DEVELOPMENT OF SUSTAINABLE PERFORMANCE MODEL BASED ON LM, QMS, SOFT TQM, AND EMS: MALAYSIAN CONTEXT

BY

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ABSTRACT

Organizations are trying to become World Class Manufacturing (WCM) by implementing the best practices of Operations Management (OM). Sustainable Performance (SP) is a common target to be achieved and maintained by any manufacturing organization. In this regard numerous studies have been carried out on essential key Operations Management (OM) practices namely Lean Manufacturing (LM), Soft TQM (STQM), Quality Management System (QMS), and Environmental Management System (EMS) with a view to assessing the impact on SP. However, most of these studies were conducted separately at manufacturing industries in different parts of the world and found to be inadequate to explore whether these practices are integrated together in the same enterprise or not in a holistic manner. In this context an attempt is made to develop a conceptual model by investigating the linkages among these key OM practices and inaugurating their associative interrelationships based on feedback from industrial managers through an exhaustive survey in Malaysia. The model encapsulates that LM is the exogenous, SP is the endogenous construct while three practices namely QMS, STQM and EMS are proposed as mediators. For this empirical investigation of the model, twenty (20) hypotheses were postulated. Both qualitative and quantitative techniques were adopted. Primary data were gathered through three stages. Initially a semi-structured interview was conducted to explore the model applicability by the verbatim responses gathered from fifteen managers. Then a pilot study was done by using the responses gathered through a structured survey questionnaire relating to the OM practices distributed among 240 operations managers in different certified manufacturing industries. For the final stage of the study a wider survey was done by distributing 900 questionnaires to the managers of manufacturing industries in Malaysia via both postal and web-based survey. Principal Component Analysis (PCA) was exploited from SPSS22 for data reduction whereas Confirmatory Factor Analysis (CFA), structural model and bootstrapping technique were adopted from Structural Equation Modeling (SEM) AMOS 22 for examining model validity and hypotheses testing. Findings from the thematic analysis demonstrate that managers are adequately aware of these practices as these are aligned with OM theories and the developed model is supported. PCA show that all the model constructs are deemed reliable. The range of Kaiser Meyer Olkin (KMO) values for latent constructs lie between 0.69 and 0.85. Seven components for LM, while three components for each of the practices, QMS, STQM, EMS and SP were extracted and found to be considered as the critical success factors by the manufacturers for successful implementation. The study found that three practices such as QMS, STQM, and EMS were performing as mediators. Seven causal hypotheses were supported, whereas six mediated hypotheses were supported. The developed model can be preserved as an “eye opener” primarily for the local operations managers to implement the identified initiatives to help achieve Malaysia’ vision of becoming a developed nation in foreseeable future. Nevertheless, this study results can be treated as a guiding portfolio for manufacturing operations elsewhere.

خلاصة البحث

تحاول المؤسسات أن تصبح من ضمن مؤسسات التصنيع العالمي من خلال تنفيذ أفضل الممارسات لإدارة العمليات.الأداء المستدام يعتبر هدف مشترك تسعى المؤسسات الإنتاجيه لتحقيقه والحفاظ عليه. وبالرغم من أن هناك دراسات كثيرة أجريت على الممارسات الأساسية لأدارة العمليات وهي التصنيع الرشيق، ادارة الجودة الشاملة اللينة ،نظام ادارة الجودة ، ونظام ادارة البيئة وفحص تأثيرها على الأداء المستدام.فأن معظم هذه الدراسات أجريت بشكل منفصل في مناطق مختلفه من العالم وخصوصا في القطاع الصناعي الماليزي.كما أنها وجدت غير ملائمة لاستكشاف هذه الممارسات المتداخله وهل يمكن تواجدها معا في نفس المؤسسة أم لا. في هذا الصدد تم تطوير نموذج تفاهمي من اجل تفحص الروابط بين هذه الممارسات وتدشين العلاقات الترابطية الخاصة بينها. وتتضمن هذه الدراسة أن التصنيع الرشيق هو متغير مستقل بينما الأداء المستدام هو متغير تابع.والمتغيرات الثلاثة وهي ادارة الجودة الشاملة اللينة،نظام ادارة الجودة ، ونظام ادارة البيئةكمتغيرات وسطية. لفحص النموذج تجريبيا فأنه تم صياغه 20 فرضية وتم استخدام التقنيات النوعية والكمية حيث تم جمع البيانات الأولية من خلال ثلاثة مراحل. أولاً المقابلات شبه المنظمه لاكتشاف مدى تطبيق النموذج أجريت مع 15 مديراً في الشركات الصناعية الماليزية.ثانياً الدراسة التجريبية حيث تم توزيع 240 استبانة على مدراء العمليات في مختلف القطاعات الانتاجية الصناعية. وثالثاً تم توزيع 900 استبانه في المرحلة الحقيقية عن طريق البريد الماليزي وشبكه الانترنت.أدوات الاحصاء الوصفي والاستقرائي تم استخدامها لتحليل البيانات .تم استغلال التحليل العاملي الرئيسي (PCA) من خلال برنامج الحزمة الاحصائية للعلوم الاجتماعية الإصدار 22 وذلك لاستكشاف واستخلاص العوامل الحرجه لنجاح ممارسات إداره العمليات , كما تم استخدام التحليل العاملي التوكيدي (CFA) من خلال برنامج الأموس 22 في نمذجه المعادلة الهيكلية وذلك لفحص مصداقيه وثبات النموذج الذي تم تطويره وفحص الفرضيات المصاغة. نتائج التحليل الموضوعي أظهرت بأن مدراء العمليات على دراية بهذه الممارسات والفوائد التي يمكن تحقيقها وأن هذه الممارسات متناغمة مع نظريات ادارة العمليات مما يعني قبول النموذج الذي تم تطويره. كما أظهرت النتائج أن جميع المتغيرات موثوقه كما أن مقياس دقة المتغيرات الخمسه يقدر بين 0.69 و 0.85. تم استخلاص سبعة عوامل للتصنيع الرشيق بينما تم استخلاص ثلاثة عوامل أخرى للمتغيرات الأخرى والتي اعتبرت عوامل حرجة للتنفيذ الناجح من قبل المدراء حال تنفيذها بالطرق السليمة. أظهرت النتائج بأن المتغيرات الثلاثة وهي ادارة الجودة الشاملة اللينة ونظامي ادارة الجودة والبيئة تعتبر كوسيط في مختلف العلاقات ما بين المتغيرات وفق النموذج المطور. كما أظهرت نتائج الدراسة عن قبول 13 فرضية من أصل 20 فرضية مختلفة. نموذج البحث التفاهمي الذي تم تطويره يعتبر كفاتح عين للمدراء الماليزيين حيث سيمكنهم من تحقيق الرؤية الماليزية لتكون دولة صناعية متقدمة . ومع ذلك فأن نتائج هذه الدراسه يمكن الحفاظ عليها باعتبارها كمحفظة توجيهية لعمليات التصنيع في أماكن أخرى.

APPROVAL PAGE

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DECLARATION

I hereby declare that this dissertation is the result of my own investigations, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at IIUM or other institutions.

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Dedicated to people who contributed in different ways

to complete this PhD dissertation, and make it successful

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LIST OF ABBREVIATIONS

AVE	Average Variance Extracted
ASV	Average Shared Variance
AGFI	Adjusted Goodness of Fit Index
AMOS	Analysis of Moment Structure
BSP	Business System Planning
CFA	Confirmatory Factor analysis
CR	Composite Reliability
CFI	Comparative Fit Index
CSF	Crtitical Success Factors
DF	Degree of Freedom
EMS	Environmental Management System
EFA	Exploratory Factor Analysis
EM	Environmental Management
EFQM	European Foundation for Quality Management
FMM	Federation of Malaysian Manufacturers
GFI	Goodness of Fit Index
HEMS	Hard Environmental Management System
HRM	Human Resource Management
ISO	International Organisation for Standardisation
IMS	Integrated Management System
JIT	Just In Time
KMO	Kaiser Meyer Olkin
LM	Lean Manufacturing
LSS	Lean Six Sigma
MI	Modification Indices
MLE	Maximum Likelihood Estimation Method
MBNQA	Malcolm Baldrige National Quality Award
MSV	Maximum Shared Variance
NVA	Non-Value Activities
NFI	Normed Fit Index
OM	Operations Management
PCA	Principal Component Analysis
PDCA	Plan Do Check Act
QMS	Quality Management System
QM	Quality Management
QFD	Quality Function Deployment
RMSEA	Root Mean Square Error of Approximation
RBV	Resource Based View
RDT	Resource Dependence Theory
SEM	Structural Equation Modeling
STQM	Soft Total Quality Management
SPSS	Statistical Package for Social Science
SP	Sustainable Performance
STS	Socio Technical System
SD	Sustainable Development

SDMS	Sustainable Development Management System
SLCM	Strategic Life Cycle Management
SEMS	Soft Environmental Management System
SRS	Stratified Random Sample
SIRIM	Standards and Industrial Research Institute of Malaysia
SMEs	Small and Medium Enterprises
SEMS	Soft Environmental Management System
SMED	Single Minute Exchange of Dies
TQEM	Total Quality Environmental Management
TPS	Toyota Production System
TOC	Theory of Constraints
TLI	Tucker Lewis Index
TPM	Total Productive Maintenance
TQC	Total Quality Control
VIF	Variance Inflation Factor
VSM	Value Stream Mapping
VAA	Value Added Activities

LIST OF SYMBOLS

α	Cronbach alpha
β	Standardized Beta (β)

CHAPTER ONE

INTRODUCTION

1.1 GENERAL BACKGROUND

It is quite imperative for any manufacturer to constantly look for ways to increase productivity and at the same time to lower cost to secure a competitive position. In this regard the practice of Lean Manufacturing (LM) is recognized as an effective approach which is capable to yield a superior competitive advantage in terms of productivity, quality and overall successful sustainable performance. Consequently numerous enterprises are in the process of implementing different LM tools and techniques to be branded as lean enterprises (Pandi, Sethupathi, & Rajesh, 2012). In parallel to this trend the words such as 'Sustainability' and 'Green' have become integral parts in all industrial operations to cope with the twenty-first century strategic and evolutionary necessities (Andreas, Allen, Farley, Kao, & Mladenova, 2010). Since the mid-1990s, various voluntary actions in Environmental Management (EM) have been adopted by enterprises around the world. It would not be unrealistic to say that implementation of Environmental Management System (EMS) ISO 14001 standard is one of the most prominent EM practices by the enterprises (He, Liu, Lu, & Cao, 2015).

However, on the other side, successful implementation of Total Quality Management (TQM) as affected by the key Operations Management (OM) practices requires a total integration of the LM and EM initiatives into daily affairs of an enterprise.

According to the contemporary OM literature, the perceived benefits originate from successful implementation of key five practices namely; LM, Soft TQM (known