

Assessing the Efficiency of Companies in Thailand's Creative Industry using Data Envelopment Analysis: A Case Study of Media Industry

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Abstract

This study aimed to assess the efficiency of companies in creative industry in Thailand during 2008 – 2011 by employing Data Envelopment Analysis (DEA). To do so, 26 listed companies in media industry in the Stock Exchange of Thailand were chosen as a case study. The findings revealed that the average overall technical efficiency of these companies under the assumption of constant return to scale was not high during 2008 – 2010, ranging from 62.53 to 77.17 percent. However, their average overall technical efficiency increased sharply to 86.48 percent in 2011. There were only two companies which were efficient in every year under this assumption. However, as variable return to scale was assumed, there were six companies which were efficient in every year under this assumption. Additionally, their average pure technical efficiency ranged from 70.45 to 92.38 percent, implying considerably high pure technical efficiency and the upward trend of pure technical efficiency during the study period. As looking at their scale efficiency, we found that only two companies were scale efficient, implying optimal level of production, during 2008 – 2011, whereas the rest of them could not operate at the optimal level, implying production either below or beyond the optimal level. Nevertheless, the scale efficiency of these 26 media companies exhibited the upward trend since the average scale efficiency increased from 87.62 percent in 2008 to 93.45 percent in 2011 and the number of companies with constant return to scale, indicating optimal level of production, increased from 5 companies in 2008 to 11 companies in 2011.

Keywords: Efficiency, Creative Industry, Media Industry, Data Envelopment Analysis, Thailand

1. Introduction

Thailand has been losing its competitive advantage in the global market due to many reasons. First of all, the global economic crisis in the USA and European countries has caused the global aggregate demand to diminish, leading to the declining exports of Thailand. In addition, Thailand has been currently facing the diminishing proportion of working-age population in an ageing society thanks to the declining fertility. Such a demographic shift has a detrimental impact on Thailand's labor intensive industry because it causes Thailand's advantage of cheap labor, Thailand's major factor to drive its economic growth, to fade away. Furthermore, China, India and Vietnam which have the cheaper labor have over taken Thailand in export of labor intensive products (NESDB, 2009). With these situations, Thailand needs to find the way to increase its competitive advantage so that it can create the constant economic growth and the improving standard of living of its people. As a result, it decided to shift from a factor-driven economy to a creativity-driven economy (NESDB, 2009). In other words, Thailand has adopted "a creative economy" as its development scheme.

According to Howkins (2001), the creative economy is defined as a comprehensive analysis of the new economy, based on creative people, creative industries and creative cities. It is also defined by UNCTAD (2008) as an evolving concept based on creative assets potentially generating economic growth and development. In case of Thailand, the NESDB defines the creative economy as an economic development which is based on the creation and utilization of knowledge, creativity and intellectual property, linked with the cultural heritage, knowledge accumulation, technology and innovation, in creating the economic value added (NESDB, 2009). Based on UNCTAD (2008), the creative economy can foster income generation, job creation and export earning while promoting social inclusion, cultural diversity and human development. It embraces economic, cultural and social aspects interacting with technology, intellectual property and tourism objectives. It is also a set of knowledge-based economic activities with a development dimension and cross-cutting linkages at macro and micro levels to the overall economy. Additionally, at the heart of the creative economy are the creative industries.

UNCTAD (2008) defines the creative industry as the cycles of creation, production and distribution of goods and services that use creativity and intellectual capital as primary inputs. They comprise a set of knowledge-based activities that produce tangible goods and intangible intellectual or artistic services with creative content, economic value and market objectives. In case of Thailand, the NESDB has modified UNCTAD's creative industrial classification and classified Thailand's creative industry into 4 groups, including (1) cultural heritage and nature, (2) arts, (3) media and (4) functional creation. In this study, we examine the efficiency of companies in creative industry in Thailand during 2008 – 2011. In addition, 26 listed companies in media industry are selected as the case study.

The media industry is chosen as the case study since its GDP as percentage of Thailand's GDP is still low in comparison to those of cultural heritage and nature and functional creation industries (NESDB, 2009; Howkins, 2011). This situation leads to the question regarding the efficiency of media companies in Thailand. That is why the study on the efficiency of media industry is very important. Moreover, listed media companies in the Stock Exchange of Thailand (SET) are chosen since most of them are the leading companies in media industry of the nation. As a result, the efficiency of these companies will suitably represent the efficiency of overall media industry in Thailand. This study will provide the useful insight regarding the efficiency of media industry in Thailand which will benefit the policy formulation and implementation to develop Thailand's media industry.

2. Previous Research

Based on the literature reviews, the efficiency of companies in a particular industry can be measured by various methods. First of all, the efficiency can be proxied by total factor productivity (TFP). It is the portion of output not explained by the amount of inputs used in production. As such, its level is determined by how efficiently and intensely the inputs are utilized in production (Comin, 2006). Additionally, total factor productivity growth reflects the better management quality and the

technological progress of companies, enabling them to produce more output with the same amount of inputs. As a result, such companies are considered to have the higher efficiency. Thus, it is thus reasonable to conclude that the higher total factor productivity also implies the higher efficiency. According to the literature reviews, we find several studies employing TFP to measure the efficiency in manufacturing and service industries (Nishimura and Kurokawa, 2004; Ikhsan-Modjo, 2006; Othman et al., 2010).

In addition, efficiency can also be measured by cost X efficiency. It measures the relative efficiency of companies from the ability to produce a given amount of output with the minimum input. Such efficiency can be measured by a parametric technique called the Stochastic Frontier Analysis (SFA) (Rosko and Proenca, 2005). Under this method, the minimum cost of production given the amount of output and the input prices will be calculated and referred as the minimum cost that would be if the company is efficient as the best practice company in the sample facing the same amount of output and input prices. Cost X-efficiency will be defined as the ratio of the calculated minimum cost to the actual cost (Rosko and Proenca, 2005; Hao, 2008; Kyj and Isik, 2008).

Another method for measuring efficiency of companies is the Data Envelopment Analysis (DEA). It is a measurement technique for analyzing the relative efficiency of companies, called “Decision Making Units (DMUs)”, which have the same multiple inputs and multiple outputs. DEA is a non-parametric analytic technique which allows us to compare the relative efficiency of companies as benchmark and by measuring the inefficiencies in input combinations in other companies relative to the benchmark (Chansarn, 2008). The fundamental concept of DEA is to compare each company with the best practice company. Such a company will be assigned the efficiency score of 1 or 100 percent. Any company with the less than 1 efficiency score is said to be inefficient (Chansarn, 2008).

DEA has been applied to measure efficiency of companies in several industries such as manufacturing industry (Yayar et al., 2012), commercial bank (Chansarn, 2008), insurance company (Hu et al., 2009), hotel (Hwang and Chang, 2001) and educational institution (Colbert et al., 2000). However, this study utilizes DEA to measure the efficiency of 26 media companies in Thailand during 2008 – 2011 thanks to several advantages. First of all, DEA can handle multiple input and multiple output models. Inputs and outputs can have very different units (Trick, 1996). Moreover, unlike regression analysis, it does not require an assumption of a functional form relating inputs to outputs. Instead, it constructs the best production function solely on the basis of observed data, hence statistical tests for significance of the parameters are not necessary (Jemric and Vujcic).

Although there have been several studies measuring efficiency of companies in various industries in Thailand, unfortunately, the study which focuses on the efficiency of media companies in Thailand has not yet been found. We found that most previous studies focused on the efficiency of companies in the traditional major industries such electricity generation industry (Sirasoontorn, 2005), hospital (Patmasiriwat, 2007), airport (Pathomsiri, 2008), commercial bank (Chansarn, 2008), insurance company (Pluemchit et al., 2009) and hotel (Unthong and Kaosa-ard, 2009). Consequently, this study will shed more light on the efficiency of media industry in Thailand. The findings, of course, will be useful to the government and the authorities, especially the NESDB, in finding ways to promote creative industry and creative economy in Thailand.

3. Data and Sources

This study utilizes financial data of 26 listed media companies in the Stock Exchange of Thailand (SET) during 2008 – 2011. These 26 companies include;

(1)	Amarin Printing and Publishing Public Company Limited	(APRINT)
(2)	Aqua Corporation Public Company Limited	(AQUA)
(3)	Asiasoft Corporation Public Company Limited	(AS)
(4)	BEC World Public Company Limited	(BEC)
(5)	Eastern Printing Public Company Limited	(EPCO)
(6)	Far East DDB Public Company Limited	(FE)

(7)	GMM Grammy Public Company Limited	(GRAMMY)
(8)	Live Incorporation Public Company Limited	(LIVE)
(9)	Major Cineplex Group Public Company Limited	(MAJOR)
(10)	Matching Maximize Solution Public Company Limited	(MATCH)
(11)	Matichon Public Company Limited	(MATI)
(12)	MCOT Public Company Limited	(MCOT)
(13)	M Picture Entertainment Public Company Limited	(MPIC)
(14)	Nation Multimedia Group Public Company Limited	(NMG)
(15)	Prakit Holdings Public Company Limited	(P-FCB)
(16)	The Post Publishing Public Company Limited	(POST)
(17)	Pongsaap Public Company Limited	(PSAAP)
(18)	RS Public Company Limited	(RS)
(19)	SE-Education Public Company Limited	(SE-ED)
(20)	Siam Inter Multimedia Public Company Limited	(SMM)
(21)	Siam Sport Syndicate Public Company Limited	(SPORT)
(22)	Thai British Security Public Company Limited	(TBSP)
(23)	T.K.S. Technologies Public Company Limited	(TKS)
(24)	Tong Hua Communications Public Company Limited	(TONHUA)
(25)	Wave Entertainment Public Company Limited	(WAVE)
(26)	Workpoint Entertainment Public Company Limited	(WORK)

Data to be utilized in this study include revenues from sales of goods and rendering of services (million baht), other incomes (million baht), property, plant and equipment (million baht), personnel expenses (million baht), current assets (million baht) and operating expense (million baht). All data are obtained from the SET Smart Database provided by the Stock Exchange of Thailand (SET).

4. Research Method

This study utilized Data Envelopment Analysis (DEA) to measure the efficiency of media companies in Thailand. Under DEA, the efficiency of companies is measured by the efficiency score. The best practice company will be assigned the efficiency score of 1.00, indicating 100 percent efficiency while the other companies will be compared with the best practice company. Any company with the less than 1.00 efficiency score is considered inefficient. The score difference indicates the amount of inputs that the company needs to decrease while producing the same amount of outputs (Charnes et al., 1978). For instance, a particular company with the efficiency score of 0.85 is considered 85 percent efficient in comparison to the best practice company. This company thus needs to decrease its input usage by 15 percent while producing the same amount of outputs so that it will be considered 100 percent efficient.

In this study, the input-oriented DEA model is employed to measure the efficiency of media companies in producing the given amount of outputs with the lowest possible amount of inputs. This study examines efficiency of media companies under 3 dimensions, including overall technical efficiency, pure technical efficiency and scale efficiency.

4.1. Overall Technical Efficiency

First of all, it examines the overall technical efficiency of media companies. The overall technical efficiency is composed of 2 components, including pure technical efficiency and scale efficiency. In addition, the pure technical efficiency reflects the ability of company to obtain the maximum output from a given set of inputs or the ability of obtain a given set of outputs from the minimum input whereas the scale efficiency reflects the ability to use the inputs in optimal proportion or the ability to produce at the optimal scale of production (Banker et al., 1984). The overall technical efficiency can be measured by CCR model which developed by Charnes et al. (1978). This model is based on the assumption of constant return to scale (CRS) at which companies are assumed to operate at optimal level. The CCR model to be solved is as the following.

$$\min_{\lambda} z_0 = \theta_0 \quad (1)$$

$$\text{Subject to } \sum_{j=1}^n \lambda_j y_{rj} \geq y_{r0} \quad r = 1, 2, \dots, s \quad (2)$$

$$\theta_0 x_{i0} - \sum_{j=1}^n \lambda_j x_{ij} \geq 0 \quad i = 1, 2, \dots, m \quad (3)$$

$$\lambda_j \geq 0 \quad j = 1, 2, \dots, n \quad (4)$$

Where θ_0 = the efficiency score, y_{rj} = the amount of output r of company j , x_{ij} = the amount of input i of company j and λ_j = non-negative weight.

4.2. Pure Technical Efficiency

Additionally, this study also examines the pure technical efficiency of media companies by employing BCC model which developed by Banker et al. (1984). This model measures the efficiency of companies in producing a given set of outputs from the minimum input, based on the assumption of variable return to scale (VRS) at which companies are assumed to perform decreasing, constant or increasing return to scale. The BCC model to be solved is as the following.

$$\min_{\lambda} z_0 = \theta_0 \quad (5)$$

$$\text{Subject to } \sum_{j=1}^n \lambda_j y_{rj} \geq y_{r0} \quad r = 1, 2, \dots, s \quad (6)$$

$$\theta_0 x_{i0} - \sum_{j=1}^n \lambda_j x_{ij} \geq 0 \quad i = 1, 2, \dots, m \quad (7)$$

$$\sum_{j=1}^n \lambda_j = 1 \quad (8)$$

$$\lambda_j \geq 0 \quad j = 1, 2, \dots, n \quad (9)$$

4.3. Scale Efficiency

Finally, this study examines the scale efficiency which reflects the ability of companies to operate at the optimal level. The scale efficiency can be calculated by the following formula.

$$SE = \frac{OE}{TE}$$

Where SE = the scale efficiency, OE = the overall efficiency and TE = technical efficiency.

4.4. Outputs and Inputs of Media Companies

In this study, there are 2 outputs, including (1) sales of goods and rendering of services (million baht) and (2) other incomes (million baht) whereas there are 4 inputs, including (1) property, plant and equipment (million baht), (2) personnel expenses (million baht), (3) current assets (million baht) and (4) operating expense (million baht).

5. Empirical Results

Table 1 presents the descriptive statistics regarding outputs and inputs of 26 listed media companies in Thailand. As looking at the revenues from sales of goods and rendering of services, the findings reveal that mean value of the average revenues from sales of goods and rendering of services of these 26 companies equals 2,356.20 million baht. BEC World has the greatest average revenues from sales of goods and rendering of services of 10.6 billion baht whereas Tong Hua Communication has the lowest one of 33.08 million baht. However, it is GMM Grammy which has the greatest average other incomes of 268.48 million baht whereas Matching Maximize Solution has the lowest one of only 4.88 million baht. In addition, mean value of the average other incomes is 73.87 million baht.

Moreover, we find that mean value of the average property, plant and equipment is 744.16 million baht. Major Cineplex Group and Wave Entertainment have the greatest and lowest average property, plant and equipment of 5.3 billion baht and 11.96 million baht, respectively. GMM Grammy has the highest average personnel expenses of 1.5 billion baht whereas Tong Hua Communication has the lowest one of 11.65 million baht. Additionally, its mean value equals 392.45 million baht. In terms of the average current assets, we find that its mean value is approximately 1.3 billion baht. Furthermore, BEC World and Tong Hua Communication have the greatest and the lowest average current assets of 5.9 billion baht and 56.86 million baht, respectively. Finally, GMM Grammy and Tong Hua Communication have the greatest and the lowest average operating expenses of 2.7 billion baht and 18.62 million baht, respectively, whereas its mean value is 519.28 million baht.

Table 1: Outputs and Inputs of Listed Media Companies in Millions of Baht

Company	RGS	OT	PPE	PP	CA	OE
APRINT	1,820.60	22.45	844.11	417.12	1,206.83	248.05
AQUA	375.50	45.62	270.77	40.48	256.99	142.83
AS	1,558.15	30.76	122.79	272.25	1,269.39	379.89
BEC	10,566.13	153.04	363.76	1,062.25	5,859.97	1,523.87
EPCO	639.70	21.30	346.91	86.64	366.51	40.60
FE	628.38	52.00	205.82	131.70	710.48	291.45
GRAMMY	8,264.20	268.48	999.46	1,504.55	4,512.14	2,668.89
LIVE	314.50	10.44	101.57	113.82	190.72	148.66
MAJOR	5,914.60	214.78	5,307.18	567.88	2,015.50	1,389.89
MATCH	644.53	4.88	103.05	202.50	295.62	157.90
MATI	1,457.04	73.53	835.42	485.19	1,120.24	398.82
MCOT	4,927.78	115.52	3,960.33	1,295.06	5,508.22	1,018.40
MPIC	756.20	18.19	16.57	53.77	580.86	223.93
NMG	2,703.55	114.80	1,511.93	885.02	1,669.31	762.87
P-FCB	439.93	64.84	205.34	125.97	565.61	183.77
POST	1,801.46	32.53	1,057.00	665.79	649.56	473.60
PSAAP	564.24	123.55	189.79	69.87	254.48	292.38
RS	2,535.96	30.63	162.75	525.34	1,154.30	523.91
SE-ED	4,895.34	60.33	551.53	518.84	1,315.72	1,234.09
SMM	553.12	10.81	136.38	106.76	497.43	132.73
SPORT	2,005.98	207.65	334.60	413.67	799.50	428.95
TBSP	915.26	12.16	262.71	248.06	514.89	122.54
TKS	5,494.67	143.83	860.78	205.37	1,050.11	336.09
TONHUA	33.08	8.30	38.12	11.65	56.86	18.62
WAVE	116.98	44.76	11.96	23.34	408.65	55.29
WORK	1,334.23	35.40	547.40	170.89	674.46	303.27
Mean	2,356.20	73.87	744.16	392.45	1,288.63	519.28
Std. Deviation	2,708.32	72.48	1,221.81	403.12	1,561.44	603.99
Maximum	10,566.13	268.48	5,307.18	1,504.55	5,859.97	2,668.89
Minimum	33.08	4.88	11.96	11.65	56.86	18.62

Remark: 1. RGS = revenues from sales of goods and rendering of services, OT = other incomes, PPE = property, plant and equipment, EE = personnel expenses, CA = current assets and OE = operating expense.

2. APRINT = Amarin Printing and Publishing, AQUA = Aqua Corporation, AS = Asiasoft Corporation, BEC = BEC World, EPCO = Eastern Printing, FE = Far East DDB, GRAMMY = GMM Grammy, LIVE = Live Incorporation, MAJOR = Major Cineplex Group, MATCH = Matching Maximize Solution, MATI = Matichon, MCOT = MCOT, MPIC = M Picture Entertainment, NMG = Nation Multimedia Group, P-FCB = Prakrit Holdings, POST = The Post Publishing, PSAAP = Pongsaap, RS = RS, SE-ED = SE-Education, SMM = Siam Inter Multimedia, SPORT = Siam Sport Syndicate, TBSP = Thai British Security, TKS = T.K.S. Technologies, TONHUA = Tong Hua Communications, WAVE = Wave Entertainment and WORK = Workpoint Entertainment.

3. Figures shown in this table are the average outputs and inputs of 26 media companies during 2008 – 2011 in million of baht. Note that 1 US dollar is roughly equal to 32 Thai baht.

5.1. Overall Technical Efficiency of Media Companies in Thailand

The efficiency of listed media companies under CCR model during 2008 – 2011 is presented in Table 2. Note that CCR model measures the overall technical efficiency of companies under the assumption of constant return to scale at which companies are supposed to produce a given set of outputs from the minimum input at the optimal scale of production. The findings reveal that in 2008 there were only 5 companies out of 26 companies which were efficient under this assumption (having the efficiency score of 1.00), accounting for 19.23 percent. The average efficiency score is 0.6398, implying 63.98 percent efficiency. As a result, media companies, in average, need to decrease the amount of inputs by 36.02 percent while producing the same amount of outputs so that they are considered efficient. Moreover, the least efficient company in this year had very low efficiency score of 0.2586, indicating that this company needs to decrease its input usage by 74.14 percent while maintaining the same amount of output to be considered efficient.

Table 2: Efficiency of Listed Media Companies in Thailand under CCR Model

Year	2008	2009	2010	2011	Mean
Number of Companies	26	26	26	26	26
Number of Efficient Companies	5	7	10	11	2
Percentage of Efficient Companies	19.23	26.92	38.46	42.31	7.69
Average Efficiency (μ)	0.6398	0.6253	0.7717	0.8648	0.7254
Standard Deviation (σ)	0.2523	0.2996	0.2312	0.1587	0.1926
Minimum Efficiency	0.2586	0.2337	0.3197	0.5649	0.3895
Maximum Efficiency	1.0000	1.0000	1.0000	1.0000	1.0000

Source: Author's calculation

In 2009, the number of efficient media companies which had the efficiency scores of 1.00 increased to 7 companies, accounting for 26.92 percent. However, the overall technical efficiency in media industry diminished in this year due to the lower average efficiency score of 0.6253, indicating 62.53 percent efficiency. This figure implies that media companies in 2009 in average need to decreased the amount of inputs by 37.47 percent while producing the same amount of outputs to be considered efficient. Additionally, the efficiency score of the least efficient company also declined in 2009 to only 0.2337. As a result, this company will be considered efficient if it can produce the same amount of outputs with 76.63 percent lower input usage. The overall technical efficiency in Thailand's media industry increased in 2010 when the average efficiency score increased to 0.7717, implying 77.17 percent efficiency. Moreover, the number of overall technical efficient companies in this year also increased to 10 companies (accounting for 38.46 percent) whereas the least efficient company had the higher efficiency score of 0.3197. These figures show that media companies, in average, need to reduce the amount of inputs by 22.83 percent and the least efficient company need to reduce its amount of inputs by 68.03 percent in producing the same amount of outputs to become efficient.

In 2011, the overall technical efficiency in media industry increased further thanks to the higher average efficiency score which was 0.8648, implying that media companies in average were 86.48 percent efficiency and reducing the amount of inputs by 13.52 percent in producing the same amount of outputs will help media companies in average become efficient. There were 11 efficient companies, accounting for 42.31 percent. Additionally, even the least efficient company also had not very low efficiency score which was 0.5649, meaning that reducing its input usage by 43.51 percent while keeping its outputs unchanged will make it become efficient. Now let us look at the overall technical efficiency of media companies in Thailand during 2008 – 2011. We find that there were only 2 companies, accounting for 7.69 percent, which were overall technical efficient (having the efficiency scores of 1.00) in every single year. In addition, mean value of the average efficiency score was 0.7254, indicating the during 2008 – 2011 most media companies in Thailand employed too much inputs in their production and, in average, they need to reduce the amount of inputs by 27.46 percent while keeping their outputs constant to be considered efficient.

5.2. Pure Technical Efficiency of Listed Media Companies in Thailand

Table 3 summarizes the efficiency under BCC model which measures pure technical efficiency of 26 media companies in Thailand. Under this model, the assumption of constant return to scale is relaxed and companies are allowed to operate under variable return to scale. In other words, this model measures only the efficiency of companies in producing a given amount of output by employing the lowest possible amount of inputs. Based on Table 3, we can see that there were more efficient companies under BCC model than CCR model. In 2008, 8 media companies were found pure technical efficient (having the efficiency scores of 1.00), accounting for 30.77 percent. Furthermore, these 26 media companies in average need to decrease the amount of inputs by 27.45 percent while producing the same amount of outputs to be considered efficient thanks to the average efficiency score of 0.7255, indicating 72.55 percent efficiency. Moreover, the least efficient company in this year had the efficiency score of only 0.2643, hence it must reduce its input usage by 73.57 percent while keeping its output unchanged to be considered efficient.

Table 3: Efficiency of Listed Media Companies in Thailand under BCC Model

Year	2008	2009	2010	2011	Mean
Number of Companies	26	26	26	26	26
Number of Efficient Companies	8	10	14	15	6
Percentage of Efficient Companies	30.77	38.46	53.85	57.69	23.08
Average Efficiency (μ)	0.7255	0.7045	0.8543	0.9238	0.8020
Standard Deviation (σ)	0.2295	0.2825	0.1957	0.1163	0.1700
Minimum Efficiency	0.2643	0.2538	0.4335	0.6280	0.5399
Maximum Efficiency	1.0000	1.0000	1.0000	1.0000	1.0000

Source: Author's calculation

Even though there were 10 efficient companies, accounting for 38.46 percent, in 2009, the pure technical efficiency in Thailand's media industry seemed to decrease as the average efficiency score gradually decreased to 0.7045 (70.45 percent efficiency). Accordingly, media companies in average need 26.55 percent reduction in the amount of inputs in producing the same amount of outputs so that they are considered efficient. Moreover, the efficiency score of the least efficient company in this year also declined to 0.2538, indicating that 74.62 percent reduction in the amount of inputs, while producing the constant outputs, is required so that such company can become efficient company. However, the situation regarding the pure technical efficiency in Thailand's media industry got better in 2010 when the average efficiency score rose to 0.8543, 85.43 percent efficiency, and the number of efficient companies rose to 14 companies, accounting for 53.85 percent. Therefore, in this year media companies in Thailand in average need to employ 14.57 percent less input to produce the constant outputs so that they can be considered efficient. In addition, the least efficient company in 2010 had the efficiency score of 0.4335, meaning that 56.65 percent decrease in its input usage in producing the same amount of outputs is needed to be considered efficient.

The pure technical efficiency in media industry in Thailand grew further in 2011 when 15 media companies, accounting for 57.69 percent, were found efficient and the average efficiency score increased to 0.9238, implying 92.38 percent efficiency. Accordingly, media companies in Thailand, in average, need to produce the same amount of outputs by employing 7.62 percent less input so that they are considered efficient. Additionally, the least efficient company in 2011 needs to produce the same amount of output by employing 37.2 percent less input so as to be considered efficient. As looking at the pure technical efficiency of media companies during 2008 – 2011, the findings reveal that only 6 companies, accounting for 23.08 percent, were pure technical efficient in every single year during the study period. Mean value of the average efficiency score equaled 0.8020, implying that during 2008 – 2011 media companies, in average, will be considered efficient if they can reduce the amount of inputs by 19.80 percent while keeping their outputs unchanged.

5.3. Scale Efficiency of Listed Media Companies in Thailand

Table 4 presents the scale efficiency in Thailand's media industry. Note that the scale efficiency reflects the ability of companies to operate at the optimal level of production where the average cost of product is minimal. Therefore, the scale efficient companies are those which can achieve the optimal level of production whereas any company of which production falls below or exceeds this optimal level is considered scale inefficient. According to Table 4, Thailand's media industry had high scale efficiency during 2008 – 2011 with the average efficiency score ranging from 0.8751 to 0.9345. In 2008, 5 media companies, accounting for 19.23 percent, were efficient and the average efficiency score equaled 0.8762, implying that median companies, in average, were 87.62 percent efficient and the production of Thailand's media companies, in average, was close to the optimal level. In 2009, the average efficiency score slightly decreased to 0.8751 although the number of scale efficient companies increased to 7 companies (26.92 percent of total companies). Nevertheless, scale efficiency of 87.51 percent in media industry was still considered high since this figure implies that the production of media companies, in average, was still close to the optimal level.

Table 4: Scale Efficiency of Listed Media Companies in Thailand

Year	2008	2009	2010	2011	Mean
Number of Companies	26	26	26	26	26
Number of Efficient Companies	5	7	10	11	2
Percentage of Efficient Companies	19.23	26.92	38.46	42.31	7.69
Average Efficiency (μ)	0.8762	0.8751	0.9022	0.9345	0.8970
Standard Deviation (σ)	0.1590	0.1574	0.1483	0.1085	0.0944
Minimum Efficiency	0.3684	0.5197	0.3197	0.5726	0.6437
Maximum Efficiency	1.0000	1.0000	1.0000	1.0000	1.0000

Source: Author's calculation

From 2010 onward, the scale efficiency in Thailand's media industry clearly exhibited an upward trend. In 2010, 10 companies, accounting for 38.46 percent, were scale efficient and media companies, in average, were 90.22 percent efficiency thanks to the higher average efficiency score of 0.9022 in this year. These figures indicate that the production of Thailand's media companies, in average, got closer to the optimal level. In 2011, the average efficiency score increased to 0.9345, implying 93.45 percent scale efficiency. Additionally, there were 11 scale efficient companies, accounting for 42.31 percent, in 2011. As a result, it is sensible to conclude that in 2011 the production of Thailand's media companies, in average, nearly achieve the optimal level. Finally, as looking at the scale efficiency in media industry during 2008 – 2011, we find that only 2 companies or 7.69 percent of total companies in this industry were scale efficient in every single year. However, mean value of the average efficiency score during 2008 – 2011 equaled 0.8970, indicating 89.70 percent efficiency, can support the statement that Thailand's media industry had high scale efficiency during 2008 – 2011.

5.4. Return to Scale of Listed Media Companies in Thailand

Table 5 summarized return to scale of listed media companies in Thailand during 2008 – 2011. Note that constant return to scale reflects the optimal level of production whereas decreasing and increasing return to scale reflect the non-optimal level. More clearly, decreasing return to scale implies the production beyond the optimal level whereas increasing return to scale implies the production below the optimal level. Based on Table 5, 5 companies, accounting for 19.23 percent were operating under constant return to scale whereas 1 company (3.85 percent) and 20 companies (76.92 percent) were operating under decreasing and increasing return to scale, respectively. In 2009, the number of companies which operated under decreasing and constant return to scale increased to 7 companies, accounting for 26.92 percent. However, the number of companies which operated under increasing return to scale decreased to 12 companies, accounting for 46.15.

Table 5: Return to Scale of Listed Media Companies in Thailand

Year	2008	2009	2010	2011
Number of Companies	26	26	26	26
Decreasing Return to Scale (DRS)	1	7	5	8
Constant Return to Scale (CRS)	5	7	10	11
Increasing Return to Scale (VRS)	20	12	11	7
Percentage of DRS	3.85	26.92	19.23	30.77
Percentage of CRS	19.23	26.92	38.46	42.31
Percentage of VRS	76.92	46.15	42.31	26.92

Source: Author's calculation

In 2010, the number of companies which operated under decreasing and increasing return to scale, implying the non-optimal level, decreased to 5 companies, accounting for 19.23 percent, and 11 companies, accounting for 42.31 percent, respectively. Meanwhile, the number of companies which operated under constant return to scale, implying the optimal level, increased to 10 companies, accounting for 38.46 percent. That is why the scale efficiency in Thailand's media industry increased in 2010. In 2011, the number of companies which operated decreasing return to scale increased to 8 companies, accounting for 30.77 percent but the number of companies with increasing return to scale decreased to 7 companies, accounting for 26.92 percent. Additionally, the number of companies with constant return to scale also increased to 11 companies, accounting for 30.77 percent.

6. Discussion

According to the empirical results, media companies listed in the Stock Exchange of Thailand, in average, are still considered inefficient because many of them still fail to operate at the optimal level of production and employ too much input in producing a given amount of output. Fortunately, there is a good sign. That is, the efficiency in Thailand's media industry obviously exhibited the upward trend during the study period. In 2008, the findings reveal that overall technical efficiency in media industry was low. The major cause of this low overall efficiency was the somewhat pure low technical efficiency, stemming from the inefficiency in utilizing inputs to produce outputs. That is, media companies in 2008 seemed to employ too much input in producing the given amount of outputs. More clearly, most of media companies (nearly 80 percent) in 2008 still had production below the optimal level (too low production), leading to the inefficient utilization of fixed factors. Such situation led to the high average cost of production and, of course, the pure technical inefficiency. Fortunately, the scale efficiency in this year was high, showing that the production of media companies in average was close to the optimal level, help the overall efficiency not be very low.

In 2009, most of media companies increased their production, as a result there were 8 fewer companies which had production below the optimal level and 2 more companies which had the optimal level of production. However, the scale efficiency in 2009 turned out to decrease due to 6 more companies which instead had production beyond the optimal level. In addition, production beyond the optimal level seemed to adversely affect the pure technical efficiency of media companies. That is, such production normally led the inefficient utilization of variable factors, therefore companies which operate beyond the optimal level were likely to employ too much input in producing the given amount of outputs and have high average cost of production, leading to the lower pure technical efficiency in 2009. The lower pure technical and scale efficiency in 2009 thus caused the overall technical efficiency in Thailand's media industry to decline.

Production of most media companies in Thailand moved closer toward the optimal level in 2010, consequently there were fewer companies which operated beyond and below the optimal level of production and 3 more companies which operated at the optimal level. Such improvement certainly led to the higher scale efficiency in Thailand's media industry in this year. In addition, as more companies operated at the optimal level while fewer companies operated below or beyond this level, both fixed

and variable factors of production were likely to be more efficiently utilized, leading to the lower average cost of production and the higher pure technical efficiency. The higher pure technical and scale efficiency led to the improving overall efficiency in media industry in 2010. Moreover, the scale efficiency in Thailand's media industry increased further in 2011 despite 3 more companies with production beyond the optimal level. However, there was one more company with the optimal level of production and 4 fewer ones with production below the optimal level, leading to this constant improving scale efficiency. Furthermore, as the scale efficiency increased, the efficiency in utilizing both fixed and variable factors of production also increased. Such improvement led to the lower average cost of production and the higher technical efficiency. That is why the overall technical efficiency in Thailand's media industry increased in 2011.

7. Conclusion and Recommendation

According to the assessment of efficiency of media companies listed in the Stock Exchange of Thailand during 2008 – 2011 by employing Data Envelopment Analysis, we can conclude that media companies in Thailand, in average, still had the pure technical and scale inefficiency, causing the overall technical inefficiency. More clearly, media companies, in average, still had production either below or beyond the optimal level and employed too much input in producing the certain amount of outputs. That is why these companies also experienced the overall technical inefficiency. However, both the pure technical and scale efficiency clearly exhibited the upward trend during 2008 – 2011, leading to the upward trend of the overall technical efficiency in media industry of Thailand. Such improvement leads to Thailand's good opportunity for promoting its creative industry and creative economy. This is because media companies in Thailand are likely to have more productivity and competitiveness as they become more efficient. Consequently, Thailand's media industry is likely to be more productive and competitive and help drive Thailand's creative industry and creative economy. With the creative economy, Thailand is likely to gain more competitive advantage in the global market and have the sustained economic growth.

Nevertheless, there is a threat which may cause a detrimental impact on the efficiency in Thailand's media industry. That is, most media companies have been increasing their production scales and many of them are likely to produce beyond the optimal level. Based on the empirical results, the number of companies which operated beyond the optimal level constantly increased over the study period. Such situation may cause the pure technical and scale efficiency to decline, leading to the lower overall technical efficiency, in long run if the number of companies with production beyond the optimal level persistently increases. Therefore, the government and the authorities, especially the National Economic and Social Development Board (NESDB), need to have tight monitoring and control over the production of media companies so that they will not produce either below or beyond the optimal level. Additionally, media companies are recommended to employ the operation management strategies such as job design, JIT production, material requirement planning and supply chain management in order to improve their production and reduce cost of production. These strategies are supposed to help promote the technical efficiency of companies, leading to the higher overall efficiency in media industry. By doing so, Thailand is likely to have the sustained creative economy and the sustainable prosperity.

References

- [1] Banker, R.D., A. Charnes and W.W. Cooper. 1984. Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis. *Management Sciences*, 30, 1078 – 1092.
- [2] Chansarn, S. 2008. The Relative Efficiency of Commercial Banks in Thailand: DEA Approach. *International Research Journal of Finance and Economics*, 18, 53 – 68.
- [3] Charnes, A., W.W. Cooper and E. Rhodes. 1978. Measuring the Efficiency of Decision Making Units. *European Journal of Operational Research*, 2, 429 – 444.

- [4] Colbert, A. R.R. Levary and M.C. Shaner. 2000. Determining the relative efficiency of MBA programs using DEA. *European Journal of Operation Research*, 125(3), 656 – 669.
- [5] Comin, D. 2006. *Total Factor Productivity*. New York: New York University.
- [6] Hao, J.C. 2008. Measuring Cost Efficiency in the Taiwan Life Insurance Industry. *International Journal of Management*, 25(2).
- [7] Howkins, J. 2001. *The Creative Economy: How People Make Money from Ideas*. London: Penguin.
- [8] Howkins, J. 2011. *Thailand's National Strategy on Creative Economy*. Bangkok: National Economic and Social Development Board.
- [9] Hu, Z., Zhang, C., Hu, J.L. and Zhu, N. 2009. Analyzing Efficiency in the Chinese Life Insurance Industry. *Management Research News*, 32(10), 905 – 920
- [10] Hwang, S.N. and T.Y. Chang. 2001. Using Data Envelopment Analysis to Measure Hotel Managerial Efficiency Change in Taiwan. *Tourism Management*, 24(4), 357 – 369.
- [11] Ikhsan-Modjo, M. 2006. *Total Factor Productivity in Indonesian Manufacturing: A Stochastic Frontier Approach*. Victoria: Monash University, ABERU Discussion Paper 28.
- [12] Jemric, I. and B. Vujcic. 2002. *Efficiency of Banks in Croatia: A DEA Approach*. Croatian National Bank, Working Papers No.W-7.
- [14] Kyj, L. and I. Isik. 2008. Bank X-Efficiency in Ukraine: An Analysis of Service Characteristics and Ownership. *Journal of Business and Economics*, 60(4), 369 – 393.
- [15] NESDB (National Economic and Social Development Board). 2009. *Creative Economy*. Bangkok: National Economic and Social Development Board.
- [16] Nishimura, K.G. and F. Kurokawa. 2004. *Total Factor Productivity in Japanese Information Service Industries: Firm-Level Analysis*. Tokyo: University of Tokyo, Manufacturing Management Research Center, Discussion Paper No.11.
- [17] Pathomsiri, S. 2008. *Productivity of Thai Domestic Airport*. Paper Presented at the 6th Prince of Songkhla Engineering Conference, Songkhla, May 8 – 9, 2008.
- [18] Patmasiriwat, D. 2007. *Study on Efficiency of the Medium-Sized Community Hospitals in Thailand: The Case Study of 166 Community Hospitals Under the Ministry of Public Health*. Bangkok, Thammasat University, Economic Research and Training Center, Discussion Paper No. 0003.
- [19] Pluemchit, W., T. Nilbai, K. Homkajorn and P. Boonserm. 2009. *Technical Efficiency Analysis of Life Insurance Industry in Thailand*. Paper Presented at the 18th National Graduate Research Conference, Bangkok, September 10 – 11, 2009.
- [20] Othman, M., L.Y. Foo, M.S. Abdul Karim and Y. Abdul Aziz. 2010. Total Factor Productivity Efficiency Changes in a Malaysian Hotel Chain. *International Journal of Revenue Management*, 4(3/4), 327 - 343.
- [21] Rosko, M.D. and J. Proenca. 2005. Impact of Network and System Use on Hospital X-Inefficiency. *Health Care Manage Review*, 30(1), 69 – 79.
- [22] Sirasontorn, P. 2005. Efficiency Measure and Regulation: Thai Electricity Generation. *Thammasat Economic Journal*, 23(1).
- [23] Trick, M.A. 1996. *Data Envelopment Analysis for Consultants* [online]. Available at <http://mat.gsia.cmu.edu/classes/mstc/dea/dea.html>, accessed November 2, 2011.
- [24] UNCTAD (United Nations Conference on Trade and Development). 2008. *Creative Economy Report 2008*. Geneva: United Nations Conference on Trade and Development.
- [25] Unthong, A. and M. Kaosa-ard. 2009. Change in Managerial Efficiency of Hotel in Chiang Mai. *Thammasat Economic Journal*, 27(3).
- [26] Yayar, R., S.S. Karaca and Y. Erol. 2012. Data Envelopment Analysis Approach for the Measurement of ISO500 Firms' Efficiencies: Iron-Steel Basic Metal Industry. *European Journal of Economics, Finance and Administrative Sciences*, 47, 19 – 29.