber of Commerce provides 39 undergraduate program. The School of Graduate Studies is responsible for 9 graduate programs and 1 graduate diploma program, and the School of Business Administration is responsible for 1 certification programs. All programs are approved by the Ministry of University Affairs.

Thailand Management Association

Thailand Management Association (TMA) is a highly professional body of managers and executives, from all branches of business in Thailand who are dedicated to seeking and transferring knowledge through the exchange of the latest information on advanced managerial principles and practices in various fields. This exchange is considered as a contribution from the business sector to the efficient and productive utilization of human and material resources, which contributes ultimately to the well-being of the nation. In 1962, two top management development conferences, inspired by Mr. W.T.Utting, then Chief of the United Nations International Labor Organization (ILO), were organized, by the Thailand Management Development and Productivity Center. These two conferences concluded that the proper and well organized management training center was urgently needed, to improve the overall management skills of both local and foreign enterprises in Thailand. This led to the establishment of the Thailand Management Association, with the late Khun Snoh Nilkamhaeng, then Director of Lever Brothers (Thailand) Ltd., as its first president. The objectives are: 1) to improve the general abilities, education, technical knowledge and effectiveness of person engaged in management, by providing a forum for members for discussion of management subject, 2) to provide mutual assistance in applying management practices to increase the efficiency of the members' enterprises, 3) to propagate the concept that management is a worthwhile and honorable profession, and 4) to promote and maintain high ethical standards of management practices.

Kellogg College, University of Oxford, United Kingdom

Kellogg College is one of Oxford's largest, most international graduate colleges and membership is diverse. The College was named in honour of W. K. Kellogg on the 1st October 1994, in recognition of the generous support given by the W K Kellogg Foundation to the University over the preceding decades. The College has close connections with the University Department for Continuing Education, the Department of Education and other departments active in areas of professional and part-time study. The College can trace its origins back to the start of university extension movement in the 1870s, and came into being on 1st March 1990 (as Rewley House).



University of the Thai Chamber of Commerce

126/1 Vibhavadi-Rangsit Road Dindaeng Bangkok 10400

Tel. 02-697-6000

www.utcc.ac.th

ISSN 19065582

