DEVELOPMENT OF A TWO-STAGE NETWORK DATA ENVELOPMENT ANALYSIS (DEA) MODEL TO ANALYZE PRODUCTION LINE'S PERFORMANCE: COMBINATION OF AUTOMATION AND LABOR

NIK AFIEZA BINTI CHE AZHAR

Thesis submitted in fulfilment of the requirements
for the award of the degree of
Master of Sciences (by Research)

Faculty of Technology
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OCTOBER 2016

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θ	Efficiency

LIST OF ABBREVIATIONS

CCR	Charnes-Cooper-Rhodes
DEA	Data Envelopment Analysis
DMU	Decision Making Units
EFQM	European Foundation for Quality Management
KPI	Key Performance Indicator
ROI	Return on Investment

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ABSTRAK

Pada masa kini, pembangunan pelbagai industri tidak lagi asing di mata dunia. Setiap industri bersaing antara satu sama lain untuk meningkatkan produktiviti dan menghasilkan produk baru dan berkualiti tinggi bagi memenuhi permintaan pelanggan. Setiap syarikat boleh mencapai Key Performance Indicator (KPI) atau matlamat yang disasarkan tetapi tanpa mengambil kira kos, tenaga kerja, masa atau lain-lain unsur-unsur adalah tidak cekap terhadap produktiviti. Menambah baik barisan pengeluaran dalam industri pembuatan memerlukan pelaburan yang besar untuk menghasilkan prestasi yang baik. Syarikat boleh mencapai Return of Investment (ROI) dan menyimpan lebih banyak wang daripada membayar gaji buruh dan meningkatkan produktiviti. Walau bagaimanapun, syarikat itu juga mungkin mempunyai risiko kehilangan wang mereka daripada pelaburan yang dilakukan tanpa penilaian barisan pengeluaran yang betul. Dalam kajian ini, kami mengkaji keberkesanan barisan pengeluaran yang dilengkapi dengan kombinasi antara penggunaan automasi dan buruh untuk menentukan produktiviti dan kualiti pengeluaran. Kemudian, membandingkan setiap barisan pengeluaran mengunakan automasi dengan barisan pengeluaran yang menggunakan tenaga buruh. Sebagai kajian kes, kajian ini memberi tumpuan kepada barisan pengeluaran yang menghasilkan produk yang mempunyai permintaan yang tinggi dan berterusan bagi melihat pelaburan ke atas automasi boleh memberi pulangan yang baik ataupun sebaliknya. Oleh itu, model Two-Stage Network DEA telah dibangunkan untuk mengukur barisan pengeluaran di peringkat yang berbeza. Hasil dari penilaian data melalui model ini akan menunjukkan semua keberkesanan barisan pengeluaran. Model ini akan memberi manfaat kepada industri berkaitan dalam prestasi setiap baris pengeluaran oleh itu, syarikat boleh membuat penambahbaikan terhadap barisan pengeluaran yang tidak cekap.

ABSTRACT

Nowadays, the growth of industry can be seen as a nature of the world. Each company race again each other to increase productivity to produce new, high quality and product that fulfil customer demand. One can achieve the Key Performance Indicator (KPI) or targeted goal but without considering the cost, manpower, time or others elements is inefficient toward productivity. Upgrade production line in manufacturing industry needs huge investment to come out with good performance. The company can receive Return of Investment (ROI) and save more money from paying labor salary and increase productivity. However, the company also may have the risk of losing their money from the investment done without proper production line evaluation. In this research, we studied the effectiveness of production line that equipped with combination between automation usage and labor to determine the productivity and quality of the production line. Then, compare those production line with production line that use labor energy. As a case study, this research focuses on the production line that producing a product with a high and continues demand to observe how the investment on automation can give good return or otherwise. Therefore, the model of Two-Stage Network DEA was developed in order to measure those production line in different stages. As a result, the evaluation of data through this model will show all the effectiveness of the production line. The model will benefit the related industries in their performance by show the efficiency of each production line then company can make improvement toward those inefficient production line.

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