

**THE DETERMINANTS OF FIRMS' INNOVATIVENESS
ON CONSTRUCTION TECHNOLOGY
IN MALAYSIAN HEAVY CONSTRUCTION SECTOR**

NG WENG SENG

**DOCTOR OF BUSINESS ADMINISTRATION
UNIVERSITI UTARA MALAYSIA
November 2012**

**THE DETERMINANTS OF FIRMS' INNOVATIVENESS
ON CONSTRUCTION TECHNOLOGY
IN MALAYSIAN HEAVY CONSTRUCTION SECTOR**

By

NG WENG SENG

**Dissertation Submitted to
Othman Yeop Abdullah Graduate School of Business
Universiti Utara Malaysia
in Partial Fulfillment of the Requirement for the Degree of
Doctor of Business Administration**

PERMISSION TO USE

In presenting this project paper in partial fulfillment of the requirements for a Post Graduate degree from 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 of this dissertation in any manner, in whole or in part, for scholarly purpose may be granted by my supervisor(s) or in their absence, by the Dean of Othman Yeop Abdullah Graduate School of Business where I did my dissertation. It is understood that any copying or publication 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 from my dissertation.

Request for permission to copy or make other use of materials in this dissertation 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

ABSTRACT

The peculiar characteristics of constructed products significantly differentiate construction from manufacturing. Past researches seem have been given greatest attention and concentration to the innovation in manufacturing sector. This research assesses the determinants of firm's innovativeness in construction sector, which has been neglected by researchers despite its immense importance to the technological advancement in affecting the degree of innovation implementation and adoption. A total of fourteen hypotheses were developed and tested. These hypotheses are established within the context of heavy construction sector characteristics that are consistently suggested to be significant determinants of firm innovativeness. These characteristics include (1) market structure characteristics, (2) organisation and task characteristics, (3) adopter industry competitive environment, and (4) external cooperation linkage. This study has reviewed the problem of determinants of firms' innovativeness in technological innovation the Malaysian heavy construction sector to meet the three outlined objectives. Hypotheses were tested utilising survey data collect from Malaysia Construction Industry Development Board, CIDB Grade 7 construction firms throughout the Malaysia. The relationships of the identified four domains were discussed in this research. The results indicate that adopter industry competitive environment and external cooperation linkage are among the variables that significantly affect the degree of innovation implementation and adoption. Results also indicate that 13 out of 14 hypotheses are supported and positively affecting the degree of innovation implementation and adoption. Lastly, a new model closely reflects the essence of the determinants of firm's innovativeness in heavy construction sector was formulated. Therefore, the results suggest that increasing the rate of innovation implementation and adoption may be enhanced to a greater degree by increasing adopter industry competitive environment and external linkage rather than implementing market structure environment characteristics or organisation and task characteristics. This research has value and has advanced knowledge in construction industry, especially, and hence the aim has successfully attained.

Keywords: Innovation, Construction Technological Innovation, Determinants of Firms' Innovativeness, Heavy Construction Sectors, Modeling

ABSTRAK

Perbezaan yang ketara antara pembinaan dengan pembuatan dapat diperlihat melalui ciri-ciri istimewa pada produk yang terhasil. Melalui penyelidikan sebelum ini, pengamatan dan pemerhatian terhadap inovasi hanya diberi pengkhususan pada sektor pembuatan. Tujuan kajian ini adalah untuk menilai penentu tahap inovasi sesuatu firma dalam sektor pembinaan, dimana ianya sering diabaikan oleh para penyelidik walaupun terdapat kepentingan ketara terhadap pembangunan kemajuan teknologi dalam mempengaruhi tahap implimentasi dan adaptasi sesuatu inovasi. Sebanyak 14 hipotesis telah dimajukan dan diuji. Hipotesis-hipotesis ini dikenalpasti dalam konteks sektor pembinaan berat yang konsisten untuk dijadikan sebagai penentu inovasi yang penting bagi sesuatu firma. Ciri-ciri kajian ini merangkumi (1) ciri-ciri struktur pasaran, (2) ciri-ciri organisasi dan tugas, (3) adaptasi industri terhadap persaingan persekitaran, dan (4) rangkaian kerjasama luar. Hipotesis ini telah diuji dengan menggunakan data terkumpul dari firma-firma pembinaan di seluruh Malaysia yang berdaftar dengan Lembaga Pembinaan dan Pembangunan Industri Malaysia (CIDB) sebagai kontraktor Gred 7. Penyelidikan ini mengkaji masalah penentuan inovasi sesuatu firma dalam penggunaan inovasi teknologi bagi sektor pembinaan berat di Malaysia untuk memenuhi tiga objektif yang telah digariskan. Hubungan diantara empat faktor yang dikenalpasti telah dibincangkan dalam kajian ini. Keputusan kajian menunjukkan bahawa adaptasi industri terhadap persekitaran yang kompetitif dan rangkaian kerjasama dengan agensi luar adalah antara pembolehubah yang mempengaruhi tahap pelaksanaan inovasi secara signifikan. Keputusan-keputusan dari kajian juga menunjukkan bahawa 13 daripada 14 keseluruhan hipotesis-hipotesis disokong dan mempengaruhi tahap pelaksanaan and adaptasi inovasi dengan positif. Akhir sekali, kajian ini telah dapat penemuan model baru yang paling tepat mencerminkan intipati penentu inovasi sesuatu firma dalam sektor pembinaan berat. Oleh yang demikian, hasil kajian mencadangkan bahawa peningkatan kadar pelaksanaan dan adaptasi boleh ditambahbaik ke tahap yang lebih tinggi dengan meningkatkan adaptasi industri persekitaran persaingan yang kompetitif dan rangkaian luar berbanding melaksanakan ciri-ciri persekitaran pasaran struktur atau ciri-ciri organisasi dan sifat sesuatu tugas. Kajian ini memperlihatkan nilai dan memberi pengetahuan yang lebih lanjut dalam industri pembinaan. Dengan itu, tujuan kajian ini telah tercapai dengan jaya dan sempurna.

Katakunci: Inovasi, Inovasi Teknologi Pembinaan, Penentu Kadar Inovasi Firma-firma, Sektor Pembinaan Berat, Model

PUBLICATIONS FROM THIS RESEARCH

The following papers have been produced from the research reported in this dissertation:

Seng, N. W., Kumar, M. D., & Mohtar, S. (2012). Creativity and innovation in design and build consortium. *International Journal for Management Research and Engineering*. Retrieved July 2012, retrievable from [http:// www.ijmre.com](http://www.ijmre.com).

Seng, N. W., Kumar, M. D., & Mohtar, S. (2012). Determinants of firm's innovativeness and innovation adoption in Malaysian heavy construction. *International Journal of Management and Social Sciences*, 2(8), 47-61.

Seng, N. W., Kumar, M. D., & Mohtar, S. (2012). The systematic modeling approach for firms' innovativeness in Malaysian heavy construction sector. *International Journal for Management Research and Engineering*. Retrieved July 2012, retrievable from [http:// www.ijmre.com](http://www.ijmre.com).

Seng, N.W., & Mohtar, S. (2012). *Modeling the determinants of firms' innovativeness on construction technology in Malaysian heavy construction sector*. Proceedings of the 3rd international conference on technology and operations management: Sustaining competitiveness through green technology management, Bandung, Indonesia (July 4-6), 465-474.

Kumar, M. D., Mohtar, S., & Seng, N. W. (2012). Innovation: Adoption and implementation in Malaysian heavy construction sector. *International Journal of Commerce and Behavioral Science*, 2(1), Retrieved October 1st, 2012, retrievable from [http://www.theinternationaljournal.org/ojs/index.php?journal=rjcb&page=issue&op=view&path\[\]=60&path\[\]=showToc](http://www.theinternationaljournal.org/ojs/index.php?journal=rjcb&page=issue&op=view&path[]=60&path[]=showToc).

DEDICATION

*I dedicated this dissertation to my **Mum** and **Dad** for nursing me with affections and their dedicated partnership for success in my life.*

This Dissertation is also in debt to my wife, Tan Mee Teng. Her hours of work in loving our children, enabled the hours of research, contemplation, and writing necessary to complete this research. She is my “excellent wife, worth more than jewels”. Please continue to help me to care and deliver more lovely children.

Thank all for your everlasting love, care, support ...

ACKNOWLEDGMENTS

This dissertation would not have been possible without the contribution from several individual. Hence, I wish to present my appreciation to all those who extended their support to many different ways. I would firstly like to thank Associate Professor Dr. Shahimi Mohtar as a great mentor throughout the whole research journey. I am very grateful for his advice, encouragement, challenging questions and sacrifice. I was very fortune to be under his supervision, as he embraced every responsibility of a principal supervisor to guide my research.

This dissertation would not have been finished without endless support, encouragement, and love of my family. My deepest appreciation is given to my great PARENTS who have always inspired me on my academy advancement. I will always assure that both of you are proud with my life achievement in the past, now and future. Whatsoever merits are absolutely for both of you. I also wish to express my sincere thank to my wife, Tan Mee Teng and my lovely daughter Ng Kher Er for their continuous encouragement and support throughout this journey. Never forget, Tong and Ern who has been inspired me and accompany me all the while on together academy development. I love you all.

Thank also Madam Tham LB for without her early inspiration, coaching and enthusiasm none of this would have happen. You are truly my great supporter in the academic excellence and continuous advancement.

I love you all.

TABLE OF CONTENTS

TITLE PAGE	i
CERTIFICATION OF DISSERTATION	ii
PERMISSION TO USE	iv
ABSTRACT	v
ABSTRAK	vi
PUBLICATIONS FROM THIS RESEARCH	vii
DEDICATION	viii
ACKNOWLEDGMENTS	ix
TABLE OF CONTENTS	x
LIST OF TABLES	xv
LIST OF FIGURES	xvii
LIST OF EQUATIONS	xviii
LIST OF ABBREVIATIONS	xx
LIST OF APPENDICES	xxi
REFERENCES	208
CHAPTER ONE: INTRODUCTION	1
1.1 Introduction	1
1.2 Background of the Study	1
1.3 Problem Statement	6
1.4 Research Question	13
1.5 Research Objective	15
1.6 Scope of Work	15
1.7 Definition of Terms	17
1.8 Organisation of the Dissertation	19
CHAPTER TWO: LITERATURE REVIEW	21
2.1 Introduction	21
2.2 Definition of Innovation	21
2.2.1 Types of Innovation	22

2.2.2	Stages of Innovation	23
2.2.3	Levels of Analysis	23
2.3	Determination for Firm Innovativeness	24
2.3.1	Market Structure Characteristics	25
2.3.1.1	Industry Fragmentation	25
2.3.1.2	Operation Location	30
2.3.1.3	Firm Size	32
2.3.2	Organisation and Task Characteristics	38
2.3.2.1	Types of Constructions	38
2.3.2.2	Presence of Trade Unions	39
2.3.2.3	Professional and Trade Association Affiliations	43
2.3.2.4	Complexity (Purchase and Use)	49
2.3.2.5	Management Intensity	50
2.3.2.6	Experience in Construction Industry	52
2.3.3	Adopter Industry Competitive Environment	54
2.3.3.1	Perceived Environmental Uncertainty	54
2.3.3.2	Competitive Rivalry	58
2.3.4	External Linkages	62
2.3.4.1	Firm-University Cooperation	62
2.3.4.2	Firm-Research Center Cooperation	64
2.3.4.3	Firm-Government Cooperation	65
2.4	Underpinning Theories	66
2.4.1	Rogers' Initial Innovation Diffusion Model	67
2.4.2	Rogers' Refined Innovation Diffusion Model	70

2.4.3	The Classic Model of the Innovation Diffusion Process	71
2.4.4	Organizations and the Classic Model of the Innovation Diffusion Process	75
CHAPTER THREE: METHODOLOGY		77
3.1	Introduction	77
3.2	Research Framework	78
3.3	Hypotheses	79
3.4	Research Design	81
3.4.1	Unit of Analysis	82
3.4.2	Survey Methodology	82
3.4.3	Sample Selection	83
3.4.4	Survey Sample Size	83
3.4.5	Survey Development and Execution	84
3.4.5.1	Dependent Variable	87
3.4.5.2	Independent Variable	88
3.5	Data Analysis Methodology	95
3.5.1	Response Rate and Nonresponse Bias	96
3.5.2	Data Screening	96
3.5.3	Reliability and Validity	97
3.5.4	Correlation Analysis	98
3.5.5	Factor Analysis	99
3.5.5.1	Principal Component Analysis	100
3.5.5.2	Multiple Regression Analysis	106

CHAPTER FOUR: RESULTS AND DISCUSSION	117
4.1 Introduction	117
4.2 Response Rate and Nonresponse Bias	117
4.3 Data Screening	118
4.4 Profile of the Respondents	119
4.5 Reliability and Validity	125
4.6 Descriptive Analysis	125
4.7 Inferential Statistics	127
4.7.1 Correlation Analysis	128
4.7.2 Multiple Regression Analysis	133
4.8 Hypotheses Testing	139
4.9 Principal Component Analysis (PCA)	155
4.10 MRA - Model with Components or Factors	164
4.11 Conclusion	168
CHAPTER FIVE: CONCLUSION AND RECOMMENDATION	170
5.1 Introduction	170
5.2 Overview of the Study	170
5.3 Summary of the Research Findings	172
5.4. Implications	176
5.4.1 Theoretical Implications	177
5.4.2 Practical Implications	180
5.5 Limitations of the Study	182

5.6	Recommendations for Further Researches	185
5.7	Conclusion	187

LIST OF TABLES

Table	Title	Page
2.1	Advantages and disadvantages associated with large and small firms in innovation adoption	37
2.2	Characteristics of product and process innovations that influence their rate of adoption	70
3.1	Summary of the hypothesised determinants of firms' innovativeness in the construction industry	80
3.2	Analysis of CIDB contractor registration	85
4.1	Level of position	119
4.2	Working department	121
4.3	Category of registration	122
4.4	Gross annual revenue	124
4.5	Summary of Cronbach's Alpha	126
4.6	Descriptive analysis	128
4.7	Correlation analysis	130
4.8	Results of regression analysis for market structure characteristics	134
4.9	Results of regression analysis for organization and task characteristics	135
4.10	Results of regression analysis for adopter industry competitive environment	136
4.11	Results of regression analysis for external cooperation linkage	138
4.12	Results of regression analysis for industrial fragmentation	139
4.13	Results of regression analysis for operation location	141
4.14	Results of regression analysis for firm size	142
4.15	Result of regression analysis for types of construction	143

Table	Title	Page
4.16	Results of regression analysis for presence of trade unions	144
4.17	Results of regression analysis for professional trade association	145
4.18	Result of regression analysis for complexity in purchase and use	146
4.19	Results of regression analysis for management intensity	147
4.20	Results of regression analysis for experience in construction	148
4.21	Results of regression analysis for perceived environmental uncertainty	150
4.22	Results of regression analysis for competitive rivalry	151
4.23	Results of regression analysis for firm-university cooperation	152
4.24	Results of regression analysis for firm-research center cooperation	153
4.25	Results of regression analysis for firm-government cooperation	154
4.26	Results of KMO and Bartlett's test	158
4.27	Component Matrix	159
4.28	Rotated component matrix	162
4.29	Output of regression analysis with components	166

LIST OF FIGURES

Figure	Title	Page
2.1	Elemental components of Rogers' initial model of the innovation diffusion process	69
2.2	Elemental components of Rogers' refined classical model of the innovation diffusion process	72
2.3	Elemental components of Rogers' "classic" innovation diffusion model for organizations	76
4.1	Distribution of level of position	120
4.2	Distribution of working department	121
4.3	Distribution of category of registration	123
4.4	Distribution of the firms' gross annual revenue	124

LIST OF EQUATION

Equation	Title	Page
3.1	Sample Size	84
3.2	Model for the i th Standardized Variable in X_i	101
3.3	General Expression for the Estimate of the j th in Factor F_j	102
3.4	Multiple Regression Analysis	107
4.1	Regression for Construction Firms' Innovativeness and Market Structure Characteristics	133
4.2	Regression for Construction Firms' Innovativeness and Organisation and Task Characteristics	135
4.3	Regression for Construction Firms' Innovativeness and Adopter Industry Competitive Environment	136
4.4	Regression for Construction Firms' Innovativeness and External Cooperation Linkage	137
4.5	Regression for Hypothesis 1	140
4.6	Regression for Hypothesis 2	141
4.7	Regression for Hypothesis 3	142
4.8	Regression for Hypothesis 4	143
4.9	Regression for Hypothesis 5	144
4.10	Regression for Hypothesis 6	145
4.11	Regression for Hypothesis 7	147
4.12	Regression for Hypothesis 8	148
4.13	Regression for Hypothesis 9	149
4.14	Regression for Hypothesis 10	150
4.15	Regression for Hypothesis 11	151

Equation	Title	Page
4.16	Regression for Hypothesis 12	152
4.17	Regression for Hypothesis 13	153
4.18	Regression for Hypothesis 14	154
4.19	Model for Implementation and Adoption of Technology Innovation in Heavy Construction Sector	165

LIST OF ABBREVIATIONS

AICE	Adopter Industry Competitive Environment
CFI	Construction Firms' Innovativeness
CIDB	Construction Industry Development Board
Comp	Complexity in Purchase and Use
CR	Competitive Rivalry
ECL	External Cooperation Linkage
EIC	Experience in Construction
FGC	Firm-Government Cooperation
FRCC	Firm-Research Center Cooperation
FS	Firm Size
FUC	Firm-University Cooperation
IF	Industrial Fragmentation
MI	Management Intensity
MRA	Multiple Regression Analysis
MSC	Market Structure Characteristics
OL	Operation Location
OTC	Organisation and Task Characteristics
PCA	Principal Component Analysis
PEU	Perceived Environmental Uncertainties
PTA	Professional and Trade Association Affiliation
PTU	Presence of Trade Unions
R&D	Research and Development
SPSS	Statistical Package for Social Science
TOC	Types of Construction

LIST OF APPENDICES

Appendix	Title	Page
1	Questionnaire	208
2	Pilot Test	217
3	Frequencies Analysis	229
4	Normality Test	233
5	Reliability Test	252
6	Descriptive Analysis	265
7	Correlations Analysis	266
8	Regression Analysis	283
9	Factor Analysis	296

CHAPTER ONE: INTRODUCTION

1.1 INTRODUCTION

This chapter provides an overview of the background of the study, problem statement, research question, research objective, scope of work, definition of terms used in this study and organisation of the dissertation.

1.2 BACKGRUND OF THE STUDY

Malaysia has been experiencing a massive surge of construction activity with the construction boom reaching its climax at the turn of the 2010s. Examples of heavy construction projects delivered includes, but not limited to, North-South Highway, Kuala Lumpur International Airport (KLIA), Malaysia-Singapore Second Link, Electrified Double Tracking Project (EDTP), Second Penang Bridge, Mechanical Railway Transit Project (MRT), Light Railway Transit Project (LRT) and many more. The Malaysian construction industry has been one of the greatest contributors to the Gross Domestic Product (GDP). Advancement in technology is an integral part of Malaysia's growth as an industrialised country. However, the firms' innovativeness in technological innovation in construction has virtually been given relatively less attention and neglected as a viable area for investigation and research in most of the countries (Holt, 2010). In contrast, the firms' innovativeness in technological change in manufacturing industries has received more attention from the industry and the research communities.

Budiawan & Sidwell (2004), Manley (2006), Brochner (2008), Kristian (2010), Hardie (2010), and Aouad, Ozorhon, & Abbott. (2010) are few examples of the

The contents of
the thesis is for
internal user
only

REFERENCES

- Abdullah, A.A. (1991). *Technology adoption and innovation patterns in construction industry in Saudi Arabia: An exploratory study*. Ph.D. Dissertation, Austin: University of Texas
- Abernathy, William J., & Utterback, J.M. (1978). Patterns of industrial innovation. *Technology Review*, 80, 40-47.
- Abernathy, William J., & Wayne, K. (1974). Limits of the learning curve. *Harvard Business Review*, 52, 109-119.
- Abernathy, William J., Clark, K. B. Clark, & Kantrow, A. M. (1983). *Industrial renaissance: Producing a positive future for America*. New York: Basic Books.
- Abrahamson, Eric, & Rosenkopf, L. (1993). Institutional and competitive bandwagons: Using mathematical modeling as a tool to explore innovation diffusion. *Academy of Management Review*, 18(7), 487-517.
- Acha, V., Gann, D., & Salter, A. J. (2005). Episodic innovation: R and D strategies for project-based environments. *Industry and Innovation*, 12(2), 255-281.
- Acs, Z.J., & Audretsch, D.B. (1988). Innovation and firm size in manufacturing. *Technovation*, 7(3), 197-210.
- Acs, Zoltan J., & David, B. A. (1987). Innovation, market structure, and firm size. *The Review of Economics and Statistics*, 69 (11), 567-574.
- Aldrich, H. E. (1979). *Organisations and environments*. Englewood Cliffs, New Jersey: Prentice-Hall.
- Al-Jarallah, M. I. (1983). Construction industry in Saudi Arabia. *Journal of Construction Engineering and Management*, 109(4), 355-369.
- Allen, S. G. (1985). *Why construction industry productivity is declining*. Working Paper Series No. 1555, Cambridge, Massachusetts: National Bureau of Economic Research.
- Al-Saleh, F. S. (1980). *A case study and evaluation of a technological delivery system: construction management in Saudi Arabia*. Dissertation, Seattle, WA: University of Washington.
- Andersson, N., & Widén, K. (2005). Construction innovation systems - A sector approach. *Conference proceedings of combining forces - Advancing facilities management and construction through innovation*. Helsinki, VTT, 203-213.
- Andriopoulos, C. (2001). Determinants of organisational creativity: a literature review. *Management Decision*, 39(10), 834-840.
- Aouad, A., Ozorhon, B., & Abbott, C. (2010). Facilitating innovation in construction. *Construction innovation* 10(4), 374-394.
- Aouad, G., Ozorhon, B., & Abbott, C. (2010). Facilitating innovation in construction; Directions and implications for research and policy. *Construction innovation*, 10(4), 374-394.
- Arioglu, N. (1996). A procedure for selecting building product. *International Journal for Housing Science and Its Applications*, 20(1), 49-55.
- Arthur D. L. (1985). *From vision to reality: Managing innovation*. Cambridge, MA: Arthur D. Little, Inc.

- Arto, K., & Martinsuo, M. (2008). Project strategy: strategy types and their contents in innovation projects. *International Journal of Managing Projects in Business*, 1, 48-70.
- Atkin, B. (1988). *Intelligent buildings: applications of IT and building automation to high technology construction projects*. New York: J. Wiley.
- Atuahene-Gima, K. (1995). An exploratory analysis of the impact of market orientation on new product performance. *Journal of Product Innovation Management*, 12(9), 275-293.
- Atuahene-Gima, K. (1996). Differential potency of factors affecting innovation performance in manufacturing and services firms in Australia. *Journal of Product Innovation Management*, 13(1), 35-52.
- Australian Construction Industry Foundation (2002). *Innovation in the Australian building and construction industry: A study report*. Retrieved April 19, 2004, from <http://www.acea.aust.com/issues/ACIFsurvey.pdf>
- Baldrige, J. V., & Robert A. B. (1975). Organisational innovation: individual, organisational, and environmental impacts. *Administrative Science Quarterly*, 20(6), 165-176.
- Barrett, P., & Sexton, M. (2006) Innovation in small, project-based construction firms. *British Journal of Management*, 17, 331–346.
- Bart A. G. B. (2004). Effectiveness of innovation leadership styles: A manager's influence on ecological innovation in construction projects. *Journal of Construction Innovation*, 4(4), 211-228.
- Baumol, W. J. (1992). Horizontal collusion and innovation. *Economic Journal*, 102(1), 129-137.
- Benvignati, A. M. (1982). Interfirm adoption of capital-goods innovations. *Review of Economics and Statistics*, 64(5), 330-335.
- Berk, R. (1979). Generalizability of behavioral observations: A clarification of interobserver agreement and interobserver reliability. *American Journal of Mental Deficiency*, 83(5), 460-472.
- Bernstein, H. M., Kissinger, J. P., & Kirksey, W. (1998). Moving innovation into practice. *Proceedings of the 1st International Civil Engineering Conference, February 19-20, Manila, Philippines*, 250-259.
- Betcherman, G. (1991). The effect of unions on the innovative behaviour of firms in Canada. *Industrial Relations Review*, 22 (Summer), 142-151.
- Betz, F. L. (1987). *Managing Technology*. Englewood Cliffs, NJ: Prentice-Hall.
- Bhattacharyya, S. (2011). Creativity and innovation for competitive excellence in organisations. *Conference on global competition and competitiveness of Indian corporate*. 53-62
- Bigoness, W. J., & William D. P. (1981). A conceptual paradigm and approach for the study of innovators. *Academy of Management Journal*, 24(3), 68-82.
- Bingham, R. D, Brett W. H., John P. F., & Mary P. L. (1981). *Professional associations and municipal innovation*. Madison, Wisconsin: University of Wisconsin Press.
- Blau, Judith R., & McKinley, W. (1979). Ideas, complexity, and innovation. *Administrative Science Quarterly*, 24(6), 200-219.

- Bogers, M. (2011). The open innovation paradox: knowledge sharing and protection in R and D collaborations. *European Journal of Innovation Management*, 14, 93-117.
- Bossink, B. A. G. (2002a). A Dutch public-private strategy for innovation in sustainable construction. *Construction Management and Economics*, 20(7), 633-642.
- Bossink, B. A. G. (2002b). Innovative quality management practices in the Dutch construction industry. *International Journal of Quality and Reliability Management*, 19(2), 170-186.
- Bossink, B. A. G. (2002c). The development of co-innovation strategies: stages and interaction patterns in interfirm innovation. *R and D Management*, 32(4), 311-320.
- Bossink, B. A. G. (2002d). The strategic function of quality in the management of innovation. *Total Quality Management*, 13(2), 195-205.
- Brand, M. J. & Huizingh, E. (2008). Into the drivers of innovation adoption: What is the impact of the current level of adoption? *European Journal of Innovation Management*, 11, 5-24.
- Brand, M. J., & Huizingh, E. (2008). Into the drivers of innovation adoption. *European Journal of Innovation Management*, 11(1), 5-24.
- Brandon, P., & Lu, S. L. (2008). *Clients driving innovation*. Oxford, UK: Wiley-Blackwell.
- Brochner, J. (2008). Construction contractors integrating into facilities management. Facilities. *Latest Science News*, 26(1/2), 5-15.
- Brockhoff, K., & Chakrabarti, A. (1988). R and D/marketing linkage and innovation strategy: some West German experience. *IEE Transactions on Engineering Management*, 35(3), 167-174.
- Brown, W., & Karagozoglou, N. (1989). A systems model of technological innovation. *IEE Transactions on Engineering Management*, 36(1), 11-16.
- Bruhl, R., Horch, N., & Osann, M. (2010). Improving integration capabilities with management control. *European Journal of Innovation Management*, 27, 385-408.
- Bryant & Yarnold (1994). *Principal components analysis and exploratory and confirmatory factor analysis. Reading and understanding multivariate analysis*. US: American Psychological Association Books.
- Bryman, A., & Cramer, D. (2001). *Quantitative data analysis with SPSS Release 10 for Windows*. London: Routledge.
- Buchko, A. A. (1994). Conceptualisation and measurement of environmental uncertainty: An assessment of the miles and snow perceived environmental uncertainty scale. *Academy of Management Journal*, 37(4), 410-425.
- Budiawan, D., & Sidwell, A.C. (2004). *Driver of construction innovation. A summary of the PhD thesis, by Dedi Budiawan: Determinants of process innovation on construction projects from contractors' perspective*. Queensland: Queensland University of Technology.
- Burgelman, R. (1983). Corporate entrepreneurship and strategic management: insights from a process study. *Management Science*, 29(12), 1349-1364.
- Burgelman, R. A., & Sayles, L. R. (1986). *Inside corporate innovation*. New York, NY: The Free Press.

- Carmines, E., & Zeller, R. (1979). *Reliability and validity assessment*. Beverly Hills, California: Sage Publications.
- Carneiro, A. (2008). When leadership means more innovation and development. *Business Strategy Series*, 9, 176-184.
- Carter, C. F., & Williams, B.R. (1957). *Industry and technical progress: Factors governing the speed of application of science*. New York: Oxford University Press.
- Cassiman, B., & Veugelers, R. (2002). R and D Cooperation and spillovers: some empirical evidence from Belgium. *American Economic Review*, 92(4), 1169-1184.
- Cavallucci, D. (2002). *TRIZ, the Altshullerian approach to solving innovation problems*. London: Springer.
- Chakrabarti, A.K., & Souder, W.E. (1984). Critical factors in technological innovation and their policy implications. *Technovation*, 2(4), 255-275.
- Chang, L. (1988). Methods to identify and assess new building technology. *Journal of Construction Engineering and Management, ASCE*, 114(3), 408-425.
- Charles, D. (2003). Universities and territorial development: Reshaping the regional role of UK Universities. *Local Economy*, 18, 7-20.
- Chiesa, V., Frattini, F., Lamberti, L., & Noci, G. (2009). Exploring management control in radical innovation projects. *European Journal of Innovation Management*, 12, 416-444.
- Chilton, M. A., & Bloodgood, J. M. (2010). Adaption-innovation theory and knowledge use in organisations. *Journal of Management Decision*, 48, 1159-1180.
- Chong A. Y. L., Chan F. T. S. Chan, Ooi, K. B., & Sim J. J. (2011). Can Malaysian firms improve organisational/innovation performance via SCM? *Journal of Industrial Management and Data Systems*, 111, 410-431.
- Civil Engineering Research Foundation (1996a). Action plan: *An enhanced building technology evaluation process*, CERF report no. 96-5021-02. Washington, D.C.: Civil Engineering Research Foundation.
- Civil Engineering Research Foundation (1996b). *Creating the 21st century through innovation*, CERF report no.96-5016.E. Washington, D.C.: Civil Engineering Research Foundation.
- Civil Engineering Research Foundation (1996c). *The foundation for a new approach to implement building innovation*, CERF report No. 96-5021. Washington, D.C.: Civil Engineering Research Foundation.
- Clark, K. B. (1984). Unionization and firm performance: The impact of profits, growth, and productivity. *American Economic Review*, 74(12), 893-919.
- Clark, P., & Neil S. (1989). *Innovation in technology and organisation*. New York: Routledge.
- Coakes, S.J., & Ong, C. (2011). *SPSS version 18.0 for window*. Australia, Mc Dougall Street, Milton: John Wiley and Sons.
- Cochran, W. G. (1977). *Sampling techniques*. New York: John Wiley and Sons.
- Cohen & Jacob (1983). The Cost of Dichotomization. *Applied Psychological Measurement*, 7 (Summer), 24-253.
- Cohen D. H. (1989a). *The adoption of innovative wood processing technologies in the building products industry*. Ph.D. Dissertation, Blacksburg, Virginia: Virginia Polytechnic Institute and State University.

- Cohen D. H. (1989b). An inventory of innovative technology use in the North American processing of wood structural panels and softwood lumber. *Canadian Journal of Forest Research*, 19(12), 1629-1633.
- Cohen D. H., & Steven A. S. (1990). The adoption of new manufacturing technologies: Impact on the performance of North American producers of softwood lumber and structural panels. *Forest Products Journal*, 40 (November/December), 67-73.
- Cohen, A. B. (1988). Innovation at DuPont - A real-time perspective. *Research-Technology Management*, 31, 47-50.
- Cohen, A. J. (1984). Technological change as historical process: The case of the U.S.Pulp and paper industry: 1915-1940, *Journal of Economic History*, 44(9), 775-799.
- Cohen, L. & Holliday, M. (1982). *Statistics for social scientist*. London: Harper and Row.
- Colebourne, A. (1994). *Toward sustainable housing: Barriers and accelerators to innovation in the residential construction industry*. M.P.L. Thesis, Kingston, Ontario, Canada: Queen's University at Kingston.
- Combiér, L. A. (1993). *Diffusion of innovation in the construction industry*. M.S. Thesis, Cambridge, Massachusetts: Massachusetts Institute of Technology.
- Construction R and D in a research program and strategy to foster technology advancement in the U.S. construction industry. (1981). *A report, construction technology area, construction industry cost effectiveness project*. New York: The Business Roundtable.
- Cooper, J. R. (1995). *An analysis of the adoption of process innovation in household wood furniture manufacturers*. Ph.D. Dissertation, Lexington. Kentucky: University of Kentucky.
- Corsten, H. (1987a). Technology transfer from universities to small and medium-sized enterprises - an empirical survey from the standpoint of such enterprises. *Technovation*, 6(1), 57-68.
- Corsten, H. (1987b). Problems with cooperation between universities and enterprises - a comparative study on size of enterprise. *Technovation*, 6(4), 295-301.
- Cottam, A., Ensor, J., & Band, C. (2001). A benchmark study of strategic commitment to innovation. *European Journal of Innovation Management*, 4, 88-94.
- Criscuolo, P., & Narula, R. (2005). Using multi-hub structures for international R and D: organisational inertia and the challenges of implementation. *DRUD Working Paper, No. 05-13*.
- Criscuolo, P., Narula, R., & Verspagen, B. (2005) The role of home and host country innovation systems in R and D internationalisation: a patent citation analysis. *Economics of Innovation and New Technology*, 14, 417-433.
- Cronbach, L. (1990). *Essentials of psychological testing*. New York: Harper & Row.
- Croome, D. (1990). The impact of technological innovation on the construction industry. *Building Research and Practice*, 18(3), 174-182.
- Damanpour, F. (1987). The adoption of technological, administrative, and ancillary innovations: Impact of organisational factors. *Journal of Management*, 13(Winter), 675-688.
- Damanpour, F. (1991). Organisational innovation: A meta-analysis of effects of determinants and moderators. *Academy of Management Journal*, 34(9), 555-590.

- Daniel, W. W. (1987). *Workplace industrial relations and technical change*. London: Frances Pinter Publishers, Ltd.
- Daniels, J.D., & Robles, F. (1982). The choice of technology and export commitment: The Peruvian textile industry. *Journal of International Business Studies*, 13(1), 67-87.
- Denning, S. (2005). Why the best and brightest approaches don't solve the innovation dilemma. *Strategy and Leadership*, 33, 4-11.
- Dewar, R. D. and Dutton J. E. (1986). The adoption of radical and incremental innovations: An empirical analysis. *Management Science*, 32 (November), 1422-1433.
- DiLiello, T. C., & Houghton, J. D. (2006). Maximising organisational leadership capacity for the future: Towards a model of self- leadership, innovation and creativity. *Journal of Managerial Psychology*, 21(4), 319- 337.
- Dillamn, D. A. (1978). *Mail and telephone surveys: The total design method*. New York: John Wiley and Sons, Inc.
- Dobni, C. B. (2008). The DNA of innovation. *Journal of Business Strategy*, 29, 43-50.
- Dowall, D. D., & Lynch, J. (1986). *The impacts of technological change on residential construction: A case study of the U.S. manufactured housing industry*. Working paper No. 449, Institute of Urban and Regional Development, Berkeley, California: University of California, Berkeley.
- Downs, George W., & Lawrence B. M. (1976). Conceptual issues in the study of innovations. *Administrative Science Quarterly*, 21 (December), 700-714.
- Draper, N. R., & Smith, H. (1981). *Applied regression analysis*. New York: John Wiley and Sons.
- Drucker, P. F. (1985). *Innovation and entrepreneurship: practice and principles*. New York: Harper and Row.
- Eaton, D. (2001). A temporal typology for innovation within the construction industry. *Journal of Construction Innovation*, 1, 165-179.
- Edosomwan, J. A. (1989). *Integrating innovation and technology management*. New York: John Wiley and Sons.
- Edquist, C. (2004). *Systems of innovation — perspectives and challenges*. Oxford: The Oxford Handbook of Innovation, Oxford University Press.
- Ettlie, J. E. (1983). Organisational policy and innovation among suppliers to the food processing sector. *Academy of Management Journal*, 26(3), 27-44.
- Fickle, J. E. (1980). *The new South and the "New Competition"*. Urbana, Illinois: University of Illinois Press.
- Fidler, L. A., & Johnson, D. (1984). Communication and innovation implementation, *Academy of Management Journal*, 9(12), 704-711.
- Fierro, J. C. (2011). Inter-firm market orientation as antecedent of knowledge transfer, innovation and value creation in networks. *Journal of Management Decision*, 49, 444-467.
- Fransman, M. (1985). Conceptualising technical change in the Third World in the 1980s: an interpretive survey. *Journal of Development Studies*, 21(4), 572-652.
- Freeman, C. (1974). *The economics of industrial innovation*. London: Frances Pinter
- Freeman, C., Clark, J., & Soete L. (1982). *Unemployment and technical innovation: A study of long waves and economic development*. London: Frances Pinter.

- Freeman, Richard, & Medoff, J. (1984). *What do unions do?* New York: Basic Books.
- Freund, R. J., & Minton, P. D. (1979). *Regression analysis*. New York: M. Dekker
- Friedman, A. (1989a). *Innovation and the North American homebuilding industry*. McGill university, affordable homes program, Research Paper No. 2, Montreal, Quebec, Canada: McGill University.
- Friedman, A. (1989b). Innovation and the North American homebuilding industry. *Open House International*, 14(3), 16-19.
- Froese, T., & Rankin, J. H. (2009) Strategic roadmaps for construction innovation: assessing the state of research, *Journal of Information technology in construction (ITcon)*, Vol. 14, 400-411.
- Galbraith, J. (1977). *Organisation design*. Reading, Massachusetts: Addison-Wesley.
- Gatignon, Hubert and Robertson, T. R. (1991). *Innovative decision processes*. Englewood Cliffs, New Jersey: Prentice-Hall, Inc.
- Gatignon, Hubert, & Robertson, T. R. (1989). Technology diffusion: An empirical test of competitive effects. *Journal of Marketing*, 53(1), 35-49.
- Gay, L. (1987). *Educational research: competencies for analysis and application*. Columbus: Merrill Pub. Co.
- Globerman, S. (1975). Technological diffusion in the Canadian carpet industry. *Research Policy*, 4(5), 129-148.
- Globerman, S. (1976). New technology adoption in the Canadian paper industry. *Industrial Organisation Review*, 4 (I), 5-12.
- Goldberg, B., & Shepard, E. M. (1989). *Diffusion of innovation in the housing industry*. Report prepared for the U.S. Department of Energy, Upper Marlboro, Maryland: National Association of Home Builders [NAHB] Research Center.
- Gopalakrishnan, S., & Damanpour, F. (1997). A review of innovation research in economics. *Omega*. Vol. 25.(1), 15-28.
- Gråsjö, U. (2005). *Accessibility to R and D and patent production*. CESIS electronic paper series. Stockholm: Royal Institute of Technology.
- Ha, Mikyoung and Weber, M. J. (1991). Innovative housing adoption model for households. *Housing and Society*, 18 (I), 37-48.
- Hair, Joseph F., Anderson. R. E., Tatham, R. L., & Black, W. C. (2009). *Multivariate data analysis with readings*. New York: MacMillan Publishing Company.
- Hakansson, & Hakan (1989). *Corporate technological behavior: Co-operations and networks*. New York: Routledge.
- Hall, B.H., Link, A.N. & Scott, J.T. (2003) Universities as research partners. *Review of Economics and Statistics*, 85(2), 485-49
- Handfield, Robert B., & Pagell, M. D. (1995). An analysis of the diffusion of flexible manufacturing systems. *International Journal of Production Economics*, 39(5), 243-253.
- Hansen, K.L., & Tatum, C.B. (1989). Technology and strategic management in construction. *Journal of Management in Engineering*, 5(1), 67-83.
- Hardie, M. (2010). Influences on innovation in small Australian construction businesses. *Journal of Small Business and Enterprise Development*, 17, 387-402.

- Hardie, M., & Newell, G. (2011). Factors influencing technical innovation in construction SMEs: an Australian perspective. *Engineering, Construction and Architectural Management*, 18(6), 618-636.
- Harris, E.D. (1989). Creativity and innovation: the elusive competitive advantage for technology-driven industries. *Engineering Management International*, 5(3), 233-242.
- Harrison & Bennett (1995). The geography of innovation. *Technology Review*, 98(1), 62.
- Hartmann, A., Reymen, I. M. M. J., & Van Oosterom, G. (2008). Factors constituting the innovation adoption environment of public clients. *Building Research and Information*, 36(5), 436-449.
- Harty, C. 2005. Innovation in construction: a sociology of technology approach. *Building Research & Information*, 33(6), 512 - 522.
- Hausman, A. (2005). Innovativeness among small businesses: Theory and propositions for future research. *Industrial Marketing Management*, 34(8), 773-782.
- Haygreen, John, Gregersen, H., Hyun, A., & Ince, P. (1985). Innovation and productivity change in the structural panel industry. *Forest Products Journal*, 35(10), 32-38.
- Henderson, R., Jaffe, A. B., & Trajtenberg, M. (1998) Universities as a source of commercial technology: A detailed analysis of University Patenting 1965-1988. *Review of Economic and Statistics* 80(1), 119-127.
- Hicks & Donald (1986). *Automation technology and industrial renewal*. Washington, D.C.: American Enterprise Institute.
- Hitt, Michael A., R. Duane, I., & K.A. Palia (1982). Industrial firms' grand strategy and functional importance: moderating effects of technology and uncertainty. *Academy of Management Journal*, 2(6), 265-298.
- Holt, G. (2010). Contractor selection innovation: examination of two decades' published research. *Journal of Construction Innovation*, 10, 304-328.
- Hsu, Y. (2011). Design innovation and marketing strategy in successful product competition (2011). *Journal of Business and Industrial Marketing*, 26, 223-235.
- Ichikazu, Y. (1992). The business network: A powerful and challenging business tool. *Journal of Business Venturing*, 7(9), 341-346.
- Ince, Peter J., McKeever, D. B., & Haynes, R. W. (1995). The role of markets and technology in conservation of timber resources. *Proceedings of the 1995 International Environmental Conference*. Atlanta, Georgia: TAPPI Press, 315-325.
- Ismail, N.A., & King, M. (2007). Firm performance and AIS alignment in Malaysian SMEs. *International Journal of Accounting Information Systems*, 6(4), 241-259.
- Jack Faucett Associates (1986). The impacts of structural change in residential construction on employment. *Research study submitted to U.S. Department of Labor*. Washington D.C.: Bureau of Labor Statistics.
- Jauch, L. R., & Kraft, K. L. (1986). Strategic Management of Uncertainty. *Academy of Management Review*, 11, 777-790.
- Jeroen P.J., & Deanne N. (2007). How leaders influence employees' innovative behavior. *European Journal of Innovation Management*, 10, 41-64.

- Johannisson, B. (1990). Economies of overview guiding the external growth of small firms. *International Small Business Journal*, 9(1), 32-44.
- John, A. (1987). *Collective bargaining and the division of the value of enterprise*. National Bureau of Economic Research Working Paper No. 2137, Washington, D.C.: National Bureau of Economic Research.
- Johnson, W. H. A., & Chuang, M. (2010). A comparative innovation study of China, Japan and Taiwan. *Journal of Chinese Management Studies*, 4, 385-400.
- Kamien, Morton I., & Schwartz, N. L. (1975). Market structure and innovation: A survey. *Journal of Economic Literature*, 13(3), 1-37.
- Kamien, Morton I., & Schwartz, N. L. (1976). On the degree of rivalry for maximum innovative activity. *Quarterly Journal of Economics*, 90(5), 245-259
- Kangari, R., & Yoshida, T. (1989). Prototype robotics in construction industry. *Journal of Construction Engineering and Management*, 115(2), 284-301.
- Karake, Z. A. (1990). *Technology and developing economies: the impact of Eastern European versus Western technology transfer*. New York: Praeger.
- Keefe, J. H. (1991). Do unions influence the diffusion of technology? *Industrial and Labor Relations Review*, 44(1), 261 -274.
- Keegan, A., & Turner, R. J. (2002). *The management of innovation in project-based firms*. *Long Range Planning*. Retrieved August 10, 2003, from EBSCO host electronic database.
- Kennedy, A. M. (1983). The adoption and diffusion of new industrial products: A literature review. *European Journal of Marketing*, 17(3), 31-88.
- Keupp, M. M., & Gassmann, O. (2009). Determinants and archetype users of open innovation. *R and D Management* 39(4), 331-341.
- Kimberly, J. R. (1978). Hospital adoption of innovation: the role of integration into external informational environments. *Journal of Health and Social Behavior*, 19(12), 361-373.
- Kimberly, J. R., & Evanisko, M. J. (1981). Organisation innovation: The influence of individual organisational and contextual factors on hospital adoption of technological and administrative innovations. *Academy of Management Journal*, 24(12), 689-713.
- Kline, S. J., & Rosenberg, N. (1986). *An overview of innovation*. Washington, D.C.: National Academy Press.
- Kotler, P. (1991). *Marketing management: Analysis, planning, implementation, and control*. Englewood Cliffs, New Jersey: Prentice-Hall, Inc.
- Kuczmarki, T. D. (2006). What is innovation? And why aren't companies doing more of it? *Journal of Consumer Marketing*, 20, 535-541.
- Kumar, M. D., Mohtar, S., & Seng, N. W. (2012). Innovation: Adoption and implementation in Malaysian heavy construction sector. *International Journal of Commerce and Behavioral Science*, 1(12), Retrieved October 1st, 2012, retrievable from <http://www.theinternationaljournal.org/ojs/index.php?journal=rjcb>s.
- Kuo-Ming, C. & Hui-Chun, C. (2009). Community based innovation: its antecedents and its impact on innovation success. *Internet Research*, 19, 496-516.
- Kym, H. (1991). *An evaluation of adoption and implementation strategies for customer-oriented electronic data interchange*. Ph.D. Dissertation, Stanford, California, Canada: York University.

- Lady, D. E. (2008). *Exploring innovative characteristics of technology in nonprofit trade association: a multi-case study*. DBA Thesis, U.S: Northcentral University.
- Lange, J. E., & Daniel Q. M. (1979). *An introduction to the construction sector of the economy in the construction industry*. Lexington, Massachusetts: Lexington Books, 1-9.
- Latre, J. R., Muller, A., & Jones, D. (2010). Delivering on the promise of open innovation. *Journal of Strategy and Leadership*, 38, 23-28.
- Latreille, P. L. (1992). Unions and the inter-establishment adoption of new microelectronic technologies in the British private manufacturing sector. *Oxford Bulletin of Economics and Statistics*, 54(2), 31-51.
- Lawrence, P., & Lorsch, J. (1967) Differentiation and integration in complex organizations. *Administrative Science Quarterly* 12, 1-30.
- Lemire, N. (1988). Key factors in the innovation development process. *Organisation Development Journal*, 6(1), 72-75.
- Levin, S. G., Levin, S. L., & Meisel, J. B. (1992). Market structure, uncertainty, and intrafirm diffusion: The case of optical scanners in grocery stores. *Review of Economics and Statistics*, 74(5), 345-350.
- Liao, H. L., & Lu, H. P. (2008). *The role of experience and innovation characteristic and continued use of e-learning websites*. Taiwan: National Taiwan University of Science and Technology.
- Ligny, E. E., & Erkelens, P. (2008). Construction technology diffusion in developing countries: limitations of prevailing innovation systems. *Journal of Construction in Developing Countries*, 13(2), 43-64.
- Lin, H. F. (2007). Knowledge sharing and firm innovation capability: an empirical study. *International Journal of Manpower*, 28, 315-332.
- Linsu, K. (1980). Organisational innovation and structure. *Journal of Business Research*, 8(6), 225-245.
- Loewe, P., & Chen, G. (2007). Changing your company's approach to innovation. *Journal of Management Decision*, 35, 118-26.
- Löf, H., & Heshmati, A. (2006). On the relationship between innovation and performance: A sensitivity analysis. *Economics of Innovation and New Technology*, 15, Retrieved August 7, 2011, retrievable from: http://elsa.berkeley.edu/~bhhall/EINT/Loof_Heshmati.pdf.
- Lundgren, A. L. (1989). *Development, dissemination, and adoption of new technology in forest resource economics and policy research: Strategic directions for the future*. San Francisco, California: Westview Press.
- Lusch, Robert F., & Laczniak, G. R. (1987). The evolving marketing concept, competitive intensity and organisational performance. *Journal of the Academy of Marketing Science*, 15, 1-11.
- Lutzhiser, L. (1994). Innovation and organisational networks: barriers to energy efficiency in the U.S. housing industry. *Energy Policy*, 22(10), 867-876.
- Lynch, J. (1989). Looking overseas for new members. *Association Management*, 41(5), 110-115.
- MacCrimmon, Kenneth R., Wehrung, D. A., & Stanbury, W.T. (1986). *Taking risks. The Management of Uncertainty*, New York: Free Press.

- MacDonald, K. G. (1993). *Adoption of health care innovations by Canadian physicians*. Ph.D. Dissertation, North York, Ontario, Canada: York University.
- Machin, S., & Wadhvani, S. (1991). The effects of unions on investment and innovation: Evidence from WIRS. *Economic Journal*, 101(3), 324-300.
- MacLaurin, W. R. (1954). Technological progress in some American industries. *American Economic Review*, 44(5), 178-189.
- Malhotra, N. K. (1993). *Marketing research: An applied orientation*. Englewood Cliffs, NJ: Prentice Hall.
- Mangione, T. W. (1995). *Mail Surveys: Improving the quality*. Thousand Oaks, CA: Sage Publications.
- Manley, K. (2006). Identifying the determinants of construction innovation. *International conference on construction culture, innovation and management, Dubai, 26-29(11)*. Retrieved July, 7 2011, retrievable from: <http://eprints.qut.edu.au/7312/1/7312.pdf>.
- Manseau, A. (2005). Construction - A changing industry challenging current innovation models. *Building Tomorrow: Innovation in Construction and Engineering*, Ashgate, Aldershot, 23-42.
- Manseau, A., & Shields, R. (2005). Conclusion a roundtable on construction innovation - How to make it work?, *Building Tomorrow: Innovation in Construction and Engineering*, Ashgate, Aldershot, 175-179.
- Marcel, B. (2011). The open innovation paradox: knowledge sharing and protection in R and D collaborations. *European Journal of Innovation Management*, 14, 93-117.
- Marsh, R. M., & Mannari, H. (1981). Technology and size as determinants of the organisational structure of Japanese factories. *Administrative Science Quarterly*, 26, 33-57.
- Martin, F., Swan N., Banks I., Barker, G., & Beaudry, R. (1979a). *The case of roof trusses in the interregional diffusion of innovations in Canada*. Hull, Quebec, Canada: Economic Council of Canada.
- Martin, F., Swan N., Banks I., Barker, G., & Beaudry, R. (1979b). *The newsprint industry in the interregional diffusion of innovations in Canada*. Hull, Quebec, Canada: Economic Council of Canada.
- Martino, Joseph, P., Kuei-Lin, C., & Lenz, R. C. (1978). *Predicting the diffusion rate of industrial innovations*. United States Department of Commerce, National Technical Information Service, Dayton, Ohio: University of Dayton Research Institute.
- McCabe (2006). *A guide to measuring scales and questionnaire*. New York: Oxford University Press.
- McCoy P. A. (2009). Understanding the role of developer/builders in the concurrent commercialization of product innovation. *European Journal of Innovation Management*, 12, 102-128.
- McLaughlin, D. (1979). *The Impact of labor unions on the rate and direction of technological innovation*. Institute of Labor and Industrial Relations, Detroit, Michigan: University of Michigan-Wayne State University.
- McMillan, C. (2010). Five competitive forces of effective leadership and innovation. *Journal of Business Strategy*, 31, 11-22.

- McNicholas, T. M. (1994). *Potential barriers to the adoption of new technology in the U.S. construction industry*. PhD. Dissertation, San Francisco, California: Golden Gate University.
- McQuiston, D. H. (1989). Novelty, complexity, and importance as casual determinants of industrial buyer behavior. *Journal of Marketing*, 53(4), 66-79.
- Michaelis, B., Stegmaier, R., & Sonntag, K. (2010). Shedding light on followers' innovation implementation behavior. *Journal of Managerial Psychology*, 25(4), 408-429.
- Miles, Raymond E., & Snow, C. C. (1978). *Organisational strategy, structure, and process*. New York: McGraw-Hill Book Company.
- Miller, Danny & Friesen, P.H. (1982). Innovation in conservative and entrepreneurial firms: two models of strategic momentum. *Strategic Management Journal*, 3 (January/March), 1-25.
- Milliken, F. J. (1987). Three types of perceived uncertainty about the environment: state, effect, and response uncertainty. *Academy of Management Review*, 12 (January), 133-143.
- Mishra, B. P., & Srinivasan, S. (2005). A framework for technology innovation. *Journal of Advances in Management Research*, 2, 61-69.
- Molleman, E., & Timmerman, H. (2003). Performance management when innovation and learning become critical performance indicators. *Personal Review*, 32(1), 93-113.
- Montrey, Henry M., & Utterback J.M. (1990). Current status and future of structural panels in the wood products industry. *Technological Forecasting and Social Change*, 38(August), 15-35.
- Mostafa, M. (2005). Factors affecting organisational creativity and innovativeness in Egyptian business organisations: an empirical investigation. *Journal of Management Development*, Vol. 24(1), 7-33.
- Mueller, W. F., Culbertson, J., & Peckham, B. (1979). *Market structure and technological performance in the food manufacturing industry*. Final Report, Washington, D.C.: National Science Foundation.
- Mullins, M. (1992). *Structural panel technology innovation in proceedings of structural panels and composite lumber, two sides of the profit coin: Processing - products/markets*. Atlanta, Georgia: Forest Products Research Society.
- Myers, R. H. (1990). *Classical and Modern Regression with Applications*. PWS-Kent Publishing Company.
- NAHB Economics Department (1994). *1994 home builder industry survey*. Washington, D.C.: National Association of Home Builders [NAHB] Economics Department.
- NAHB Research Center (1989a). *Criteria for evaluation of emerging housing technologies, report prepared for Martin Marietta Energy Systems Inc.*. Upper Marlboro, Maryland: National Association of Home Builders [NAHB] Research Center.
- NAHB Research Center (1989b). *Historical review of housing innovation, report prepared for Martin Marietta Energy Systems Inc.*. Upper Marlboro, Maryland: National Association of Home Builders [NAHB] Research Center.

- NAHB Research Center (1991). *Advanced housing technology program: phase I, report prepared for Oak Ridge National Laboratory*. Upper Marlboro, Maryland: National Association of Home Builders [NAHB] Research Center.
- Nam, C. H. (1990). *The process of product innovation in the building and heavy sectors of the U.S. construction industry*. Ph.D. Dissertaion, USA: Stanford University.
- Nam, C. H., & Tatum, C. B. (1988). Major characteristics of constructed products and resulting limitations of construction technology. *Construction Management and Economics*, 6(2), 133-148.
- Nam, C. H., & Tatum, C. B. (1989). Toward Understanding of Product Innovation Process in Construction. *Journal of Construction Engineering and Management*, 115(12), 517-534.
- Nam, C. H., & Tatum, C. B. (1992). Strategies for technology push: lessons from construction innovations. *Journal of Construction Engineering and Management*, 118(9), 507-524.
- Needham, D. (1978). *The economics of industrial structure, conduct, and performance*. New York: Holt, Rinehart and Winston.
- Neter, J., Wasserman, W., & Kutner, M. H. (1990). *Applied linear statistical models. Regression Analysis of variance and experimental designs*. Homewood, Illinois: Irwin.
- Norusis, M. J. (1992). *SPSS for Windows: Base system user's guide texts. SPSS for Windows: Professional Statistics User's Guide*. Chicago: SPSS Inc.
- Obloj, K. & Davis, A.S. (1991). Innovation without change: The contradiction between theories-espoused and theories-in-use. *Journal of Management Studies*, 28(4), 323-337.
- Oliva, F. L. (2011). Measuring the probability of innovation in technology-based companies. *Journal of Manufacturing Technology Management*, 22, 355-383.
- Oster, Sharon M., & Quigley, J. M. (1977). Regulatory barriers to the diffusion of innovation: Some evidence from Building Codes. *Bell Journal of Economics*, 8(Autumn), 361-377.
- Ostgaard, T. A., & Birley, S. (1994). Personal networks and firm competitive strategy - A strategic or coincidental match? *Journal of Business Venturing*, 9(7), 281-305.
- Pallant, J. (2001). *The SPSS survival manual: A step-by-step guide to data analysis using SPSS for Windows (version 10)*. St Leonards, NSW: Allen and Unwin.
- Panayides, P. (2006). Enhancing innovation capability through relationship management and implications for performance. *European Journal of Innovation Management*, 9, 466-482.
- Panuwatwanich, K., Stewart, R. A., & Mohamed, S (2009). Validation of an empirical model for innovation diffusion in Australian design firms. *Construction Innovation*, 9, 449-167.
- Panuwatwanich, K., Stewart, R. A., & Mohamed, S. (2008). Construction innovation Vol. 9 No. 4, 2009 pp. 449-467, from Emerald database.
- Parkinson, S. T. (1976). *The role of information in the adoption of industrial innovation*. M.S. thesis, Glasgow, Scotland: University of Strathclyde.

- Paulson, B. C. (1982). *Alternative methods for underground station construction in Japan*. The Construction Institute, Department of Civil Engineering, Stanford, CA: Stanford University.
- Paulson, B. C. (1985). Automation and robotics for construction. *Journal of Construction Engineering and Management*, 111(3), 190-207.
- Pawanchilk, A., & Sulaiman, S. (2010). *The Malaysia Innovation Climate Report 2010*, Microsoft Innovation Center: Malaysia.
- Pearson, G., Pearson, A., & Ball, D. (1989). Innovation in a mature industry: a case study of wrap knitting in the U.K. *Technovation*, 9(8), 657-679.
- Peters, M. P., & Venkatesan, M. (1973). Exploration of variables inherent in adopting an industrial innovation. *Journal of Marketing Research*, 10(8), 312-315.
- Phillips, B. D., Lakhani, H. A. G., & George, S. L. (1984). The economics of metric conversion for small manufacturing firms in the United States. *Technological Forecasting and Social Change*, 25(4), 109-121.
- Poitras, Andre & Duff, J. (1988). *Technological innovation in residential construction and production housing using non-traditional methods*. Quebec, Canada: Societe d'habitation du Quebec.
- Porter, M. E. (1980). *Competitive strategy*. New York: Free Press.
- Porter, M. E. (1990). *The competitive advantage of nations*. New York: Free Press.
- Prabhu, J. (2010). Innovation in a recession. *Strategy HR Review*, 9, 5-11.
- Prajogo, D. I., Power, D. J., & Sohal, A. S. (2004). The role of trading partner relationships in determining innovation performance: an empirical examination. *European Journal of Innovation Management*, 7, 178-186.
- Ramstad, E. (2009). Developmental evaluation framework for innovation and learning networks. *Journal of Workplace Learning*, 21, 181-197.
- Rankin, J., Fayek, A., Meade, G., Haas, C., & Manseau, A. (2008). Initial metrics and pilot program results for measuring the performance of the Canadian construction industry. *Canadian Journal of Civil Engineering*, 35(9), 894-907.
- Read, A. (2011). Determinants of successful organisational innovation: a review of current research. *Journal of Management Practice*, 3(1), 95-119.
- Rees, John, Briggs, R., & Oakey, R. (1984). The adoption of new technology in the American machinery industry. *Regional Studies*, 18(12), 489-504.
- Reinganum, J. F. (1981). Market structure and the diffusion of New Technology. *Bell Journal of Economics*, 12(Autumn), 618-624.
- Reynolds, W. A. (1968). *Innovation in the United States carpet industry*. New York: Van Nostrand Company, Inc.
- Richardson, D. (1989). *Innovation and information technology in forestry: A multiple-use enterprise*. Proceedings of the Thirteenth Commonwealth Forestry Conference, Rotorua, New Zealand: Forest Research Institute.
- Roberts, B. R. (1988). Managing invention and innovation. *Research-Technology Management*, 31(1), 11-29.
- Robertson, Maxine, Swan, J., & Newell, S. (1996). The role of networks in the diffusion of technological innovations. *Journal of Management Studies*, 33(5), 333-359.
- Robertson, T. S., & Gatignon, H. (1986). Competitive effects on technology diffusion. *Journal of Marketing*, 50(7), 1-12.

- Robertson, T. S., & Wind, Y. (1980). Organisational psychographics and innovativeness. *Journal of Consumer Research*, 7(6), 24-31.
- Rockel, M. L., & Buongiorno, J. (1982). Derived demand for wood and other inputs in residential construction: A cost function approach. *Forest Science*, 28(6), 207-219.
- Rogers, E. M. (1995). *Diffusion of innovations*. New York: Free Press.
- Rogers, E. M., & Kincaid, D. L. (1981). *Communication networks: Toward a new paradigm for research*. New York: Free Press.
- Rogers, E. M., & Shoemaker, F. F. (1971). *Communication of innovations: A cross-cultural approach*. New York: Free Press.
- Rogers, E.M. (1983). *Diffusion of innovations*. New York: Macmillan, Inc.
- Romano, C. A. (1990). Identifying factors which influence product innovation: a case study approach. *Journal of Management Studies*, 27(1), 75-95.
- Rosenberg, N. (1982). *Inside the Black Box: Technology and Economics*. Cambridge: Cambridge University Press.
- Rosenberg, Nathan, Ince, P., Skog, K., & Plantinga, A. (1990). Understanding the adoption of new technology in the forest products industry. *Forest Products Journal*, 40(10), 15-22.
- Rosenbloom, B. (1978). Retail trade associations as a resource for retailing education. *Journal of Retailing*, 54(Fall), 53-66.
- Rothwell, R. & Zegveld, W. (1982). *Innovation and the small and medium sized firm*. London: Frances Pinter.
- Rothwell, R. (1978). Small and medium sized manufacturing firms and technological innovation. *Management Decision*, 16, 362-370.
- Rothwell, R. (1984). The role of small firms in the emergence of new technologies. *Omega*, 12(1), 19-29.
- Saaksjarvi, M. (2003). Consumer adoption of technological innovations. *Journal of Innovation Management*, 6, 90-100.
- Saaksjarvi, M., & Lampinen, M. (2005). Consumer perceived risk in successive product generations. *European Journal of Innovation Management*, 8, 145-156.
- Sabir, R. I. (2010). Managing technological innovation: China's strategy and challenges. *Journal of Technology Management in China*, 5, 213-225.
- Salomon, R. (1981). *Innovation in the Housing Sector: A Framework for Research*. Dares Salaam, Tanzania: Building Research Unit, Ministry of Lands, Housing and Urban Development.
- Saren, M. A. (1984). A classification and review of models of the intra-firm innovation process. *R and D Management*, 114(1), 11-24.
- Scherer, F. M. (1965). Size of firm, oligopoly, and research: A comment. *Canadian Journal of Economics and Political Science*, 31(5), 256-266.
- Scherer, F. M., & Ross, D. R. (1990). *Industrial market structure and economic performance*. Massachusetts: Houghton Mifflin.
- Schuler, Albert, Thompson, W. A., Vertinsky, I., & Ziv, Y (1991). Cross impact analysis of technological innovation and development in the softwood lumber industry in Canada. *IEEE Transactions on Engineering Management*, 38(8), 224-236.
- Schumpeter, J. A. (1950). *Capitalism, Socialism and Democracy*. New York: Harper.

- Scott, A. J., & Overton, T. S. (1977). Estimating nonresponse bias in mail surveys. *Journal of Marketing Research*, 14 (8), 396-402.
- Seng, N. W. (2001). *Analysis of factors of non-excusable delays that influence constructors' performance*. Master Thesis, Malaysia, University Technology of Malaysia.
- Seng, N. W. (2006a). *Analysing the factors of non-excusable delay*. Proceeding in international conference in the built environment in the 21st century (ICiBE 2006): Kuala Lumpur, Malaysia, 13-15 June 2006.
- Seng, N. W. (2006b). *Risk in design and build contract: A literature visit*. Proceeding in 6th Asia Pacific structural engineering and construction conference 2006 (APSEC 2006) – Challenge towards sustainable construction: Kuala Lumpur, Malaysia, 5-6 September 2006.
- Seng, N. W. (2011). *Creativity and innovation in design and build consortium – China Harbour Engineering Co. for Penang 2nd Bridge*. Consultation project, Malaysia: Universiti Utara Malaysia.
- Seng, N. W., Kumar, M. D., & Mohtar, S. (2012a). Creativity and innovation in design and build consortium. *International Journal for Management Research and Engineering*. Retrieved July 2012, retrievable from [http:// www.ijmre.com](http://www.ijmre.com).
- Seng, N. W., Kumar, M. D., & Mohtar, S. (2012b). Determinants of firm's innovativeness and innovation adoption in Malaysian heavy construction. *International Journal of Management and Social Sciences*, 2(8), 47-61.
- Seng, N. W., Kumar, M. D., & Mohtar, S. (2012c). The systematic modeling approach for firms' innovativeness in Malaysian heavy construction sector. *International Journal for Management Research and Engineering*. Retrieved July 2012, retrievable from [http:// www.ijmre.com](http://www.ijmre.com).
- Seng, N.W., & Mohtar, S. (2012). *Modeling the determinants of firms' innovativeness on construction technology in Malaysian heavy construction sector*. Proceedings of the 3rd international conference on technology and operations management: Sustaining competitiveness through green technology management, Bandung, Indonesia (July 4-6), 465-474.
- Shahriyar, M. (1998). *Construction innovation and the selection process: a case study of Boston's Central Artery/Tunnel project*. Ph.D Dissertation, Louisville, Kentucky: University of Louisville.
- Sharfman, M. P., & Dean, J. W. (1991). Conceptualising and measuring the organisational environment: A multidimensional approach. *Journal of Management*, 17, 681-700.
- Shartinger, D., & Rammer, C. (2002). *Knowledge interactions between universities and industry in Austria*. Innovation, entrepreneurship regions and economic development: International experiences and Hungarian challenges, University of Pecs.
- Sheppard, A. G. (1996). The sequence of factor analysis and cluster analysis: Differences in segmentation and dimensionality through the use of raw and factor scores. *Tourism Analysis*, 1, 49-57.
- Shields, R. (2005). *A survey of the construction innovation literature. Building tomorrow: Innovation in construction and engineering*. Aldershot: Ashgate Publishing, Ltd.
- Shoemaker, R.W., & Shoaf, R. (1975). Behavioral changes in the trial of new products. *Journal of Consumer Research*, 2(9), 104-109.

- Shook, S. R. (1997). *Innovation and the U.S. residential construction industry*. Ph.D. Dissertation, US: University of Washington.
- Shrieves, R.E. (1978). Market structure and innovation: A new perspective. *Journal of Industrial Economics*, 26(6), 329-347.
- Shrivastava, P., & Souder, W. E. (1987). The strategic management of technological innovations: a review and a model. *Journal of Management Studies*, 24(1), 25-41.
- Sinclair, S. A., & Cohen, D. H. (1992). Adoption of continuous processing technologies: its strategic importance in Standardised industrial product-markets. *Journal of Business Research*, 24(5), 209-224.
- Singh, B. K., Nautiyal, J. C., & Samama, Y. S. (1988). An econometric study of the demand for nonveneered structural panels in Canada. *Forest Products Journal*, 38 (11/12), 15-22.
- Sinkula, J. M. (1991). Some factors affecting the adoption of scanner-based research in organisations. *Journal of Advertising Research*, 31(4/5), 5055.
- Slaughter, E. S. (1993). Builders as sources of construction innovation. *Journal of Construction Engineering and Management*, 119(9), 532-549.
- Smith, R. L. (1994). *A hierarchical analysis of factors affecting the adoption and marketing of timber bridges*. Ph.D. Dissertation, Blacksburg, Virginia: Virginia Polytechnic Institute and State University.
- Smith, R. L., & Bush, R. J. (1997). A qualitative evaluation of the U.S. timber bridge market. *Forest Products Journal*, 47(1), 37-42.
- Spall, H. M. (1971). *Factors influencing the receptiveness of homebuilders to cost reducing innovations in greater Lansing*. Ph.D. Dissertation, East Lansing, Michigan: Michigan State University.
- Speece, M. W., & MacLachlan, D. L. (1992). Forecasting fluid milk package type with a multigeneration new product diffusion model. *IEEE Transactions on Engineering Management*, 39(3), 169-175.
- Speece, M. W., & MacLachlan, D. L. (1995). Application of a multi-generation model to milk container technology. *Technological Forecasting and Social Change*, 49(7), 281-295.
- Spelter, H. (1984). Price elasticities for softwood plywood and structural particleboard in the United States. *Canadian Journal of Forest Research*, 14(8), 528-535.
- Spelter, H. (1985a). *Modeling the demand for wood products in the context of technological change in proceedings of the Third North American regional meeting of the IIAS A network meeting*. Vancouver, British Columbia, Canada: Forest Economics and Policy Analysis Project.
- Spelter, H. (1985b). A product diffusion approach to modeling softwood lumber demand. *Forest Science*, 31(9), 685-700.
- Stata, R. (1989). Organizational learning: the key to management innovation. *Sloan Management Review*, 30(Spring), 63-74.
- Stead, B. A. (1996). A model for analyzing trade association services as they relate to members' needs. *Journal of Nonprofit and Public Sector Marketing*, 4(1/2), 89-97.
- Stephen Denning (2010). A leader's guide to radical management of continuous innovation. *Journal of Strategy and Leadership*, 38, 11-16.

- Sterling Hobe Corporation (1986). *Components and Structure of the U.S. Housing Industry*. Report prepared for Energetics Incorporated, Washington, D.C.: Sterling Hobe Corporation.
- Sternberg, R. J. (1990). *The geographic metaphor in R.J. Sternberg, Metaphors of mind: Conceptions of the nature of intelligence*. New York: Cambridge.
- Stier, J. C. (1980a). Estimating the production technology in the U.S. forest products industries. *Forest Science*, 26(9), 471-482.
- Stier, J. C. (1980b). Technological adaptation to resource scarcity in the U.S. lumber industry. *Western Journal of Agricultural Economics*, 5(12), 165175.
- Stier, J. C. (1985). Implications of factor substitution, economies of scale, and technological change for the cost of production in the United States pulp and paper industry. *Forest Science*, 31(12), 803-812.
- Stier, Jeffrey C. (1983). Technological substitution in the United States pulp and paper industry: The sulfate pulping process. *Technological Forecasting and Social Change*, 23(6), 237-245.
- Strassmann, W. P. (1978). *Assessing the knowledge of innovations in neglected sectors: The case of residential construction in technological innovation: A critical review of current knowledge*. San Francisco, California: San Francisco Press, Inc.
- Styan, G. E. (1980). Impact of North American timber supply on innovations in paper technology. *Paper Trade Journal*, 164(May 30), 25-29.
- Swan, J. A., & Newell, S. (1995). The role of professional associations in technology diffusion. *Organisation Studies*, 16(Winter), 847-874.
- Swan, P. L. (1970). Market structure and technological progress: The influence of monopoly on product innovation. *Quarterly Journal of Economics*, 84(11), 627-638.
- Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics*. MA: Allyn & Bacon.
- Tatum, C. B., Bauer, M., & Meade, A. (1988). Process of innovation for up/down construction at Rowes Wharf. *Journal of Construction Engineering and Management*, 115(2), 179-195.
- Tatum, C. B. (1986). Potential mechanisms for construction innovation. *Journal of Construction Engineering and Management*, 112(6), 178-191.
- Tatum, C. B. (1987). Process of innovation in construction firm. *Journal of Construction Engineering and Management*, 113(12), 648-663.
- Tatum, C. B. (1989a). Organizing to Increase Innovation in construction firms. *Journal of Construction Engineering and Management*, 115(12), 602-617.
- Tatum, C. B. (1989b). Managing for increased design and construction innovation. *Journal of Management in Engineering*, 5(4), 385-399.
- Tatum, C. B. (1989c). Organising to increase innovation in construction. *Journal of Construction Engineering and Management*, 115 (4), 602-617.
- Tatum, C. B., & Funke, A. T. (1988). Partially automated grading: construction process innovation. *Journal of Construction Engineering and Management*, 114(1), 19-35.
- Tauman, Y., & Weiss, Y. (1987). Labor unions and the adoption of new technology. *Journal of Labor Economics*, 5(no. 4, pt. 1), 477-501.

- Taylor, R. E. (1995). Engineered lumber: A cost-effective alternative to dimension lumber. *Widman's World Wood Review*, 1(4), 4-5.
- Teece, D. J. (1987). *Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy in the competitive challenge: Strategies for industrial innovation and renewal*. Cambridge, Massachusetts: Ballinger Publishing Company.
- Thompson, J. D. (1967). *Organisations in action*. New York: McGraw-Hill, Inc.
- Tornatzky, L. G., & Klein, K. J. (1982). Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings. *IEEE Transactions on Engineering Management*, 29(2), 28-45.
- Tornatzky, L. G., & Fleischer, M. (1990). *The process of technological innovation*. Lexington, KY: Lexington Books.
- United States Congress, Office of Technology Assessment (1986). *Technology, trade, and the U.S. residential construction industry: Special report*. Washington, D.C.: U.S. Government Printing Office.
- Utterback, J. M. (1974). Innovation in industry and the diffusion of technology. *Science*, 183, 620-626.
- Utterback, J. M. (1975). *The process of innovation in five industries in Europe and Japan*. Center for Policy Alternatives, Cambridge, MA: MIT Press.
- Utterback, J. M., & Abernathy, W. J. (1975). A dynamic model of process and product innovation. *Omega*, 3(12), 639-656.
- Van Raaij, FW. (1991). *The formation and use of expectations in consumer decision making. in handbook of consumer behavior*. Englewood Cliffs, New Jersey: Prentice-Hall.
- Velicer, W. F., & Jackson, D. N. (1990). Component analysis versus common factor analysis: Some issues in selecting an appropriate procedure. *Multivariate Behavioral Research*, 25(1), 1-28.
- Ventre, F. T. (1979). Innovation in residential construction. *Technology Review*, 82(2), 51-59.
- Ventre, F. T. (1980). On the blackness of kettles: Inter-industry comparisons in rates of technological innovation. *Policy Sciences*, 11(2), 309-328.
- Vernon, J. (1972). *Market structure and industrial performance*. Boston, Massachusetts: Allyn & Bacon.
- Vlosky, R. P., & Wilson, D. T. (1994a). *Interorganisational information system technology adoption effects on buyer-seller relationships in the retailer-supplier channel: An exploratory analysis, institute for the study of business markets ISBM Report 10-1994*. College of Business Administration, Pennsylvania Park, Pennsylvania: Pennsylvania State University.
- Vlosky, R. P., & Wilson, D. T. (1994b). *Technology adoption in channels in proceedings of the second research conference on relationship marketing*. Atlanta Georgia: Emory University.
- Vlosky, R. P., Smith, P. M., & Wilson, D. T. (1994). Electronic data interchange implementation strategies. *Journal of Business and Industrial Marketing*, 9(4), 5-18.
- Von Hippel, E. (1988). *The sources of innovation*. New York: Oxford University Press.

- Vos, J. F. J., & Achterkamp, M. C. (2006). Stakeholder identification in innovation projects. *European Journal of Innovation Management*, 9, 161-178.
- Vuori, S. (1992). *R and D, technology diffusion and productivity performance in finish manufacturing industries in mastering technology diffusion*. Helsinki, Finland: Research Institute of the Finnish Economy.
- Waller, G. (1971). *The concept of building research as a marketable product: A feasibility study of the use of marketing techniques during the research - development - diffusion - utilisation cycle*. London, England: Institute of Marketing, Construction Industry Marketing Group.
- Walters, W. R. (1996). Planning an expansion into engineered wood? *Wood Technology*, 123(9), 29-30.
- Webber, M., & Tonkin, S. (1988). Technical changes and the rate of profit in the Canadian wood, furniture, and paper industries. *Environment and Planning A*, 20(12), 1623-1643.
- Weisberg, S. (1985). *Applied linear regression*. New York: John Wiley.
- Weiss, A. R., & Birnbaum, P. H. (1989). Technological infrastructure and the implementation of technological strategies. *Management Science*, 35(8), 1014-1026.
- Wentworth, R. (1992). *Worldwide technology and market innovation for inorganic panels in proceedings of structural panels and composite lumber, two sides of the profit coin: processing - products/markets*. Atlanta, Georgia: Forest Products Research Society.
- West, C. D., & Sinclair S. A. (1991). Technological assessment of the wood household furniture industry. *Forest Products Journal*, 41(4), 11-18.
- West, C. D., & Sinclair, S. A. (1992). A measure of innovativeness for a sample of firms in the wood household furniture industry. *Forest Science*, 38(8), 509-524.
- Whitman, C. I. (1989). Managing technology development: perspectives of a practitioner. *Technovation*, 9(7), 551-560.
- Widén, K. (2006a). *Innovation diffusion in the construction sector: Division of Construction Management*. Lund: Lund University.
- Widén, K. (2006b). *Public policy and innovation in the construction industry*. Brisbane: CRC Construction Innovation, Icon. Net Pty Ltd.
- Widén, K., & Hansson, B. (2007). Diffusion characteristics of sector financed innovation. *Construction Management and Economics*, 25, 467-476.
- Widén, K., Atkin, B., & Hommen, L. (2007). *Setting the game plan*. Oxford, Blackwell Publishing Limited.
- Winer, B., Brown, D., & Michels, K. (1991). *Statistical principles in experimental design*. McGraw-Hill, New York.
- Yung-Ching, H., & Tsui-Hsu, T. (2006). The impact of dynamic capabilities with market orientation and resource-based approaches on NPD project performance. *Journal of American Academy of Business, Cambridge*, 8, 215-229.
- Ziv, Y., Vertinsky, I., Thompson, W. A., & Schuler, A. (1989). Cross impact analysis of technological innovation in the softwood lumber industry in Canada: A structural modelling approach. *Forest Economics and Policy Analysis Research Unit Working Paper 156, Vancouver, British Columbia*. Canada: University of British Columbia.