

**INFLUENCING FACTORS OF MANUFACTURING CAPABILITIES
DEVELOPMENT AMONG LOCAL MANUFACTURERS IN NORTHERN
MALAYSIA**

By

MOHAMMAD HARITH BIN AMLUS

These Submitted to the Centre for Graduate Studies, Universiti Utara Malaysia
in Fulfillment of the Requirement for the Master Degree



Kolej Perniagaan
(College of Business)
Universiti Utara Malaysia

PERAKUAN KERJA TESIS / DISERTASI
(Certification of thesis / dissertation)

Kami, yang bertandatangan, memperakukan bahawa
(We, the undersigned, certify that)

MOHAMED HARITH AMLUS

calon untuk ijazah
(candidate for the degree of)

MASTER OF SCIENCE (MS.c)

telah mengemukakan tesis / disertasi yang bertajuk:
(has presented his/her thesis / dissertation of the following title):

**FACTORS INFLUENCING OF MANUFACTURING CAPABILITIES DEVELOPMENT
AMONG LOCAL MANUFACTURERS IN NORTHERN MALAYSIA**

seperti yang tercatat di muka surat tajuk dan kulit tesis / disertasi.
(as it appears on the title page and front cover of the thesis / dissertation).

Bahawa tesis/disertasi tersebut boleh diterima dari segi bentuk serta kandungan dan meliputi bidang ilmu dengan memuaskan, sebagaimana yang ditunjukkan oleh calon dalam ujian lisan yang diadakan pada : **03 Oktober 2010**

That the said thesis/dissertation is acceptable in form and content and displays a satisfactory knowledge of the field of study as demonstrated by the candidate through an oral examination held on:
03 October 2010

Pengerusi Viva
(Chairman for Viva)

: **Dr. Hijattulah Abdul Jabbar**

Tandatangan
(Signature)

Pemeriksa Luar
(External Examiner)

: **Assoc. Prof. Dr. Raja Roslan
Raja Abd. Rahman**

Tandatangan
(Signature)

Pemeriksa Dalam
(Internal Examiner)

: **Assoc. Prof. Dr. Shahimi Mokhtar**

Tandatangan
(Signature)


Tarikh: **03 Oktober 2010**
(Date)

Pelajar
(Name of Student) : **Mohamed Harith Amlus**

Tajuk Tesis
(Title of the Thesis) : **Factors Influencing of Manufacturing Capabilities Development
among Local Manufacturers in Northern Malaysia**

Program Pengajian
(Programme of Study) : **Master Of Science (MS.c)**

Nama Penyelia/Penyelia-penyelia
(Name of Supervisor/Supervisors) : **Dr. Siti Norezam Othman**


Tandatangan
(Signature)

PERMISSION TO USE

In presenting this thesis in fulfillment of the requirements for a Master of Science in Technology Management degree from Universiti Utara Malaysia, I agree that the University Library may make it freely available for inspection. I further agree that permission for copying of this thesis in any manner, in a whole or in a part, for scholarly purposes may be granted by my supervisor or, in their absence, by the Director of Graduate Study Unit. It is understood that any copying or publication or use of this thesis or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that the due recognition shall be given to me and to Universiti Utara Malaysia for any scholarly use which may be made any material from my thesis. Request for permission to copy or to make other use of materials in this thesis, in whole or in part, should be addresses to:

Director of Graduate Study Unit

Academic Affairs Department

Universiti Utara Malaysia

06010 UUM Sintok

Kedah Darul Aman

ABSTRACT

Generally, manufacturing capability is the important factor in running and developing business. Hence, this research is aimed to identifying the relationships between factors that to make sure the companies can survive among companies across industries in the northern region of Malaysia. Those identified factors are manufacturing practices, knowledge sharing and manufacturing capabilities. Other than that, the training factor moderated and enhanced companies in win to the others competitors. Through the email survey, a total of 89 companies representing various industries had responded. The hypotheses involved were tested using correlation and regression techniques. The result of the study support all the hypotheses. The multiple regression analysis indicate that there are significant relationship among the factors on each criteria to manufacturing capabilities. While hierarchical multiple regression analysis was carried out to test the role of moderating in the relationship between independent variables with dependent variables. The results of the hierarchical multiple regression indicate that training moderated the relationship between manufacturing practices, knowledge sharing to manufacturing capabilities. It is believed that results of this study will be beneficial for share holders and directors of companies to apply these manufacturing capabilities.

ABSTRAK

Secara umumnya, keupayaan pembuatan adalah faktor yang sangat penting dalam menjalankan aktiviti perniagaan. Justeru kajian ini dijalankan bagi mengenalpasti perhubungan antara faktor-faktor yang menentukan kejayaan di kalangan syarikat-syarikat semua sektor di wilayah utara Semenanjung Malaysia. Faktor-faktor yang dikenalpasti ialah amalan pembuatan, perkongsian pengetahuan dan keupayaan pembuatan. Selain itu faktor latihan turut menyederhana membantu keberjayaan dalam kejayaan syarikat-syarikat pembuatan. Melalui kaedah tinjauan melalui pos, seramai 89 orang responden yang mewakili pelbagai syarikat di pelbagai sektor telah memberikan maklumbalas. Hasil analisis korelasi menunjukkan semua hipotesis di sokong. Analisis regresi pula membuktikan bahawa terdapat kesan yang signifikan yang ditunjukkan oleh keempat-empat faktor ke atas setiap kriteria dalam membuahkan kejayaan aktiviti perniagaan. Manakala analisis regresi berganda berperingkat pula digunakan untuk menguji peranan pembolehubah penyederhana terhadap hubungan di antara pembolehubah bersandar dan pembolehubah tidak bersandar. Hasil analisis tersebut mendapati latihan bertindak mempengaruhi hubungan antara amalan pembuatan dan perkongsian pengetahuan terhadap keupayaan pembuatan. Hasil kajian ini adalah diharapkan dapat member manfaat kepada pemegang saham dan ahli lembaga pengarah syarikat-syarikat dan industri dalam mengaplikasikan faktor-faktor keupayaan pembuatan dalam pengoperasian syarikat.

TABLE OF CONTENTS

	Page
PERMISSION TO USE	i
ABSTRACT	ii
ABSTRAK	iii
ACKNOWLEDGEMENTS	iv
TABLE OF CONTENTS	v
LIST OF TABLES	vii
LIST OF FIGURES	xiii
LIST OF ABBREVIATIONS	xv
 CHAPTER 1: INTRODUCTION	
1.1 Research Background	1
1.2 Problem Statement	6
1.3 Research Questions	11
1.4 Research Objectives	11
1.5 Scope of The Study	12
1.6 Significant of The Study	13
1.7 Operational Definition	14
1.8 Thesis Structure	15
 CHAPTER 2: LITERATURE REVIEW	
2.1 Overview of manufacturing Industry	16

2.2 Manufacturing Practices In Industry	18
2.2.1 Quality Management	20
2.2.2 Time Management	21
2.2.3 Management Practices	22
2.2.4 Work Teams	22
2.2.5 Product/Process Development	23
2.2.6 Manufacturing Technology	23
2.3 Knowledge Transfer in Industry	24
2.3.1 The Process of Knowledge Transfer	27
2.3.2 Knowledge Sharing	28
2.3.3 Shared Knowledge of Customer	30
2.3.4 Shared Knowledge of Suppliers	30
2.3.5 Shared Knowledge of Internal Capabilities	31
2.3.6 Learning Ability	32
2.4 Training in Industry	33
2.4.1 Training for New Work Structure	36
2.4.2 Training for Co-Makership	37
2.4.3 New Methods and Approaches for Learning While Working	39
2.5 Manufacturing capabilities in Industry	40
2.5.1 Improvement	46
2.5.2 Innovation	46
2.5.3 Integration	46
2.5.4 Acuity	47

2.5.5 Control	48
2.5.6 Agility	48
2.5.7 Responsive	48
2.6 Theoretical Framework	50
2.7 Hypothesis Statement	50
2.8 Concluding Remarks	52
 CHAPTER 3: METHODOLOGY	
3.1 Overview	53
3.2 Item Measure Development	56
3.2.1 Manufacturing Capability Measures	57
3.2.2 Manufacturing Practices Measures	57
3.2.3 Knowledge Transfer Measures	57
3.2.4 Training Measures	58
3.3 Questionnaire Development	58
3.3.1 Construction of Initial Questionnaire	59
3.3.2 Pilot Test	61
3.3.2.1 Validity	61
3.3.2.2 Reliability	62
3.4 Survey Administration	63
3.4.1 Survey Plan	63
3.4.1.1 Targeted Population	63

3.4.1.2 Unit of Analysis and Targeted Respondent	64
3.4.1.3 Sampling Frame and Sample Size	64
3.4.2 Survey Implementation	65
3.4.3 Pilot Study	66
3.5 Data Collection	68
3.6 Method of Data Analysis	70
3.6.1 Bivariate Correlation	71
3.6.2 Multiple Regression Analysis	71
3.6.3 Hierarchical Multiple Regression Analysis	72
3.7 Concluding Remarks	73
 CHAPTER 4: FINDINGS	
4.1 Rate of Return	74
4.2 Respondent Profile	75
4.2.1 Type of Industry	76
4.2.2 Type of Companies	77
4.2.3 Size of Company	77
4.2.4 Designation Position	78
4.2.5 Year of Designation	79
4.3 Data Analysis	80
4.3.1 Test for Validity	80
4.3.2 Test for Reliability	84
4.3.3 Test for Normality	85

4.3.4 Test for Linearity and Homoscedasticity	89
4.3.5 Tests for Collinearity	92
4.4 Descriptive Analysis	93
4.5 Hypothesis Testing	95
4.5.1 Correlation Analysis	95
4.5.1.1 Hypotheses 1	96
4.5.1.2 Hypotheses 2	96
4.5.1.3 Hypotheses 3	97
4.5.1.4 Hypotheses 4	100
4.5.1.5 Hypotheses 5	100
4.5.2 Multiple Regression Analysis	102
4.5.2.1 Hypotheses 6	102
4.5.3 Hierarchical Multiple Regression Analysis	106
4.5.3.1 Testing of Hypotheses 7	108
4.6 Summary of Findings	110
4.7 Summary of Chapter	111
 CHAPTER 5: DISCUSSION AND CONCLUSION	
5.1 Discussion of The Findings	112
5.1.1 Correlation Analysis	113
5.1.2 Multiple Regression Analysis	114
5.1.3 Hierarchical Multiple Regression Analysis	117

CHAPTER 6 : CONCLUSIONS AND RECOMMENDATIONS

6.1 Implications of The Study	119
6.2 Limitations	121
6.3 Recommendations	122
6.4 Direction for Future Research	123
6.5 Conclusions	125
REFERENCES	127
APPENDICES	131
Appendix A Manufacturing Capabilities Measures	131
Appendix B Manufacturing Practices Measures	134
Appendix C Knowledge Transfer Measures	136
Appendix D Training Measures	137
Appendix E Questionnaire	138
Appendix F Descriptive Analysis	152
Appendix G Normal Probability (p) plot	160
Appendix H Multiple Regression Analysis	167
Appendix I Hierarchical Multiple Regression Analysis	169

LIST OF TABLES

		Page
Table 2.1	Components of Production Competence	40
Table 2.2	Categorization of Manufacturing Capabilities Based On Competitive Priorities Modified from Kim & Arnold 1992	41
Table 3.1	Sample Size for The Research Population	65
Table 3.2	Item Descriptions of Questionnaire Section	66
Table 3.3	Statistic Summary for Each Scale on Pilot Analysis	68
Table 4.1	Total Number of Questionnaire Distributed and Collected for Northern Region of Malaysia	75
Table 4.2	Respondents' Characteristics Based On The Type of Industry	76
Table 4.3	Respondents' Characteristics based on The Type of Company	77
Table 4.4	Respondents' Characteristics based on The Size of Company	78
Table 4.5	Respondents' Job Designation	79
Table 4.6	Respondents' Characteristics based on Length of Employment	80
Table 4.7	Results of Factor Analysis	83
Table 4.8	Cronbach's Alpha for the Study Variables	85

Table 4.9	Value (Skewness and Kurtosis)	86
Table 4.10	Shape of Distribution	87
Table 4.11	Intercorrelation Matrix for Success Factor Variables	92
Table 4.12	Testing Multicollinearity (Tolerance and VIF Values)	93
Table 4.13	Descriptive Statistics of Variables	94
Table 4.14	Correlation Coefficients Between Knowledge Transfer and The Core Manufacturing Capabilities	97
Table 4.15	Correlation Coefficients between knowledge transfer and and manufacturing capabilities.	98
Table 4.16	Correlation Coefficients between training and and manufacturing practices .	99
Table 4.17	Correlation Coefficients between training and and knowledge transfer .	100
Table 4.18	Correlation Coefficients between training and and manufacturing capabilities.	102

Table 4.19	Multiple Regression Equation	102
Table 4.20	Aggregate effect of the Independent Variables on Manufacturing Capabilities	104
Table 4.21	Influence of Independent Variables on Manufacturing Capabilities	104
Table 4.22	Hierarchical Multiple Regression Equation	106
Table 4.23	Results of Hierarchical Multiple Regression Evaluating the Core Manufacturing Capabilities	108
Table 4.24	Summary of Hypotheses Testing	109
Table 5.1	Relationship of Manufacturing Capabilities, Manufacturing Practices, Knowledge Transfer and Training	117

LIST OF FIGURES

	Page
Figure 2.1 Theoretical Framework	50
Figure 3.1 An overview of Research Process	55
Figure 4.11 Normal P-P Plot of Regression Standardized Residual	88
Figure 4.12 Scatterplot between Manufacturing Practices and Responsive	90
Figure 4.13 Scatterplot between Standardized Residual of Responsive and Standardized Predicted Values of Manufacturing Capabilities	91

LIST OF ABBREVIATIONS

i.	MIDA	Malaysian Industrial Development Authority
ii.	SME	Small Medium Entrepreneur
iii.	RBV	Resource Based View
iv.	ICT	Information and Communication Technology
v.	GDP	Gross Domestic Products
vi.	NIE	Newly-Industrialized Economy
vii.	R&D	Research and Development
viii.	CAD	Computer Aided Design
ix.	ASRS	Automated Storage and Retrieval System
x.	OTD	On Time Delivery
xi.	OFLT	Order Fulfillment Lead Time
xii.	IPD	Integrated Product Development
xiii.	CD-I	Computer Designed Interactive
xiv.	FMM	Federation of Malaysian manufacturers
xv.	SPSS	Statistical Package for The Social Science
xvi.	KMO	Kaiser-Meyer-Olkin
xvii.	SMIDEC	Small and Medium Industries Development Corporation

CHAPTER 1

INTRODUCTION

This chapter is consists of six major sections namely (i) background of study (ii) statement of research problem (iii) research objectives (iv) contribution of the study (v) scope of study (vi) scope of the study and (vii) thesis structure. The purpose of this first chapter is to introduce the context of the research and the structure of the thesis, which explains briefly the contents of the subsequent chapters.

1.1 Research Background

The manufacturing sector is an important contributor to the economic growth and development of Malaysia which accounts for 31.6% of Malaysia's gross domestic product and exports of manufactured goods make up 78.4% of the country's total exports (MIDA,2005). One of the critical missions of the Ninth Malaysia Plan is to further move all sectors of the economy up the value chain. One of the key sectors being targeted by the Ninth Plan is the manufacturing sector. The Plan will continue to focus on enhancing the capability of the manufacturing sector to meet the competitive global environment.

The contents of
the thesis is for
internal user
only

REFERENCES

- Abernathy, W. U., J. (1975). Dynamic Model of Process and Product Innovation. *Omega* 3, 6, 639-657.
- Abernathy, W. U., J. . (1978). Patterns of Industrial Innovation. *Technology Review*, 2, 40-47.
- Adler, P. S., Goldoftas, B. & Levine, D.I. (1999). Flexibility versus Efficiency? A Case Study of Model Changeovers in the Toyota Production System. *Organisation Science*, 10(1), 43-68.
- Amundson, S. D. (1998). Relationships between Theory-Driven Empirical Research in Operations Management and Other Disciplines. *Journal of Operations Management*, 16, 341-359.
- Appelqvist, P. V., S. . (2004). Focused manufacturing versus economies of scope – A case study in consumer electronics industry.
- Baines, T. S., Hamblin, D.J. & Harrison, D.K. . (1993). A Unified Classification of Manufacturing Strategies and Design Processes. *Engineering Management Journal* 281-286.
- Banker, R. D., Bardhan, B., Chang, C.C. & Lin Y.K. . (2006). Plant Information systems, manufacturing capabilities and plant performance. *MIS Quaterly* 30(2), 315-317.
- Barnes, D. (2001). Research Methods for the Empirical Investigation of the Process of Formation of Operations strategy. *International Journal of Operations & Production Management*, 21(8), 1076-1095.
- Barnes, F. E. R. a. D. (2004). A questionnaire operating Hayes and Wheelwright's four-stage concept. *Journal Of Manufacturing Technology Management*, , 15(7), 651-661.
- Barney, J. B. (1991). Firm Resources and the Theory of Competitive Advantages. *Journal of Management* 17(1), 99-120.
- Bates, K. A., & Flynn, E. J. . (1995). Innovation history and competitive advantage: A resource-base-view analysis of manufacturing technology innovations. 235-239.
- Beach, R., Muhlemann, A.P., Price, D.H.R., Paterson, A. & Sharp, J.A. . (2000). Manufacturing Operations and Strategic Flexibility: Survey and Cases. *International Journal of Operations & Production Management*, 20(1), 7-30.
- Beinhocker, E. (2006). The Origin of Wealth: Evolution, Complexity, and the Radical Remaking of Economics. *Harvard Business School Press*.
- Bolden, R., Waterson, P., Warr, P., Clegg, C., & Wall, T. . (1997). A new taxonomy of modern manufacturing practices. *International Journal of Operations & Production Management*, 17(11), 1112-1130.
- Brown, S. (1996). Strategic Manufacturing for Competitive Advantage.
- Brown, S. B., J. . (2003). The Manufacturing Strategy-Capabilities Links in Mass-Customisation and Agile Manufacturing – An Exploratory Study. *International Journal of Operations and Production Management* 23(7), 707-730.
- Callahan, T. D., B. . (2005). Learning and linkages : The management of captive asic design and manufacturing capability. *Technology Management III, Proceedings of the Third International Conference on Management of Technology, Institute of Industrial Engineers*, 442-447.

- Cheng, C., Simmons, A. & Ritchie J (1997). Manufacturing system flexibility: the “capability and capacity” approach. *Integrated Manufacturing System*, 8(3), 147-158.
- Chiesa, V. M., R. . (1998). Towards a Framework for Dynamic Technology Strategy. *Technology Analysis & Strategic Management* 10(1), 111-129.
- Clark, K. B. (1996). Competing Through Manufacturing and the New Manufacturing Paradigm: Is Manufacturing Strategy Pass? *Production and Operations Management*, 5(1), 42-58.
- Coates, T. T. M., C.M. . (2002). An Exploratory Analysis of New Competences: a Resource-Based View. *Journal of Operations Management* 20(5), 435-450.
- Cohen, W. M. L., D.A. Absorptive Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly* 35(128-152).
- Collis, D. J. (1994). Research note: How Valuable Are Organisational Capabilities? *Strategic Management Journal* 143-152, 15.
- Corporation, M. E. T. D. (2005). Malaysia heavy Vehicles & Machinery Directory.
- Creswell, J. W. (2003). Research Design. Qualitative, Quantitative, and Mixed Methods Approaches.
- Dankbaar, B. (1999). Training Issues for the European automotive industry. *Innovation and Commercial Training*, 31(3).
- Dufficy, M. (2001). Training for success in a new industrial world *Industrial and Commercial Training*, 33(2), 45-53.
- Gao, G., Zhang, Y., Liu S. . (2007). Competing with MNE's: developing manufacturing capabilities or innovation capabilities. *Springer Science Business Media*, 32(87-107).
- Grobler, A. (2007). A dynamic view on strategic resources and capabilities applied to an manufacturing strategy literature *Journal Of Manufacturing Technology Management*, 18(3).
- Grobler, A. G., A. . (2006). An empirical model of the relationships between manufacturing capabilities. . *International Journal of Operations & Production Management* 26(5).
- Haifeng, G., Yezhuang, T., & Zhandong, L. . (2006). An empirical analysis on relationships of manufacturing practices and manufacturing capabilities. *Paper presented at the International Conference on Management of Innovation and Technology*.
- Hilmola. (2006). Stock market performance and manufacturing capability of the fifth long-cycle industries. 393-407.
- International, S. Q. (2005). Sirim Qas Directory of certified Products and Companies.
- International, S. Q. (2005). SIRIM Qas Directory International Directory of certified Products and companies 2005.
- Jackson, P. R. (1999). The impact of just-in-time on job content, employee attitudes and well being: a longitudinal study. *Ergonomics*.
- Kremp, E., & Mairesse, J. . (2002). Knowledge Management in the Manufacturing Industry an Asset for Inovation.
- Kwasi Amoako-Gyampah, J. R. M. (2007). Examining cumulative capabilities in a developing economy. *International Journal of Operations & Production Management*, 27(9), 928-950.
- Leung, S. L. L. (2004). Strategic manufacturing capability pursuance : a conceptual framework. *Benchmarking: An International Journal*, 11(2).
- Li, X. (2000). Manufacturing Capability development in a changing business environment. *Industrial Management & Data Systems*, 100(6), 261-270.

- Lukas, T. B., J. (2000). Strategic market position and R&D capability in global manufacturing industries – implications for organizational learning and organizational memory. *Industrial Marketing Management*, 29(6), 565-574.
- MacNeil, S. (2000). Developments in the automotive Industry 2000-2015. *Center for Urban and Regional Studies, University of Birmingham*.
- Makadok, R. (2001). Toward a Synthesis of the resource-based and Dynamic-capability Views of Rent Creation. *Strategic Management Journal* 22, 387-401.
- Manufacturers, F. O. M. (2009). FMM Directory 2009 Malaysian Industries 39th edition.
- Mason, G. (1999). Engineering Skills formation in Britain:cyclical and structural issues *Skills Task Force Research Paper*, 7.
- Matthew B. Miles, A. M. H. (194). An Expanded Sourcebook:Qualitative Data Analysis.
- Mikko Ketokivi, R. S. (2004). Manufacturing Practices,stratagic fit and performance:A routine-based view. *International Journal of Operations & Production Management*, 24(2), 171-191.
- Narasimhan, T., Swink, S. & Kim, D (2005). An exploratory study of manufacturing practice and performance interrelationships, Implications for capability progression. *International Journal of Operations & Production Management*, 25(10), 1013-1033.
- Piaw, C. Y. (2006). Asas Statistik Penyelidikan.
- R, H. B. D. (2001). Development in the Learning Factory:Training Human Capital. *Journal of European Industrial Training*, 234-267.
- Robert H. Carver, J. G. N. (2006). Doing Data Analysis with SPSS version 14.
- Robert Y. Cavana, B. L. D., Uma Sekaran. (2001). Applied Business Research:Qualitative and Quantitative Methods.
- Roberts, K. (2003). What Strategic Investments shoul you make during a recession to gain competitive advantage in the recovery? *Strategy's Leadership*, 31(4), 31-39.
- Roger, G. S., & Kimberly, A. (2002). Resource-base View of Performance. *Strategic Management Journal*, 23, 105-117.
- Sheridan J Coakes, L. S. (2007). SPSS 14.0 Analysis without Anguish.
- Sohal, M., Gordon, M, Fuller, T & Simon, K. (1999). Manufacturing practices and compatibility : An Australian study. *Technovation*, 19(5), 295 - 304.
- Swink, M., & Way, M. H. (1995). Manufacturing Strategy: propositions, current research, renewed directions. *International Journal of Operations & Production Management* 15(7), 4-26.
- Swink, M. H., M (1998). Core manufacturing capabilities and their links to product differentiation. *International Journal of Operations & Production Management*, 18(4), 374-396.
- Teece D.J., G. P., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509-533.
- Voss, C. A. (1993). Made In Britain. *London Business School, London*.
- White, G. (1996). A meta- analysis model of manufacturing capabilities. *Journal of Operation Management*, 14(4), 315-331.
- Woodcock, D. (1996). How skills development affects manufacturing's competitive capability. *Integrated Manufacturing Systems Journal*, 7(1), 38-45.
- Yang, B., Burns, N.D. & Backhouse, C.J (2004). Postponement: A Review and Integrated Framework. *International Journal of Operations & Production Management*, 24(5), 468-487.

Zikmund, W. G. (2000). Business Research Methods. *Ford Worth: The dryden Press.*