A COMPARATIVE STUDY ON THE PERFORMANCE OF MISSIONS OR CONFERENCES AND INSTITUTIONS OF WEST INDONESIA UNION MISSION

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ABSTRACT: This study focuses on study comparative performance of Missions or Conferences and Institutions which group into two groups: 8 Missions or Conferences (group I) and 6 Institutions (group II) for 11 years, bringing the total period of pooled data to 154 years. Data Envelopment Analysis (DEA), is used to measure the performance of Missions or Conferences and Institutions. In DEA there are 2 inputs (Salaries and Wages, Other Operating Expenses) and 2 outputs (Total Assets and Total Earned Income) which were applied to evaluate and compare the performance of Missions or Conferences and Institutions.

DEA findings show that Missions or Conferences are more efficient or managerial efficient (1.007) than Institutions (0.998), but Institutions are more technologically efficient (1.006) than Missions or Conferences (0.975). In Total Factor Productivity both of the groups (Missions or Conferences 0.981 and Institution 0.993) failed to get to the frontier. Using Mann-Whitney U test, there is no significant difference between Missions or Conferences and Institutions in terms of EFFCH, TECHCH, and TPFCH

Keywords: DEA, Performance, Efficiency

INTRODUCTION

Data envelopment analysis (DEA), occasionally called frontier analysis, was first put forward by Charnes, Cooper and Rhodes in 1978. It is a performance measurement technique which, as we shall see, can be used for evaluating the relative efficiency of decision-making units (DMU's) in organizations. Here a DMU is a distinct unit within an organization that has flexibility with respect to some of the decisions it makes, but not necessarily completes freedom with respect to these decisions.

Examples of such units to which DEA has been applied are: banks, police stations, hospitals, tax offices, prisons, defense bases (army, navy, air force), schools and university departments. Note here that one advantage of DEA is that it can be applied to non-profit making organizations.

Previous studies that used DEA in measuring nonprofit sector: Athanassoppulos and Gounaris (2001), Borden (1998), Butler (2003), Chang (1998), Chang et al. (2004), Chen et al. (2003), Chillingerian (1995), Gaynor and Anderson (2001), Midttun and Martinussen (2004), Oullette and Vierstraete (2004), Ozcan (1995), Polizos (2002), Shroff (1998), Valdmanis (1992), Rosko (2001), Rosko (2004), Bryce et al. (2000), White and Ozcan (1996), and Anderson et al. (1999).

This method is also applied to the service sector; schools/universities (Coelli *et al.*, 1998; Abott and Doucouliagos, 2002; and hospitals Chirikos and Sear, 2000).

These previous studies are all helpful in offering a benchmark for measuring productivity, especially the use of DEA method in this research. All identified variables such as inputs and outputs used are all consistent with those variables employed by previous studies in performing productivity analysis.

This paper calculates output-oriented Malmquist indices of Total Factor Productivity (TFP), technological change (TECHCH), and technical efficiency change (EFFCH) of Missions or Conferences and Institutions of West Indonesia Union Mission. Unlike previous studies which dealt only with nonprofit organization applied to service sector like universities and hospital, this study analyze the comparison between 2 groups, Missions or Conferences (group I) and Institutions (group II) under church ownership. Hence, this present study would fill the productivity performance of the organization under the church ownership. The results of this study add to the growing literature on efficiency and productivity performance and also for policy formulation purposes in the Board of Directors & management of the Church of West Indonesia Union Mission.

Apparently, performance of the Missions or Conferences and Institutions of West Indonesia Union Mission was not improving well. Hence, the objective of this paper (a) to know the positive technical efficiency, technological and total factor productivity among the groups (b) to measure the performance trend among the two groups in terms of technical efficiency, technological and factor productivity (c) to test the differences in the productivity and efficiency levels of Groups 1 and 2 in the sample.

SEVENTH-DAY ADVENTIST (SDA) ORGANIZATION IN INDONESIA

Today, under the West Indonesia Union Mission (WIUM) umbrella there are eight Missions or Conferences and six Institutions to be studied.

Missions or Conferences consists of several churches. Authority in the church comes from the membership of local churches; hence SDA church is a representative form of church government. Executive responsibility is given to representative bodies and officers to govern the Church with four levels of Church structure emanating from the individual believer to the worldwide Church organization build as follows:

1. The local church made up of individual believers
2. The local conference, or local field/mission, made up of a number of local churches in a state, province, or territory
3. The union conference, or union field/mission made up of conferences or fields within a larger territory (often a grouping of states or a whole country)
4. The General conference, the most extensive unit of organization, made up of all unions in all parts of the world. Divisions are sections of the general Conference, with administrative responsibility for particular geographical areas.

Each level is "representative," that is it reflects a democratic process of formation and election with officers and church boards elected by a majority vote. Churches in turn elect delegates to the conferences which meet "in session" every two or three years. Executive authority between sessions is exercised by the Conference Executive Committee and the executive officers (normally President, Secretary and Treasurer), all of whom are elected by the session.

Anthony and Young (2003) stated that religious organization operates as a nonprofit organization and West Indonesia Union Mission is no exception, it operates as a nonprofit organization.

A nonprofit organization operates with goals other than earning a profit for its owners. Very often such nonprofit organizations provide services. Since service is difficult to quantify, it is more difficult to measure performance in a nonprofit organization. Just as clear-cut choices among alternative courses of action are difficult and relationships between service costs and benefits are usually hard to measure. Despite these shortcomings, management must operate at its optimum level so all resources are used efficiently and effectively. Comparative analysis of Seventh Day Adventist with 28 other

Protestant denominations revealed that members are giving far less today than in the past (Lee, 2000). Steven G. Rose, under treasurer of General Conference of Seventh Day Adventist reported in financial statement September 30, 2003 for the first time revealed a $ 4.9 million loss before adjustment (Gallagher, 2003). The denomination needs an organization capable of meeting challenges and opportunities never before imagined and the task facing church leaders today is to enable a complex organization to be faithful, effective and efficient during a time of rapid change in a culturally diverse context (Lee, 2000).

Today's knowledge revolution, globalization, advancing technology, and learning organizations are driving managers and leaders to create corresponding modifications inside organization to be more productive and efficient. According to Murdick et al. (2001), managers need to anticipate social, technological, political, cultural and religious shocks, and their impact on organization.

Productivity and efficiency is also a pressing issue in the SDA organization in Indonesia, because the issue has been overlooked unlike in the Western countries where efficiency and productivity are highlighted. SDA organizations in Indonesia have overlooked measuring performance. Thus this study compares the performance of Missions or Conferences and Institutions of the WIUM from period 1993 – 2003.

DEA – MALMQUIST INDEX METHOD

DEA (Data Envelopment Analysis) is the optimization method of mathematical programming to generalize the Farrell (1957) single-input/ single-output technical efficiency measure to the multiple-input/ multiple-output case by constructing a relative efficiency score as the ratio of a single virtual output to a single virtual input (Emrouznejad, 2001). Thus, DEA becomes a new tool in operational research for measuring technical efficiency. It originally was developed by Charnes, Cooper, Rhodes (1978) with CRS and was extended by Banker, Charnes, Cooper (1984) to include variable returns to scale. Thus, the basic DEA models are known as CCR and BCC. Since 1978 over 1000 articles, books and dissertation have been published and DEA has rapidly extended to returns to scale, dummy or categorical variables, discretionary and non-discretionary variables, incorporating value judgments, longitudinal analysis, weight restrictions, stochastic DEA, non-parametric Malmquist indices, technical change in DEA

and many other topics (Emrouznejad, 2001). Currently, the DEA measure has been used extensively to evaluate and compare educational departments (schools, colleges and universities), health care (hospitals, clinics) prisons, agricultural production, banking, armed forces, sports, market research, transportation (highway maintenance), courts, benchmarking, index number construction and many other applications.

DEA is a linear programming based technique for measuring the relative performance of organizational units where the presence of multiple inputs and outputs makes comparisons difficult (Dyson et al., 1990)

There is an increasing concern with measuring and comparing the efficiency of organizational units such as local authority departments, schools, hospitals, shops, bank branches and similar instances where there is a relatively homogeneous set of units.

The usual measure of efficiency, i.e.:

$$\text{efficiency} = \frac{\text{output}}{\text{input}}$$

is often inadequate due to the existence of multiple inputs and outputs related to different resources, activities and environmental factors.

DEA comes from its property to envelope all points on or below a frontier line (Cooper et al. 2000). It is a measure of productivity growth, technical progress and efficiency change using the Malmquist index. The Malmquist index (MI) represents Total Factor Productivity (TFP) that is a product of two geometric means either input-oriented or output oriented. DEA can solve input-oriented or output-oriented efficiency measure for any unit, country, or industry (Coelli, et al., 1988).

Input-oriented DEA seeks the maximum comparative reduction in resources while maintaining the number of outputs produced from each firm. The output-oriented case search for the maximum comparative increase in output produced, with a certain level of input used. Both orientations are computed through a series of piece-wise frontier inside a linear programming solution for each of the firms in the sample over the data points (Cooper et al., 2000). The frontier represents an efficient technology.

DEA-Malmquist index is embedded in a mathematical programming system that can accommodate time varying panel data to measure firm's performance and the output-

oriented Malmquist index will use as a measure of the total factor productivity change (TFPCH) between two data points over time. This will be done by calculating the ratio of distances of each data points relative to a common technology. Fare et al. (1994) formulated the components of distance function of the Malmquist index as follows

$$m_0(y_{t+1}, x_{t+1}, y_t, x_t) = \frac{d_0^{t+1}(y_{t+1}, x_{t+1})}{d_0^{t}(y_t, x_t)} \times \left\{ \left(\frac{d_0^{t}(x_{t+1}, y_{t+1})}{d_0^{t}(x_t, y_t)} \right) \left(\frac{d_0^{t+1}(x_{t+1}, y_{t+1})}{d_0^{t+1}(x_t, y_t)} \right) \right\}^{1/2}$$

Where: m_0 = Malmquist productivity

d_0 = Distance function from period t to t+1

Malmquist productivity index (m_0) shown in Equation above is represented by two decomposed component ratios. The first ratio (outside the bracket) is the change in relative efficiency from period t to t+1. The second ratio (inside the bracket) reflects the shift in technology between the period's x_t and x_{t+1} (Fare et al., 1994).

The Malmquist index of total factor productivity change (TFPCH) is the product of technical efficiency change (EFFCH) and technological change (TECHCH) as expressed (Cabanda, 2001):

TFPCH = EFFCH x TECHCH (2)

The Malmquist productivity change index, therefore, can be written as:

$m_0(y_{t+1}, x_{t+1}, y_t, x_t)$ = EFFCH x TECHCH (3)

Technical efficiency change (catch-up) measures the change in efficiency between current *(t)* and next *(t+1)* periods, while the technological change (innovation) captures the shift in frontier technology.

As expressed by Squires and Reid (2004), technological change (TECHCH) is the development of new products or the development of new technologies that allows methods of production to improve and results in the shifting upwards of the production frontier. More specifically, technological change includes new production processes, called process innovation and the discovery of new products called product innovation.

With process innovation, firms figure out more efficient ways of making existing products allowing output to grow at a faster rate than economic inputs are growing. The cost of production declines over time with process innovations --new ways of making things.

Technical efficiency change, on the other hand, can make use of existing labor, capital, and other economic inputs to produce more of same product. An example is increase in skill or learning by doing. As producers gain experience at producing something they become more and more efficient at it. Labor find new ways of doing things so that relatively minor modifications to plant and procedures can contribute to higher levers of productivity.

Panel data allow for an estimation of technical progress (the movement of the frontier established by the best-practice firms) and changes in technical efficiencies over time (the distance of the inefficient firms from the best practice firm) or catching up.

DEA has its own limitations; however, for the purposes of this study, DEA method is very useful in evaluating the performance of Seventh-Day Adventist (SDA) organization and determining the sources of their inefficiency and this study calculate efficiency and productivity with the aid of computer software, which was developed by Tim Coelli known as the Data Envelopment Analysis Program (DEAP) Version 2.1 (Coelli, 1996).

This study uses two inputs and two outputs, which made it possible to run the output-orientated Malmquist DEAP. The two inputs and two outputs were taken as measures of a firm's efficiency and productivity. The Missions or Conferences and Institutions inputs were salary and wages and other operating expense. Outputs were total earned income (revenue) and total assets. These inputs and outputs measures were calculated for the period 1993-2003, among a panel of 14 selected organizations in our sample. In aggregate, the test period covered about 154 years in the entire group of organization in the sample that ensured a very rigorous and reliable result.

EMPIRICAL RESULTS

Table 1 below shows the Malmquist Index Summary of Missions and Conferences by applying a nonparametric method developed by Fare et al. (1994) and the computer program of Coelli DEAP Version 2.1 (1996).

Table 1. Malmquist Index Summary of Firm Means

Missions or Conferences

FIRM	EFFCH	TECHCH	TFPCH
CSM	1.018	0.976	0.994
EJC	1.011	0.996	1.007
JC	0.994	0.971	0.965
KM	1.000	0.957	0.957
NSM	1.014	1.002	1.016
NTM	1.006	0.965	0.971
SSM	0.996	0.951	0.947
WJC	1.015	0.982	0.997
Mean	1.007	0.975	0.981

The table further shows the Malmquist Index Summary means for technical efficiency change or managerial efficiency change (EFFCH), technological change (TECHCH) and total factor productivity change (TFPCH). The Malmquist index of total factor productivity change (TFPCH) is the product of technical efficiency change (EFFCH) and technological change (TECHCH) as expressed TFPCH = EFFCH x TECHCH (Cabanda, 2001).

The table reveals that there were six or 75% out of eight Missions or Conferences (group I) with EFFCH performed above frontier level of one which means the Missions or Conferences tends to exert better managerial efficiency to be productive than technological change (12.5%). Among the group I Central Sumatera Mission appears to be the most efficient (1.018) compare to its peer in the group. North Sumatera Mission is more productive with TFP index growth 1.016 which the average growth of 1.6% per year. This growth was due to both EFFCH and TECHCH. East Java Conference is also best performers in the sample as indicated in their TFP scores of greater than one. This result shows that EFFCH scores was greater than TECHCH, therefore the productivity was mainly due to efficiency change. The other Missions or Conferences that obtained values lesser than one need to exert more efforts to attain higher productivity rate.

In table 2 there are three or 50% out of six Institutions performing well or efficient in terms of efficiency change and technological change, respectively. In total factor productivity two or 33.33% out of six Institutions has TFP index above one. Indonesia Adventist University appears to be the most efficient with TFP index growth 1.112 which the average growth rate 11.2% per year. This growth was due to both technical efficiency change (4.3%) and technological efficiency change (6.6%). Medan Adventist Hospital is also the best performer

as indicated in its TFP score more than one. This result shows that its efficiency change or managerial efficiency (4.2%) was greater than its technological change (-0.2%).

Table 2. Malmquist Index Summary of Firm Means

Institutions

FIRM	EFFCH	TECHCH	TFPCH
BAH	0.954	1.044	0.995
BLAH	0.993	0.970	0.963
IAU	1.043	1.066	1.112
IPH	0.900	1.010	0.910
MAH	1.042	0.998	1.040
SNAC	1.000	0.953	0.953
Mean	0.988	1.006	0.993

[Note that all Malmquist index averages are geometric means]

There were one or 12.5% out of eight Missions or Conferences with TECHCH indices above one compare to three or 50% out of six of Institutions. For TFPCH there were two or 25% out of eight of Missions or Conferences performed above frontier level of one compare to two or 33.33% out of six Institutions. This means that 25 percent of the Missions or Conferences performed well in terms of productivity which the main source of TFP well performance was technical efficiency change, while 33.33% of the Institutions performed well in terms of productivity which the main source from both efficiency change and technological change.

Furthermore data envelopment findings show that Missions or Conferences were more efficient (1.007) than Institutions (0.998), but Institutions were more technologically efficient (1.006) than Missions or Conferences (0.975). In group I (Missions or Conferences) there were 75% efficient and 25% were inefficient, while in group II there were 50% efficient and 50% inefficient in terms of technical efficiency change. Total factor productivity in group I was affected by decline 2.5% of TECHCH while in group II decline 1.2% by EFFCH.

Table 3 below shows the Malmquist Index summary of annual means and the TFP performance of group I (Missions or Conferences). Total factor productivity change (TFPCH) can be decomposed into technical efficiency change (EFFCH) or managerial efficiency and technological change (TECHCH) or innovation. The empirical results show that TFPCH mean of group I posted below the efficient level or below one (0.981). Most of the means of TFPCH posted below the efficient level or below one, but increased significantly in the year 1995, 1998

and 2001, with scores of 1.077, 1.333 and 1.145, respectively. The negative source of TFP growth for the group I was the technological change, which decline 2.5% average per year. The positive source of TFP growth for this group I was the technical efficiency change, which therefore their productivity was mainly due to technical efficiency change with a EFFCH index score 1.007 or 0.7 percent growth rate per year.

Table 3. Malmquist Index Summary of Annual Means
Missions or Conferences

YEAR	EFFCH	TECHCH	TFPCH
1993			
1994	0.963	1.009	0.972
1995	0.929	1.159	1.077
1996	1.158	0.798	0.924
1997	0.937	0.920	0.862
1998	0.847	1.573	1.333
1999	1.082	0.830	0.898
2000	1.107	0.826	0.915
2001	1.041	1.099	1.145
2002	1.022	0.797	0.814
2003	1.021	0.955	0.975
Mean	1.007	0.975	0.981

Findings suggest that most of the time this group I have positive managerial efficiency as indicated by the positive score of EFFCH that has been achieved through the test period. These results imply that managerial efficiency is the main driving factor for TFP growth, meaning the group I was efficient in management and able to maximize their outputs (total earned income and total assets) out of given inputs, while innovation or technological improvement needs to be considered.

Table 4 presents the Malmquist index summary of means of Institutions (group II) which its trend with a 0.925 score in 1994 to 0.927 in 2003. The result shows that the TFPCH mean posted below the efficient level or below one (0.993), decline 0.7 percent growth per year. It can be noted further that TFP change fluctuated within the study period, from the negative score index 0.925 of TFP in 1994 to a highest 1.311 in 1995 or growth about 39 percent and again to the lowest 0.875 in 1996 or decline about -52 percent.

Table 4. Malmquist Index Summary of Annual Means

Institutions

YEAR	EFFCH	TECHCH	TFPCH
1993			
1994	1.116	1.829	0.925
1995	0.811	1.616	1.311
1996	1.288	0.679	0.875
1997	0.639	1.472	0.940
1998	0.690	1.549	1.069
1999	1.850	0.519	0.960
2000	1.061	0.878	0.932
2001	1.040	1.006	1.047
2002	1.816	1.240	1.011
2003	1.030	0.900	0.927
Mean	0.988	1.006	0.993

The same trend was observed in TECHCH, with a 0.829 score in 1994 to 0.900 in 2003. The result shows fluctuation in the ten years test period, from negative score index 0.829 in 1994 to the highest score index 1.616 in 1995 and to the lower score index 0.679 in 1996. The lowest score index of TECHCH was 0.519 in 1999. On average, TECHCH tends to post a better contribution to TFP as evidenced in the Malmquist score of 1.006. It can be observed that the means of EFFCH was decline from a high of 1.116 in 1994 to 1.030 in 2003, but the average (mean) during the ten year period was 0.988 which means EFFCH decline 1.2 percent per year.

Finding indicates that TFP growth was driven by TECHCH. This means that technological innovation was more apparent than managerial efficiency.

From 1993 to 2003, missions have greater improvement in efficiency, administrative operation and productivity growth than the institutions. The institutions achieved technological innovation and scale efficiency in operation than the missions. Across the firms, missions and institutions have no significant differences in their productivity and efficiency rankings. The U-test showed that there was no significant difference in malmquist indeces at 5% level. Table 25 shows the results of Mann-Whitney U-Test, where all the scores in column 8 is greater than 0.05. This means that EFFCH, TECHCH, PECH, SECH and TFPCH have performed equally

Table 5. Summary of Mann-Whitney Statistics for Malmquist Indices

Indicators	Firms	N	Mean Rank	Sum of Ranks	Mann W-U	Z	Significance
EFFCH	missions	8	8.190	65.500			
	institutions	6	6.580	39.500	18.500	-0.711	0.477
	Total	14					
TECHCH	missions	8	6.130	49.000			
	institutions	6	9.330	56.000	13.000	-1.420	0.156
	Total	14					
PECH	missions	8	8.000	64.000			
	institutions	6	6.830	41.000	20.000	-0.538	0.590
	Total	14					
SECH	missions	8	8.380	67.000			
	institutions	6	6.330	38.000	17.000	-0.912	0.362
	Total	14					
TFPCH	missions	8	7.500	60.000			
	institutions	6	7.500	45.000	24.000	0.000	1.000
	Total	14					

*significant at .05 acceptance level

CONCLUSION

DEA findings show that Missions or Conferences were more efficient or managerial efficient (1.007) with 0.7 percent growth rate per year than Institutions (0.988) with -1.2 percent declines per year while Institutions more technologically efficient or innovation (1.006) with 0.6 percent growth rate per year than Missions or Conferences

(0.975) with -2.5 percent decline per year. In total factor productivity both of the groups failed to get to the frontier, 0.981 and 0.993 or less than one.

There is no significant difference between Missions or Conferences and Institutions in terms of TFPCH, EFFCH and TECHCH.

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