A STUDY ON CRITICAL SUCCESS FACTORS (CSFs) OF SOFT TECHNOLOGY IMPLEMENTATION IN MANUFACTURING COMPANIES.

BY

ZURAIDA BT MUHAMMAD HASHIM UNIVERSITI UTARA MALAYSIA KUALA LUMPUR

DEC 2012

Master Project Paper Submitted to Othman Yeop Abdullah Graduate School of Business, Universiti Utara Malaysia, in Fulfillment of the Requirement for the Degree of Master of Business Administration (Accounting)

PERMISSION TO USE

In presenting this project paper in partial fulfillment of the requirements for a Post Graduate degree from the Universiti Utara Malaysia (UUM), I agree that the Library of this university may make it freely available for inspection. I further agree that permission for copying this project paper in any manner, in whole or in part, for scholarly purposes may be granted by my supervisor or in his absence, by the Dean of Othman Yeop Abdullah Graduate School of Business where I did my project paper. It is understood that any copying or publishing or use of this project paper or parts of it for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to the UUM in any scholarly use which may be made of any material in my project paper.

Request for permission to copy or to make other use of materials in this project paper in whole or in part should be addressed to:

Dean of Othman Yeop Abdullah Graduate School of Business

Universiti Utara Malaysia

06010 UUM Sintok

Kedah Darul Aman

ABSTRAK

Kajian ini diadakan untuk menyelidik faktor-faktor kritikalyang menyumbang kepada kejayaan penggunaan soft technology seperti Total Quality Management (TQM) dan Just-In-Time (JIT) di dalam syarikat pembuatan.Kajian ini juga menyelidik soft technology dan penggunaan teknologi, pendekatan faktor-faktor kritikal, perlaksanaan faktor-faktor kejayaan, petunjuk faktor-faktor kejayaan teknologi, dan kajian terdahulu.Data dikumpulkan dengan menggunakan borang soal selidik secara pos yang dihantar kepada syarikat-syarikat pembuatan di negeri Selangor.Keputusan kajian menunjukan bahawa sokongan dan komitmen daripada pengurusan pihak atasan dan stategi perancangan yang betul adalah faktor-faktor kejayaan kepada syarikat-syarikat pembuatan dalam perlaksanaan soft technology. Didapati kedua-dua faktor berubah ini mempunyai hubungan yang ketara dan korelasi yang sangat kuat dengan kejayaan penggunaan soft technology. Hasil kajian yang diperolehi berguna sebagai faktor-faktor kemungkinan dan pendekatan yang mana dapat memberi kebaikan kepada syarikat pembuatan.Borang soal selidik telah dihantar ke 100 syarikat di dalam negeri Selangor.

ABSTRACT

The study aims to identify the possible critical factors that contribute to the success of soft technology such as Total Quality Management (TQM) and Just-In-Time (JIT)implementation in manufacturing companies. This study also investigates soft technology and technology adoption, using the critical success factors (CSFs) approach, implementation success factors, indicators of technology success, and some previous studies. The data collected using a mailed questionnaires survey of manufacturing companies in the state of Selangor. Result of the study shows that top management support and commitment and proper strategic planning are the success factors for manufacturing companies in implementation soft technology. The relationship between those two variables is significant and correlation is very strong. The outcomes provide useful insights into our knowledge of how these possible critical factors will be useful in devising suitable approaches that will benefit manufacturing companies. A set of questionnaires were sent to 100organizations within the manufacturing companies in Selangor.

ACKNOWLEDGEMENT

Praise to Allah, The Most Compassionate, for granting me the chance and strength to complete this Master of Business Administration (Accounting) program, which undoubtedly bring me into heights of intellectual and emotion enrichment.

My highest gratitude goes to my supervisor; Dr. Barudin Bin Muhamad who throughout completing this research paper not only provides me the guidance and advice but generously also shares with me his insight. His patience and friendly attitude creates a comfortable student-supervisor environment that is certainly beneficial for the completion of my work.

In totally, this research paper would have not been materialized without the aid of my wonderful colleague, Puan Zainon Binti Alias whom with patience, tolerance and commitment to assist me in understanding the concept and skills of Research Methodology.

My deepest appreciation goes to my mother who always showers me in each and every moment with love, motivation and prayers. My gratefulness also goes to my loving husband, Zailan Bin Zainal, who always encourages me to seek for excellence and challenges and finally to all my wonderful children, Raudhatus Syifa', Nawfal Syafi', Raudhatus Syafiqa and Raudhatus Syafeenaz for giving me strengthand sprinkling wonderful colors throughout this challenging time.

TABL	pages			
СНАРТ	TER 1 INTRODUCTION 1-11			
1.1 1.2 1.3 1.4 1.5 1.6	Research Background Problem Statement Research Objective Scope of Study Research Significance Research Structure			
CHAPTER 2 LITERATURE REVIEW AND RESEARCH FRAMEWORK 12-62				
2.1 2.1.1 2.1.2 2.1.3 2.1.4 2.2 2.3 2.4 2.4.1 2.4.2 2.4.3 2.4.4 2.4.5 2.4.6 2.5	Overview of Soft Technology Technology Manufacturing Technology Advanced Manufacturing Technology (AMT) Soft Technology Technology Adoption Critical Success Factors Approach Implementation Success Factor Top Management Support Planning Employee Involvement Education and Training Multi-disciplinary Approach Supplier Relationship Soft Technology Success Indicator			

Proposed Framework of Success Factors and Implementation Success Research Hypotheses

Conclusions from Past Studies

Conclusion

2.4.6 2.5 2.6

2.7 2.8 2.9

CHAPT	ER 3 METHODOLOGY	63-78
3.1	Overview	
3.2	Item Measure Development	
3.2.1	Success Factors Measures	
3.2.2	Technology Success Measures	
3.3	Questionnaires Development	
3.3.1	Instrument	
3.3.2	Pilot Test	
3.3.2.1	Validity	
3.3.2.2	Reliability	
3.4	Survey Administration	
3.4.1	Survey Plan	
3.4.1.1	Unit of Analysis and Targeted Respondent	
3.4.1.2	Targeted Population	
3.4.1.3	Sampling Frame and Sample Size	
3.4.2	Survey Implementation	
3.5 Conc	· · · · · · · · · · · · · · · · · · ·	
СНАРТ	ER 4 RESEARCH FINDINGS	79-93
4.1	Introduction	
4.2	Companies' Profile	
4.3	Descriptive Analysis	
4.4	Major Findings	
4.5	Conclusion	
T. .3	Conclusion	
CHAPT		94-98
	RECOMMENDATION	
5.1	Introduction	
5.2	Discussion of Findings	
5.3	Recommendation for Future Research	
5.4	Conclusion	
REFERENCES		99-110
APPENDIX		111-116

CHAPTER 1

INTRODUCTION

The purpose of this first chapter is to introduce the context of the research. It beginswith an explanation of the research background followed by the statement of the problem, objectives of the research, the scope of the study, operational definitions and the contribution of this study to establish the research. Finally, the structure of the research, which explains briefly the contents of the next chapters, is presented in the last section.

1.1 Research Background

The structural transformation of Malaysia's economy since 1972 has been magnificent. Over the last 40 years, this country took decisive steps to progress from an economy dependent on agriculture and primary commodities to a manufacturing-based, export-driven economy encouraged on by high technology and knowledge-based and capital-intensive industries.

According to data issued by the Malaysia Industrial Development Authority (MIDA), the manufacturing sector accounted for just over half of all foreign direct investment (FDI) inflows in 2011, almost double the 27 percent drawn in by service sector. With FDI in 2011 increasing by 12.3 percent to around RM33.7

The contents of the thesis is for internal user only

- business performance. Paper presented at the 1st Joint International EurOMAPOMS Conference, Como, Italy.
- Agarwal, D. (1997). An empirical investigation of the impact of advanced manufacturing technology on business performance. Unpublished PhD Thesis, The City University of New York, New York.
- Aggarwal.S. (1995). Emerging hard and soft technologies: Current status, issues and implementation problems. Omega, 23(3), 323-339.
- A hire, S. L., & Ravichandran, T. (2001). An innovation diffusion model of TQM implementation. IEEE Transactions on Engineering Management, 48(4), 445-464.
- Ahmad, S., Schroeder, R. G., & Sinha, K. K. (2003). The role of infrastructure practices in the effectiveness of JIT practices: implications for plant competitiveness. Journal of Engineering Technology Management, 20, 161-191.
- Alic, J. A. (1995). Organizational competence: "Know-how and skills in economic development. In E. Sanidas (Ed.), Technology in Society (Vol. 26, pp. 67-84).
- Al-Mashari, M., Al-Mudimigh, A., & Zairi, M. (2003). Enterprise resource planning: A taxonomy of critical factors. European Journal of Operational Research, 146(2), 352-364.
- Anonymous (2003). Manufacturers urged to go 'soft'. Manufacturers' Monthly, October 2003, 35.
- Ang, J. S. K., Sum, C.-C., & Chung, W.-F. (1995). Critical success factors in implementing MRP and government assistance: A Singapore context. Information & Management, 29(2), 63-70.
- Ang, J. S. K., Sum, C.-C., & Yeo, L.-N. (2002). A, multiple-case design methodology for studying MRP success and CSFs. Information & Management, 39(4), 271-281.
- Ansari, A., & Modarress, B. (1986). Just-in-time purchasing: Problems and solutions. In S. Ahmad, R. G. Schroeder & K. K. Sinha (Eds.), Journal of Engineering Technology Management (Vol. 20, pp. 161-191).
- Antony, J., Leung, K., Knowles, G., & Gosh, S. (2002). Critical success factors of TQM implementation in Hong Kong industries. International Journal of Quality & Reliability Management, 19(5), 551-566.
- Barton, L. D., & Kraus, W. A. (1985).Implementing new technology.In K. A. Ghani & V. Jayabalan (Eds.), The Journal of High Technology Management Research (Vol. 11, pp. 1-18).
- Beaumont, N. B. (1997). Technology, manufacturing performance and business performance amongst Australian manufacturers. In A. Efstathiades, S. Tassou & A. Antoniou (Eds.), Technovation (Vol. 22, pp. 201-212).
- Bessant, J. (1994). Towards total integrated manufacturing. In T. F. Burgess, H. K. Gules & M. Tekin (Eds.), Integrated Manufacturing Systems (Vol. 8, pp. 323332).
- Black, S. A. (1993). Measuring the critical factors of total quality management. In

- M. Zairi & M. A. Youssef (Eds.), Benchmarking for Quality Management & Technology (Vol. 2, pp. 5-20).
- Bowman, D. J. (1991). If you don't understand JIT, how you can implement it? In G. J. Udo & I. C. Ehie (Eds.), International Journal of Operations & Production Management (Vol. 16, pp. 6-26).
- Boyer, K. K. (1998). Longitudinal linkages between intended and realised operations strategies. International Journal of Operations & Production Management, 18(4), 356-373.
- Brah, S. A., Tee, S. S. L., & Rao, B. M. (2002). Relationship between TQM and performance of Singapore companies. International Journal of Quality & Reliability Management, 19(4), 356-379.
- Bruun, P., & Mefford, R. N. (1996). A framework for selecting and introducing appropriate production technology in developing countries. International Journal of Production Economics, 46(7), 197-209.
- Burgess, T. F., Gules, H. K., & Tekin, M. (1997). Supply-chain collaboration and success in technology implementation. Integrated Manufacturing Systems, 8(5), 323-332.
- Burgess, T. F., & Gules, H. K. (1998). Buyer-supplier relationships in firms adopting advanced manufacturing technology: An empirical analysis of the implementation of hard and soft technologies. Journal of Engineering Technology Management, 15, 127-152.
- Carroll, G., & Blue, R. (1991). Measuring the success of total quality management. Paper presented at the Communications, 1991. IEEE International Conference on Conference Record, ICC 91.
- Chan, F. T. S., Chan, M. H., Lau, H., & Ip, R. W. L. (2001). Investment appraisal techniques for advanced manufacturing technology (AMT): A literature review. Integrated Manufacturing Systems, 12(1), 35-50.
- Chen, I. J., & small, M. H. (1996). Planning for advanced manufacturing technology: A research framework. International Journal of Operations & Production Management, 16(5), 4-24.
- Chin, K.-S., Pun, K.-F., Xu, Y., & Chan, J. S. F. (2002). An AHP based study of critical factors for TQM implementation in Shanghai manufacturing industries. Technovation, 22(11), 707-715..
- Chong, H., White, R. E., & Prybutok, V. (2001). Relationship among organizational support, JIT implementation, and performance. Industrial Management & Data Systems, 101(6), 273-280.
- Chung, C. A. (1996). Human issues influencing the successful implementation of advanced manufacturing technology. Journal of Engineering & Technology Management, 13(3), 283-299.
- Co, H. C., Patuwo, B. E., & Hu, M. Y. (1998). The human factor in advanced manufacturing technology adoption: An empirical analysis. International Journal of Operations & Production Management, 18(1), 87-106.
- Coakes, S. J. (2005). SPSS analysis without anguish: Version 12.0 for windows. Milton: John Wiley & Sons Australia, Ltd.
- Cressey, P. (1985). The role of the parties concerned in the introduction of new Technology. In G. Kahen (Ed.), Paper presented at the International

- Conference on The Dynamics of Strategy, The University of Surrey, Guildford, U.K.
- Cua, K. O., McKone, K. E., & Schroeder, R. G. (2001). Relationships between implementation of TQM, JIT, and TPM and manufacturing performance. Journal of Operations Management, 19(6), 675-694
- Currie, W. L. (1999). Revisiting management innovation and change programmes: Strategic visiob or tunnel vision. Omega, 27, 647-660.
- Damanpour, F. (1991). Organizational innovation: A meta-analysis of effects of determinants and moderators. Academy of Management Journal, 34(3), 555-590.
- Damanpour, F. (1996). Organizational complexity and innovation: Developing Andtesting multiple contigency models. Management Science, 42(5), 693-716.DeRuntz, B. D., & Turner, R. M. (2003). Organizational considerations for advanced manufacturing technology. The Journal of Technology Studies, 29(1), 1-7.
- Dyker, D. A. (2001). Technology exchange and the foreign business sector in Russia.Research Policy, 30, 851-868.
- Efstathiades, A., Tassou, S. A., Oxinos, G., & Antoniou, A. (2000). Advanced manufacturing technology transfer and implementation in developing countries: The case of the Cypriot manufacturing industry. Technovation, 20(2), 93-102.
- Efstathiades, A., Tassou, S., & Antoniou, A. (2002). Strategic planning, transfer and implementation of Advanced Manufacturing Technologies (AMT). Development of an integrated process plan. Technovation, 22(4), 201-212.
- Eng, Q. E., & Yusof, S. M. (2003). A survey of TQM practices in the Malaysian electrical and electronic industry. Total Quality Management, 14(1), 63-77.
- Flynn, B. B., Sakakibara, S., & Schroeder, R. G. (1995). Relationship between JIT and TQM: Practices and performance. In H. Chong, T. E. White & V. Prybutok (Eds.), Industrial Management & Data Systems (Vol. 101, pp. 273-280).
- FMM directory 2005: Malaysian industries. (2005). Kuala Lumpur: Federation of Malaysian Manufacturers.
- Fuentes-Fuentes, M. M., Albacete-Saez, C. A., & Llorens-Montes, F. J. (2004). The impact of environmental characteristics on TQM principles and organizational performance. Omega, 32, 425-442.
- Fullerton, R. R., & McWatters, C. S. (2001). The production performance benefits from JIT implementation. Journal of Operations Management, 19, 81-96.
- Gagnon, Y.-C., & Toulouse, J.-M. (1996). The behavior of business managers when adopting new technologies. Technological Forecasting & Social Change, 52(1), 59-74.
- Galbreath, J. T. (2004). Determinants of firm success: A resource-based analysis. Unpublished PhD Thesis, Curtin University of Technology, Bentley.
- Gatchalian, M. M. (1997). People empowerment: The key to TQM success. The TQM Magazine, 9, 429-433.
- Ghani, K. A., & Jayabalan, V. (2000). Advanced manufacturing technology and planned organizational change. The Journal of High Technology Management

- Research, 11(1), 1-18.
- Ghani, K. A., Jayabalan, V., & Sugumar, M. (2002). Impact of advanced manufacturing technology on organizational structure. Journal of High Technology Management Research, 13, 157-175.
- Ghobadian, A., & Gallear, D. (2001). TQM implementation: An empirical examination and proposed generic model. Omega, 29, 343-359.
- Gilbert, N. (2001). Researching social life (Second ed.). London: Sage.
- Gozlu, S., Gules, H. K., & Burgess, T. F. (2001). Advanced manufacturing technology implementation in small and mediums size enterprises in a newlyindustrializing country: The case of Turkey. Paper presented at the Management of Engineering and Technology, 2001. Portland International Conference on PICMET '01.
- Griffith, T. 1., Zammuto, R. F., & Aiman-Smith, L. (1999). Why new technology fail. Industrial Management, 41(3), 29-34.
- Gules, H. K., & Burgess, T. F. (1996). Manufacturing technology and the supply chain: Linking buyer-supplier relationships and advanced manufacturing technology. Europen Journal of Purchasing & Supply Management, 2(1), 3138.
- Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). Multivariate data analysis (Fifth ed.). New Jersey: Prentice-Hall, Inc.
- Hami, N., Razak, R. C., & Othman, A. A. (2005). Critical success factors towards soft technology adoption: A suggested framework. Paper presented at the National Conference on Management of Technology and Technology Entrepreneurship (MOTTE 2005), Johor Bahru.
- Hewitt-Dundas, N. (2004). The adoption of advanced manufactuirng technology and innovation strategy in small firms. International Journal of Innovation & Technology Management, 1(1), 17-36.
- Hottenstein, M. P., Casey, M. S., & Dunn, S. C. (1997). Facilitation of advanced manufacturing technology: Implementation and transfer. Industrial Management, 39(5), 8-12.
- Humphreys, P., McCurry, L., & McAleer, E. (2001). Achieving MRPII Class A status in an SME: A successful case study. Benchmarking An International Journal, 8(I), 48-61.
- Ip, W. H., & Yam, R. C. M. (1998). The successful implementation of MRPII via a hierarchical modeling approach. Logistics Information Management, 11(3), 160-170.
- Jackson, W. (1995). Methods: Doing social research. Scarborough, Ontario: Prentice-Hall Canada Inc.
- Jonsson, P. (1999). Achieving the potential benefits of advanced manufacturing technology-a study of 'Swedish metal working companies. Paper presented at the Management of Engineering and Technology, 1999. Portland International Conference on Technology and Innovation Management.PICMET '99.
- Kahen, G. (1996). Strategic development, technology transfer and strategic technology assessment in changing environments. Paper presented at the International conference on the Dynamics of Strategy.
- Kaynak, H. (2005). Implementing JIT purchasing: does the level of technical

- complexity in the production process make a difference? Journal of Managerial Issues, 17(1), 76-100.
- Khalil, T. M. (2000). Management of technology: The key to competitiveness and wealth creation. Boston: McGraw-Hill.
- Kidder, L. H., & Judd, C. H. (1986).Research methods in social relations.In U. Sekaran (Ed.), Research methods for business: A skill building approach. New York: John Wiley & Sons, Inc.
- Kotha, S., & Swamidass, P. M. (2000). Strategy, advanced manufacturing technology and performance: empirical evidence from U.S. manufacturing firms. Journal of Operations Management, 18(3), 257-277.
- Krejcie, R., & Morgan, D. (1970). Determining sample size for research activities. In U. Sekaran (Ed.), Research methods for business: A skill building approach. New York: John Wiley & Sons, Inc.
- Lasserre, P. & Probert, J. (1994). Competing on the Pacific Rim: High risks and high returns. Long Range Planning, 27(2), 3-11.
- Lau, H. C., & Idris, M. A. (2001). The soft foundation of the critical success factors on TQM implementation in Malaysia. The TQM Magazine, 13, 51-60.
- Lau, R. S. M., Zhao, X., & Lai, F. (2002). Survey of MRPII implementation and benefits in mainland China and Hong Kong. Production & Inventory Management Journal, 43(3/4), 65-71.
- Lee, C.-C., Lee, T.-S., & Chang, C. (2001). Quality/productivity practices and company performance in China. International Journal of Quality & Reliability Management, 18(6), 604-625.
- Lewis, M. W., & Boyer, K. K. (2002). Factors impacting AMT implementation: an integrative and controlled study. Journal of Engineering & Technology Management, 19(2), 111-130.
- Li, L. X., Chaudhry, S. S., Chaudhry, P. E., & 'Wang, Y. (2001). Evaluation of a acquiring and implementing a manufacturing resource planning system. Production & Inventory Management Journal, 42(3/4), 1-8.
- Li, J.-H., Anderson, A. R., & Harrison, R. T. (2003). Total quality management principles and practices in China. International Journal of Quality & Reliability Management, 20(9), 1026-1050.
- Liang, Y. (2001). Dynamic strategic planning and justification systems for advanced manufacturing technology acquisition. Unpublished PhD Thesis, University of Windsor, Ontario.
- Liker, J. K., Haddad, C. J., & Karlin, J. (1999). Perspectives on technology and work organization. Annual Review of Sociology, 25, 575-596.
- MacDougall, S. L., & Pike, R. H. (2003). Consider your options: changes to strategic value during implementation of advanced manufacturing technology. Omega, 31(1), 1-15.
- Machuca, J. A. D., Diaz, M. S., & Gil, M. J. A. (2004). Adopting and implementing advanced manufacturing technology: new data on key factors from the aeronautical industry. International Journal of Production Research, 42(16), 3183.

- Mann, R., & Kehoe, D. (1995). Factors affecting, the implementation and succes of TQM. International Journal of Quality & Reliability Management, 12(1), 11-23.
- Martinez-Lorente, A. R., Sanchez-Rodriguez, C., & Dewhurst, F. W. (2004). The effectof information technologies on TQM: An initial analysis. International Journal of Production Economics, 89(1), 77-93.
- Marx, K. (1976). Capital. In K. A. Ghani & V. Jayabalan (Eds.), The Journal of High Technology Management Research (Vol. 11, pp. 1-18).
- Mefford, R. N., & Bruun..P. (1998). Transferring world class production to developing countries: A strategic model. International Journal of Production Economics, 56-57, 433-450.
- Mehra, S., & Inman, R. A. (1992). Determining the critical elements of just-in-timeimplementation. In D. J. Power & A. S. Sohal (Eds.), Technovation (Vol. 17, pp. 649-666).
- Meierhoefer, C. S. (1997). Technology adoption and productivity in Georgia manufacturing establishments. Unpublished Master Thesis, Georgia Institute of Technology, Georgia.
- Merino-Diaz de Cerio, J. (2001). Implementing total quality. Engineering ManagementJournal, 11(2), 53-57.
- Mersha, T.. (1997). TQM implementation in LDCs: Driving and restraining forces. International Journal of Operations & Production Management, 17(2), 164183.
- MIDA. (2012). Invest in Malaysia: Manufacturing Companies. Retrieved 20 July, 2012
- Milis, K., & Mercken, R. (2002). Success factors regarding the implementation of ICTinvestment projects. International Journal of Production Economics, 80(I), 105-117.
- Millen, R., & Sohal, A. S. (1998). Planning processes for advanced manufacturing technology by large American manufacturers. Technovation, 18(12), 741750.
- Miller, D. C., & Salkind, N. J. (2002). Handbook of research design and social measurement (Sixth ed.). California: Sage Publications, Inc.
- MITI.(2003). Malaysia and AFTA. Kuala Lumpur: Ministry of International Trade and Industry.
- Mole, K. F., Ghobadian, A., O'Regan, N., & Liu, J. (2004). The use and deployment ofsoft process technologies within UK manufacturing SMEs: An empirical assessment using logit models. Journal of Small Business Management, 42(3), 303-324.
- Morita, M., & Flynn, E. J. (1997). The linkage among management systems, practices and behaviour in successful manufacturing strategy. International Journal of Operations & Production Management, 17(10), 967-993.
- Nah, F. F.-H., Lau, J. L.-S., & Kuang, J. (2001). Critical factors for successful implementation of enterprise systems. Business Process ManagementJournal, 7(3), 285-296.

- Narasimhan, R., Talluri, S., & Das, A. (2004). Exploring flexibility and execution competencies of manufacturing firms. Journal of Operations Management, 22(1), 91-106.
- Nemetz, P. L., & Fry, L. W. (1988). Flexible manufacturing organizations:
 Implicationsfor strategy formulation and organization design. In I. J. Chen & M.. H. Small (Eds.), International Journal of Operations & Production Management (Vol. 16, pp. 4-24).
- Noori, H. (1990). Managing the dynamics of new technology: Issues in Manufacturingmanagement. New Jersey: Prentice-Hall.
- Noori, H., & Radford, R. W. (1990). Readings and cases in the management of Newtechnology: An operations perspective. New Jersey: Prentice-Hall, Inc.
- NRI. (1990). The strategy for technology toward 2000. In J. Zhouying (Ed.), International Journal of Technology Management & Sustainable Development (Vol. 3, pp. 133-148).
- O'Regan, N., Sims, M., & Ghobadian, A. (2004). The impact of management Techniqueson performances in technology-based firms. Technovation, 24(3), 265-273.
- Pace, L. A. (1989). Motivation towards system integration. In H. Sun, I. K. Hui, A. Y. K. Tam & F. Frick (Eds.), The TQMMagazine (Vol. 12, pp. 350-354).
- Pagell, M. (1997). Linking workforce skill level decisions to the adoption of advancedmanufacturing technologies: A strategic choice framework. Unpublished PhDThesis, Michigan State University, East Lansing MI.
- Papke-Shields, K. E., Malhotra, M. K., & Grover, V. (2002). Strategic manufacturing planning systems andtheir linkage to planning system success. Decision Sciences, 33(1), 1-22.
- Park, Y.-T. (2000). National systems of advanced manufacturing technology (AMT): Hierarchical classification scheme and policy formulation process. Technovation, 20, 151-159.
- Patterson, K. A., Grimm, C. M., & Corsi, T. M. (2003). Adopting new technologies forsupply chain management. Transportation Research Part E, 39, 95-121.
- Pereira, R. E. (2002). An adopter-centered approach to understanding adoption of innovations. Europen Journal of Innovation Management, 5(1), 40-49.
- Petroni, A., & Rizzi, A. (2001). Antecedents of MRP adoption in small and medium-sized firms. Benchmarking: An international Journal, 8(2), 144-156.
- Petroni, A. (2002). Critical factors of MRP implementation in small and medium-Sizedfirms. International Journal of Operations & Production Management, 22(3), 329-348.
- Power, D. J., & Sohal, A. S. (2000). Human resource management strategies and practices in just-in-time environments: Australian case study evidence. Technovation, 20, 373-387.
- Power, D. J., & Sohal, A. S. (1997). An examination of the literature relating to Issuesaffecting the human variable in just-in-time environments. Technovation, 17(11/12), 649-666.

- Putranto, K., Stewart, D., Moore, G., & Diatnmko, R. (2003). Implementing a Technologystrategy in developing countries: The experience of the Indonesian rolling stock industry. Technological Forecasting & Social Change, 70, 163-176.
- Ramamurthy, K., & W.R., King. (1992). Computer integrated manufacturing: An exploratory study of key organizational barriers. In G. J. Udo & I. C. Ehie (Eds.), International Journal of Operations & Production Management (Vol. 16, pp. 6-26).
- Ramamurthy, K. (1995). The influence of planning on implementation success of advanced manufacturing technologies. IEEE Transactions on Engineering Management, 42(1), 62-73.
- Ramarapu, N. K., Mehra, S., & Frolick, M. N. (1995). A comparative analysis and Reviewof JIT implementation research. International Journal of Operations & Production Management, 15(1), 3 8-49.
- Rao, S., Subba, T., Ragu-Nathan, S., & Solis, L. E. (1997). Does ISO 9000 have an effecton quality management practices? An international empirical study. In K.-S.Chin, K.-F.Pun, Y. Xu & J. S. F. Chan (Eds.), Technovation (Vol. 22, pp. 707-715).
- Rho, B.-H., Hahm, Y.-S., & Yu, Y.-M. (1994). Improving interface congruence Betweenmanufacturing and marketing in industrial-product manufacturers. International Journal of Production Economics, 3 7(1), 27-40.
- Richardson, T. (1997). Total quality management. In Q. E. Eng & S. r. M. Yusof (Eds.), Total Quality Management (Vol. 14, pp. 63-77).
- Rockart, .1.F. (1979). Chief executives define their own data needs. In F. Soliman, S.Clegg & T. Tantoush (Eds.), International Journal of Operations & Production Management (Vol. 21, pp. 609-629).
- Rothwell, S. (1984). Company employment policies and new technology in manufacturing and service sectors. In G. Kahen (Ed.), Paper presented at the International Conference on The Dynamics of Strategy, The University of Surrey, Guildford.
- Rouse, P. D. (2000). Technology adoption: The process, success factors and outcomes ina manufacturing environment. Paper presented at the Applied Business Research Conference, Puerto Vallarfo, Mexico.
- Rush, H., & William, R. (1984). Consultation and change: New technology and manpower in the electronics industry. In G. Kahen (Ed.), Paper presented at the International Conference on The Dynamics of Strategy, The University of Surrey, Guildford.
- Safayeni, F., Duimering, P. R., & Purdy, L. (1991). Management of just-in-time production. Paper presented at the Technology management: the New International Language, 1991.
- Sakakibara, S., Flynn, B. B., Schroeder, R. G., & Morris, W. T. (1997). The impact of just-in-time manufacturing and its infrastructure on manufacturing performance. Management Science, 43(9), 1246-1257.
- Salaheldin, S. 1.,& Francis, A. (1998). A study on MRP practices in Egyptian manufacturing companies. International Journal of Operations & Production Management, 18(6), 588-611.

- Sambasivarao, K. V., & Deshmukh, S. G. (1995). Selection and implementation of advanced manufacturing technologies: Classification and literature review of issues. International Journal of Operations & Production Management, 15(10), 43-62.
- Sanidas, E. (2004). Technology, technical and organizational innovations, economic andsocietal growth. Technology in Society, 26, 67-84.
- Saraph, J. V., Benson, G., & Schroeder, R. G. (1989). An instrument for measuring thecritical factors of quality management. In J. Antony, K. Leung,
- G. Knowles & S. Gosh (Eds.), International Journal of Quality & Reliability Management (Vol. 19, pp. 551-566).
- Sekaran, U. (2003). Research methods for business: A skill building approach (Fourthed.). New York: John Wiley & Sons, Inc.
- Shin, H., Collier, D. A., & Wilson, D. D. (2000). Supply management orientation and supplier/buyer performance. In H. Kaynak (Ed.), Journal of Managerial Issues (Vol. 17, pp. 76-100).
- Simon, H. (1973). Technology and environment. In V. E. Sower & R. D. Abshire (Eds.), International Journal of Computer Applications in Technology (Vol. 16, pp. 12-20).
- Small, M. H. (1.993). Towards successful implementation of advanced Manufacturingtechnology: A process-factors-process approach. Unpublished PhD Thesis, Cleveland State University, Cleveland, Ohio.
- Small, M. H., & Yasin, M. M. (1997). Advanced manufacturing technology: Implementation policy and performance. Journal of Operations Management, 15(4), 349-370.
- Small, M. H. (1998). Objectives for adopting advanced manufacturing systems: Promiseand performance. Industrial Management & Data Systems, 98(3), 129-137.
- Small, M. H. (1999). Assessing manufacturing performance: An advanced Manufacturingtechnology portfolio perspective. Industrial Management & Data Systems, 99(6), 266-277.
- Small, M. H., & Yasin, M. (2000). Human factors in the adoption and performance of advanced manufacturing technology in unionized firms. Industrial Management & Data Systems, 100(8), 389-401.
- Sohail, M. S., & Hoong, T. B. (2003). TQM practices and organizational performances of SMEs in Malaysia. Benchmarking: An International Journal, 10(1), 37-53.
- Sohal, A. S., & Singh, M. (1992). Implementing advanced manufacturing technology: Factors critical to success. Logistics Information Management, 5(1), 39-46.
- Sohal, A. S., Lewis, D., & Samson, D. (1993). Integrating CNC technology and the JITkanban system: A case study. In D. J. Power & A. S. Sohal (Eds.), Technovation (Vol. 17, pp. 649-666).
- Sohal, A. S. (1996). Assessing AMT implementations: An empirical field study. Technovation, 16(8), 377-384.
- Sohal, A. S., & Terziovski, M. (2000). TQM in Australian manufacturing: Factors

- Criticalto success. International Journal of Quality & Reliability Management, 17(2), 158-167.
- Soliman, F., Clegg, S., & Tantoush, T. (2001). Critical success factors for integration of CAD/CAM systems with ERP systems. International Journal of Operations & Production Management, 21(5/6), 609-629.
- Sower, V. E., & Abshire, R. D. (2003). Successful implementation of advanced manufacturing technology: A cross sectional survey. International Journal of Computer Applications in Technology, 16(1), 12-20.
- Staggs, P. (1999). Strategic planning as a total quality management critical success factor. Journal of Organizational Leadership, 1(1), 5-17.
- Stoll, C. N., & Zubas, C. F. (1993). Total quality management: a journey. Paper presented at the Reliability and Maintainability Symposium, 1993.
- Sum, C.-C., Ang, J. S. K., & Yeo, L.-N. (1997). Contextual elements of critical Successfactors in MRP implementation. Production & Inventory Management Journal, 38(3), 77-83.
- Sum, C.-C., Quek, S.-A., & Lim, H.-E. (1999). Analyzing interaction effects on MRPimplementation using ACE. International Journal of * Production Economics, 58(3), 303-318.
- Sun, H., Hui, I. K., Tam, A. Y. K., & Frick, .1. (2000). Research and concepts: Employeeinvolvement and quality management. The TQM Magazine, 12, 350-354.
- Swamidass, P. M., & Waller, M. A. (1991). A classification of approaches to Planning and justifying new manufacturing technologies. In I. J. Chen & M. H.
- Small (Eds.), International Journal of Operations & Production Management (Vol. 16, pp. 4-24).
- Swamidass, P. M. (1993). Technology, people, and management. IEEE Spectrum, 30(9),68-69.
- Swamidass, P. M., & Nair, A. (2004). What top management thinks about the benefits ofhard and soft manufacturing technologies. IEEE Transactions on Engineering Management, 51(4), 462-471.
- Tabachnick, B. G., & Fidell, L. S. (1989). Using multivariate statistics. In S. r. M. Yusof& E. Aspinwall (Eds.), Total Quality Management (Vol. 11, pp. 449-462).
- Tamimi, N. (1998). A second-order factor analysis of critical TQM factors. International Journal of Quality Science, 3(1), 71-79.
- Taylor, W. A., & Wright, G. H. (2003). A longitudinal study of TQMimplementation: Factors influencing success and failure. Omega, 31(2), 97-111.
- Thiagaragan, T., & Zairi, M. (1998). An empirical analysis of critical factors of TQM: Aproposed tool for self-assessment and benchmarking purposes. Benchmarking for Quality Management & Technology, 5(4), 291-303.
- Thiagaraj an, T., & Zairi, M. (1997). A review of total quality management in practice: Understanding the fundamentals through examples of best practice application Part 1. The TQM Magazine, 9, 270-286.

- Thiagaragan, T., Zairi, M., & Dale, B. G. (2001). A proposed model of TQM implementation based on an empirical study of Malaysian industry. International Journal of Quality & Reliability Management, 18(3), 289-306.
- Tovey, T. (1986). Employee relations and just-in-time manufacturing techniques. In D. J. Power & A. S. Sohal (Eds.), Technovation (Vol. 17, pp. 649-666).
- Udo, G. J., & Ehie, I. C. (1996). Advanced manufacturing technologies: Determinants of implementation success. International Journal of Operations & Production Management, 16(12), 6-26.
- Udoka, S. J. (1989). An investigation into the requirements for successful Implementation of advanced manufacturing technology. Unpublished PhD Thesis, Oklahoma State University, Oklahoma.
- Umble, E. J., Haft, R. R., & Umble, M. M. (2003). Enterprise resource planning: Implementation procedures and critical success factors. European Journal of Operational Research, 146(2), 241-257.
- Voss, C. (1987). Success and failure in advanced manufacturing technology. In S. J.Udoka (Ed.), An investigation into the requirements for successful implementation of advanced manufacturing technology. Oklahoma: OklahomaStateUniversity.
- Wafa, M. A., Yasin, M. M., & Swinehart, K. (1996). The impact of supplier proximity on JIT success: An informational perspective. International Journal of Physical Distribution & Logistics Management, 26(4), 23-34.
- Wafa, M. A., & Yasin, M. M. (1998). A conceptual framework for effective implementation o JIT: An empirical investigation. International Journal of Operations & Production Management, 18(11), 1111-1124.
- Yang, T., Chen, M.-C., & Su, C.-T. (2003). Quality management practice in semiconductor manufacturing industries: Empirical studies in Taiwan. Integrated Manufacturing Systems, 14(2), 153-159.
- Yasin, M. M., Small, M. H., & Wafa, M. A. (2003). Organizational modifications Tosupport JIT implementation in manufacturing and service operations. Omega, 31(3), 213-226.
- Yasin, M. M., & Wafa, M. A. (1996). An empirical examination of factors Influencing JIT success. International Journal of Operations & Production Management, 16(1), 19-26.
- Youssef, M. A., & Zairi, M. (1995). Benchmarking critical factors for TQM Part II:Empirical results from different regions in the world. Benchmarking for Quality Management & Technology, 2(2), 3-19.
- Youssef, M. A., & Zairi, M. (1996). Benchmarking supplier partnerships in the context of advanced manufacturing technology implementation. Benchmarking for Quality Management & Technology, 3(3), 4-20.
- Yusof, S. M., & Aspinwall, E. (2000a). TQM implementation issues: Review and Casestudy. International Journal of Operations & Production Management, 20(6), 634-655.
- Yusof, S. M., & Aspinwall, E. (2000b). Critical success factors in small and Mediumenterprises: Survey results. Total Quality Management, 11(4/5 & 6), 449-462.

- Zairi, M. (1998). Supplier partnerships for effective advanced manufacturing Technologyimplementation: A proposed model. Integrated Manufacturing Systems, 9(2), 109-119.
- Zairi, M., & Youssef, M. A. (1995). Benchmarking critical factors for TQM Part I:Theory and foundations. 1995, 2(1), 5-20.
- Zaltman, G., Duncan, R., & Holbeck, J. (1973). Innovations and organizations. In M. J.Gallivan (Ed.), The .Database for Advances in Information Systems (Vol. 32, pp. 51-85).
- Zeleny, M. (1986). High technology management. In T. M. Khalil (Ed.), Management oftechnology: The key to competitiveness and wealth creation. Boston: McGraw-Hill.
- Zhao, B., Verma, A., & Kapp, B. (1992). Implementing advanced manufacturing technology in organizations: A socio-technical systems analysis. Paper presented at the Engineering Management Conference, 1992. 'Managing in a Global Environment'., 1992 IEEE International.
- Zhao, H..& Co, H. C. (1997). Adoption and implementation of advanced Manufacturingtechnology in Singapore. International Journal of Production Economics, 48(1), 7-19.
- Zhouying, J. (2004). Technological progress in history: a survey of evolution and shift ofresearch emphasis from 'hard--tech' to 'soft-tech' development. International Journal of Technology Management & Sustainable Development, 3(2), 133-148.
- Zhouying, J. (2005). Globalization, technological competitiveness and the 'catch-up'challenge for developing countries: Some lessons of experience. International Journal of Technology Management & Sustainable Development, 4(1), 35-46.

APPENDIX

QUESTIONNAIRES