DEVELOPING A COMPOSITE INDEX TO CATEGORIZE MANUFACTURING SECTOR ENTERPRISES IN SRI LANKA BY USING PRINCIPAL COMPONENT ANALYSIS

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(168810D)

Degree of Master of Science

Department of Mathematics

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Thesis submitted in partial fulfilment of the requirements for the degree of Master of Science in Operational Research

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Declaration of the candidate & supervisor

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Abstract

The industry sector, manufacturing industries play a prominent role in accomplishing economic growth in countries all over the world. Presently, Sri Lanka does not have a commonly accepted standard to categorize manufacturing enterprises. Different organisations use different definitions and there is no consistency between them. The most common criterion is the number of persons employed in the company. Though this is simple, it disregards important characteristics such as annual turnover, assets, energy consumption, etc. Hence, an establishment with fewer employees and large turnover categorized into small scale establishment and the number of employees significantly large but turnover not sufficient to large scale categories also mark as a large scale enterprise. Therefore policy-making stage on small-medium enterprises (SME) very difficult to identify enterprises categories exactly. So, Identifying manufacturing sector enterprises on a generally accepted criterion is a long-felt necessity to the country.

The main focus of this study is to develop a statistical method, to categorize manufacturing enterprises (5 or more persons engaged) in Sri Lanka. Developing a composite index and define the index boundaries to identify small, medium, and large manufacturing industries by considering the composite index mean value. One of the variable reduction methods called the principal component analysis (PCA) technique is used to define the index. Five reliable and significant variables were considered for the study. Data were collected from the Annual Survey of Industries 2017 (ASI) which is conducted by the Industries, Trade, Construction, and Services Division of the Department of Census and Statistics of Sri Lanka.

398 establishments out of the 1792 size sample were misclassified referred to two criteria (Turnover and Number of employees) as per the Ministry of Industry and Commerce (MOI) definition. Treating this misclassification is one of the main objectives of this study to come up with a solution.The analysis was addressed correctly to misclassified establishments in an accepted manner. Composite Index value less than or equal to zero (negative values) grouped as small scale and composite index value zero to 0.9983 categorized as meadium scale. Index values more than 0.9983 grouped as large scale establishments.

Eventually, by introducing cut-off index value, a newly entered establishment could also be categorized. Further cut-off point can be re-valued by changing base year when an Economic Census being done. The introduction of a consistent methodology to categorize which led to granting aid for the right establishment and paying taxes from the right establishment, which is very important for the development of the country.

Keywords: Composite Index, Principal Component Analysis, Dimensional Reduction, Categorization

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List of Abbreviations

Abbreviations	Description
CI	Composite Index
CORM	Correlation Matrix
COVM	Covariance Matrix
CV	Coefficient of Variance
DCS	Department of Census and Statistics
EU	European Union
FA	Factor Analysis
GVA	Gross Value Added
ISIC	International Standard of Industrial Classification
KMO	Kaiser Meyer Olkin
MOI	Ministry of Industry and Commerce
MSME	Micro, Small & Medium Enterprises
PC	Principal Component
PCA	Principal Component Analysis
SD	Standard Deviation
SLSIC	Sri Lanka Standard of Industrial Classification
SLSIC 2D	Sri Lanka Standard of Industrial Classification 2 Digit
SME	Small Medium Enterprise
WB	World Bank

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