Working together
www.rcis.ro

Revista de cercetare și intervenție socială

ISSN: 1583-3410 (print), ISSN: 1584-5397 (electronic)
Selected by coverage in Social Sciences Citation Index, ISI databases

THE APPLICATION OF DATA ENVELOPMENT ANALYSIS TO DISCUSS THE PERFORMANCE EVALUATION OF CULTURAL & CREATIVE INDUSTRIES PARKS

Ming-Hung LIN, Huang-Cheng CHEN, Kuang-Sheng LIU

Revista de cercetare și intervenție socială, 2017, vol. 59, pp. 75-85

The online version of this article can be found at:
www.rcis.ro, *www.doaj.org* and *www.scopus.com*

Published by:
Expert Projects Publishing House

expert projects
publishing

On behalf of:
„Alexandru Ioan Cuza" University,
Department of Sociology and Social Work
and
Holt Romania Foundation
REVISTA DE CERCETARE SI INTERVENTIE SOCIALA
is indexed by ISI Thomson Reuters - Social Sciences Citation Index
(Sociology and Social Work Domains)

The Application of Data Envelopment Analysis to Discuss the Performance Evaluation of Cultural & Creative Industries Parks

Ming-Hung LIN[1], Huang-Cheng CHEN[2], Kuang-Sheng LIU[3]

Abstract

Social change and the pressure of globalization accelerate the development of cultural & creative industries, giving people a different look of culture to the economic value. It allows culture re-appearing the economic vision and becoming the important goals of national cultural strategies and economy. The skills and capability included in cultural activity not only present the economic added value, but also show great contribution to individuals and social identity, national awareness, local cultural identity, cultural diversity, and creative tolerance and promotion. After the operation with Fuzzy Delphi Method, the geometric mean is used as the common sense of experts evaluating input and output factors. The median of the evaluation of input and output factors are further used as the screening standard to select the input and output factors in measuring the performance of cultural & creative industries parks. The research results reveal that the DEA efficiency evaluation result could help understand the relative efficiency of cultural & creative industries parks. One DMU shows strong-form efficiency, four DMUs, with the efficiency value between 0.9 and 1, present marginal inefficiency, and another four DMUs, with the efficiency value less than 0.9, appear obvious inefficiency. In terms of Slack Variable Analysis, DMUs in cultural & creative industries parks, with abundant inputs or reducing inputs, are proposed improvements. It is expected to assist in the development of domestic cultural & creative industries.

Keywords: cultural & creative industries, industries park, performance evaluation

[1] Tung-Fang Design University, Graduate Institute of Cultural and Creative Design, Kaohsiung City 82941, Taiwan ROC. E-mail: mhlin@mail.tf.edu.tw

[2] Tung-Fang Design University, Department of Digital Technology Design, Kaohsiung City, Taiwan, ROC. E-mail: chc@mail.tf.edu.tw

[3] Tung-Fang Design University, Department of Interior Design, Kaohsiung City, Taiwan, ROC. E-mail: kliu1219@yahoo.com.tw (Corresponding author)

Research background and motivation

The world economy is entering a new era. The primary trend under the economic structure is developing cultural industries and bringing culture into industry to make the closer relationship between culture and industries. Innovation, creativity, and enthusiasm are the key in cultural industries. It is therefore necessary to emphasize cultural productivity, encourage innovation, and promote creativity for more concerns about cultural industries so that all the people enthusiastically participate in culture and perceive the value from culture. Especially, the skills and capability included in cultural activity present not only the economic added value, but also show great contribution to individuals and social identity, national awareness, local cultural identity, cultural diversity, and creative tolerance and promotion.

Culture and economy are originally two different domains which are not integrated. Nevertheless, the social change and the pressure of globalization accelerate the development of cultural and creative industries, giving people a different look at the economic value from culture. Culture then re-appears the economic vision and further becomes the important goal of national cultural strategies and economy. Traditional concepts segmented culture and economy or the business consideration of daily life that it became the right for specific cultural people. In past years, the comprehension of culture has been changed. Cultural creativity and development is full of vitality, culture, economy, and science integrate with each other, and the essence, structure, and administration of cultural industries have experienced huge changes to become the new economic growth indicator. To understand the economic potential of cultural industries, the national policy focuses from idealistic fancy to market orientation and emphasizes cultural creativity and added value to thoroughly present the new image of culture. As the example of Korea, the cultural industries are systematically constructed, entertainment industries of movies and music are largely increased, and the "Korean culture" is constantly transmitted to Southeast Asian region of Mainland China, Taiwan, and Japan to create the high value of output. The process of South Korea developing the cultural industries is a worthy experience. For this reason, concerning about cultural industries should be the key indicator for the government formulating cultural policies.

Literature review

Cultural and creative industries

Finger & Dutta (2014) considered culture as the combination related to common value, belief, and expected behaviors. Five dimensions proposed by Hofstede for the research on business have attracted a lot of attention of researchers and are applied to various studies on marketing and management. Kumar & Steenkamp (2013) defined "culture" as "the effort in human society from savageness to civilization performed on science, art, religion, morality, law, custom, and habit." Sanchez-Gutierrez *et al.* (2016) explained that art culture in an area was the historical asset generated from the integration of life wisdom and cultural connotation of ancestors through a long period of time, which was then shaped the inexhaustible green resource of new life. The performed uniqueness and creativity of products with the idea of cultural and creative design became the major leader in the consumption market. Culture, being a rich value-created capital, could create the blue sea market with vital and economic value in the competitive red sea. As a result, culture and economy complemented each other so that culture was not simply culture, but the new energy of economy (Alguezaui & Filieri, 2014). Consumers do not purchase cultural products for physiological or material needs, but for psychological needs or rational addiction (Meihami & Meihami, 2014). In other words, Tsai & Lei (2016) stated the consumers purchase creative products because they consider such consumption would promote the quality of life for the enjoyment. The value management of cultural and creative industries is therefore established on social trend and to enhance the product value in consumers' mind (O'Connor, 2015).

Carroll & Buchholtz (2014) showed distinct ways of saying "cultural & creative industries" in the world, including "cultural industry", "creative industry" or "creative economy" that there was not a consistent explanation internationally. Thakur & Hale (2013) referred to United Nations Educational, Scientific and Cultural Organization (UNESCO) for the definition of "cultural industries" as "combining the contents of creation, production, and business; meanwhile, the essence of such contents presenting the characteristics of cultural assets and cultural ideas and being protected by intellectual property rights, which were presented as products or services. Regarding the contents, cultural industries could be regarded as creative industry, covering books and magazines, music, films, multimedia, tourism, and other industries produced with creativity." Geisler & Wickramasinghe (2015) stated that cultural and creative industries covered multiple contents and work items, included all upstream and downstream industries in the industrial chain, containing the design and development, research and development at the industrial front end, the production, manufacturing, and performance at the industrial middle end, as well as the marketing and promotion,

activity support, and exhibition planning at the industrial back end. Zettl (2013) pointed out the enormous industrial value and employment opportunities generated by core business or the peripheral service business. Culture in culture and creativity is the capital, and creativity is the catalyst, while time is the essential accumulation process(Chiang & Shyu, 2016). The core value of cultural and creative industries lies in culture and creativity driving industries as well as culture providing industries with quality contents and added value and creating business opportunities. Culture is a part of industries (or goods) but presents subjectivity and dominance that culture should not be treated as general goods (Wu & Lin, 2013).

Operation performance

Vesela & Klimova (2015) explained performance as the noun of Perform. According to Perter Drucker, performance was explained as the "direct result" in the *Effective Managers*. For an organization, it was regarded as the business execution result of an individual organization, i.e. the actual "output" level of an organization. In the management performance structure, Szilagyi mentioned that performance indicators contained efficiency, efficacy, productivity, profit, quality, safety, growth, participation, maintenance, satisfaction, encouragement, innovation, adaptability, and development. It is therefore understood that performance covers efficiency and efficacy (Hill, Jones, & Schilling, 2014). O'Connor & Gibson (2014) regarded performance as the degree of an enterprise or an organization achieving the specific goal. Lerro, Iacobone and Schiuma *et al.* (2012) pointed out operation performance as the indicator for enterprises evaluating and controlling the entire operation efficacy; the measurement of performance was the key in the evaluation and control, and the common control problem was the lack of objective and quantitative goals and the performance measurement standard. Zukin & Braslow (2011) considered operation performance as the actual performance and result of an organization. In other words, an organization with performance could effectively apply resources, satisfy the members' needs, achieve the preset goal, and adapt to the changes of external environment. Asanga Abhayawansa (2014) indicated that the measurement of operation performance could focus on operation performance and employees' work performance to further discover the criticism and problems. In other words, the operation performance of an enterprise was the management result of the interaction between the organization and external environment. Ngah, Abd Wahab and Salleh (2015) regarded the operation performance of an organization as the measurement of the organization achieving various goals, including employee productivity, employee turnover rate, product quality, shortening of operation time, goal support, overall performance, as well as employee morale, identity, and internal participation opportunity, and change innovation (Wang, 2016). In the discussion of the relationship between an organization and the outsourcers in the information system

outsourcing process, Fairlie & Holleran (2012) divided operation performance into "the perspective of business" and "the perspective of user". The former contained strategic benefits, economic benefits, and technical benefits, while the latter included user satisfaction.

Data Envelopment Analysis

Efficiency evaluation has been an important issue in management, while efficiency evaluation is the core of cost control. An effective efficiency evaluation could help departments enhance the efficiency of resource input and product output, i.e. to product the most products with the least resources. In other words, a favorable evaluation model could estimate an overall efficiency value to present the resource use. Besides, it should be able to evaluate qualitative and quantitative data with different units of measurement, could handle multiple inputs and outputs, could deal with variables in external environment, and could avoid subjective factors in setting weights so as to assist decision-makers in making decisions.

Charnes, Cooper and Rhodes (1978) expanded Ferrel's approach and established a more generalized linear planning model for measuring the production efficiency of multiple inputs and outputs under constant returns to scale, named Data Envelopment Analysis. The first proposed DEA model was then called CCR model. The basic model of Data Envelopment Analysis is based on three primary production hypotheses: (1) Constant returns to scale. That is, the returns would not increase or decrease with increasing operation scale; (2) Constant marginal productivity. Regardless the yield, the increased output with each increasing unit of input is the same; (3) Constant wasting of resources. The input resources wasted by an inefficient institution would become fixed proportion.

The basic idea to measure efficiency with DEA is based on the viewpoint of efficiency in "Pareto optimality". The so-called Pareto optimality indicates that no-one could enhance another person's benefits without losing others' benefits. According to such a viewpoint of efficiency, the actual production could be compared with production frontier, when "production frontier" (i.e. the idea of envelope line or efficiency frontier in economics) is known, to further measure the efficiency. With the idea of envelope line, DEA takes inputs and outputs of all decision making units (DMU) into account and divides the weighted output with the weighted input to calculate the relative efficiency of an individual enterprise to others.

Delphi Method and Modified Delphi Method

The practice of Delphi Method mainly combines the advantage of group experts' opinions to avoid the situated pressure in face-to-face discussions. Linstone and Turoff (1979) proposed that Delphi Method was suitable for the following situations. (1) Research problems provided little information and presented high uncertainty. (2) Research problems could not provide accurate analyses, but had answers by collecting subjectively judged data. (3) Participants were capable of offering useful opinions for broad and complicated issues, but were lack of interaction and discussion with other participants; or, the distinct specialties and experiences needed exchange. (4) It required several people providing opinions aiming issues. For effective interaction, face-to-face conversation would restrict the number of participants. (5) Time and location for face-to-face meeting could hardly be arranged, and it would spend a large amount of expenses. (6) The opinion exchange between people and groups needed efficient interaction, without being affected by the propagation of secondary groups. (7) Different opinions and positions could easily induce unhappiness in the face-to-face meeting process that the arbitration mechanism was necessary for group communication and the anonymity of participants should be ensured. (8) The heterogeneity of participants should be remained so as to prevent the research conclusion from being affected by the advantage of majority opinion and individual personality traits.

Linstone and Turoff (1979) also proposed four restrictions to Delphi Method. (1) Delphi research had to rely on experts' intuition knowledge, but the research result was easily interfered by experts' subjective judgment. (2) The practice of Delphi Method was hosted by the examiner who might interfere in the process. (3) The practice of Delphi Method was time-consuming and the progress was hard to control; and, expert opinions might appear contradiction. Besides, participants with low motivation could easily quit in the research process. (4) The final conclusion of Delphi Method was general, rather than simple detailed plans and specific details, so that it could merely be the guidance and reference for setting strategies. According to Murry and Hammons (1995), some research was omitted the brainstorming open-ended questionnaire for special considerations; instead, a structured questionnaire was developed, after referring to a large amount of literatures, for the first-run questionnaire survey. It was Modified Delphi Method. Modified Delphi Method directly preceded the first-run survey with the structured questionnaire to save time; besides, the structured questionnaire could have experts pay attention to the research subject and reduce the guess on open-ended questionnaire.

Research design

When applying DEA to measure the performance of cultural & creative industries parks, proper input and output factors should be selected for the efficiency evaluation. Fuzzy Delphi Method is utilized for combining the selection of input and output factors with expert opinions, reducing the input cost, and avoiding fuzziness in the investigation process. Total 30 copies of questionnaire are distributed in this study, and 22 valid copies are retrieved, with the retrieval rate 73%. Fremont, Means and Means (1970) indicated that the public opinion with more than 5 participants could be the analysis reference. The experts in this study cover industry, government, and university and show frequent interaction with cultural & creative industries that they present good representativeness.

After the operation with Fuzzy Delphi Method, the geometric mean is used as the common sense of experts evaluating the input and output factors, and the median of the evaluation scores is used as the selection standard. Total 4 input/output variables are strictly selected, and total 9 DMUs are available.

The data of variables used in this study are acquired from public statistics and annual reports.

Definition of variable:

I. Input variables: (1) Human resource: Input number of people of parks; (2) Budget: Input expenses of parks.

II. Output variables: (1) Supporting performance: Number of visitors to parks; (2) Integration effect: Enterprise-establishing effect in parks (number of enterprises established).

Efficiency analysis of cultural & creative industries park

Efficiency analysis of cultural & creative industries park

The DEA efficiency evaluation result could help understand the relative efficiency of cultural & creative industries parks. DMUs, with the efficiency value 1, present relative efficiency, while the efficiency value less than 1 shows the relative inefficiency of the DMUs. The empirical results, *Table 1*, show that Huashan 1914 Creative Park, with the efficiency value 1, is relatively efficient, i.e. the efficiency achieving the ideal state, while the rest 8 parks appear relatively worse efficiency.

Table 1. Relative efficiency value of cultural & creative industries park

Cultural & Creative Industries Park	Overall efficiency	Pure technical efficiency	Scale efficiency
Huashan 1914 Creative Park	1.00	1.00	1.00
Taichung Cultural & Creative Industries Park	0.98	0.97	0.99
Hualien Cultural & Creative Industries Park	0.94	0.93	0.95
Chiayi Cultural & Creative Industries Park	0.92	0.91	0.92
Tainan Cultural & Creative Park	0.96	0.96	0.96
Songshan Cultural and Creative Park	0.86	0.83	0.89
Chunghsing Cultural and Creative Park	0.87	0.86	0.88
Kaohsiung Cultural and Creative Park	0.85	0.85	0.84
Pingtung Cultural and Creative Park	0.81	0.80	0.82

Slack Variable Analysis

Regarding the analysis of returns to scale, *Table 2*, one cultural & creative industries park shows constant returns to scale and the efficiency achieves the optimal; the rest 8 parks reveal increasing returns to scale, showing that the marginal rewards could be enhanced by expanding the scale to further promote the efficiency.

In regard to Slack Variable Analysis, the improvement for cultural & creative industries parks with abundant inputs is shown in *Table 2*. Parks could reach efficient management by decreasing input units for abundant items. Moreover, one cultural & creative industries park presents efficiency and the input resources have achieved the optimal.

Conclusion

The efficiency value received from DEA and the variable information are classified in *Table 2*. Accordingly, one DMU, with the efficiency value 1, about 11% of all DMUs, shows strong-form efficiency, revealing better relative efficiency. Four DMUs, with the efficiency value between 0.9 and 1, about 44% of all DMUs, appear marginal inefficiency, showing that the relative efficiency could be easily enhanced. Another four DMUs, with the efficiency value lower than 0.9, about 44% of all DMUs, show obvious inefficiency, where Pingtung Cultural and Creative Park appears the lowest efficiency 0.81. The DEA result reveals high proportion of cultural & creative industries parks not achieving the scale efficiency

that the inputs should be re-considered and adjusted to promote the competitiveness. The profits of parks could hardly be adopted as current costs and investment benefits are difficult to calculate. Nevertheless, it requires the overall consideration of the park and to start from market strategies when more number of visitors to parks, rather than simply the input cost, is viewed.

Table 2. Improvement of cultural & creative industries park

Decision making unit (DMU)	Improvement of input		Improvement of output		Returns to scale
	Human resource	Budget	Supporting performance	Integration effect	
Huashan 1914 Creative Park	0	0	0	0	CRS
Taichung Cultural & Creative Industries Park	-1	-1	2	2	IRS
Hualien Cultural & Creative Industries Park	1	-2	3	3	IRS
Chiayi Cultural & Creative Industries Park	2	-3	1	1	IRS
Tainan Cultural & Creative Park	0	-1	1	1	IRS
Songshan Cultural and Creative Park	-3	1	3	4	IRS
Chunghsing Cultural and Creative Park	2	1	0	5	IRS
Kaohsiung Cultural and Creative Park	-2	-4	4	6	IRS
Pingtung Cultural and Creative Park	3	3	5	5	IRS

Data source: Self-organized in this study

Recommendations

According to the research results, the following suggestions are proposed in this study.

1. Subject characteristics of cultural & creative industries parks: Cultural & creative industries park managers have to frequently innovate the overall planning of the parks, the design and exhibition of space, and exhibition contents. Different subject characteristics are offered aiming at various subjects, which could be presented by integrating cloud technology and 3D visual reality to remain the novelty for visitors. The exhibition and performance could be divided into ticket exhibition and non-ticket exhibition to increase the income and more capital sources. Cluster effect could be applied to enhance the intention of cultural and creative businesses stationing in parks and to increase customer attraction.

2. Diverse communication platforms: The government could establish relevant mechanisms (e.g. regulations for various types of industries, cultural and creative windows for business enquiry and tutoring, development of talent intermediary service systems, cultivation plans for cultural and creative agents, establishment of experts for managing cultural and creative subsidiaries, and introduction of venture capital), place various cultural and creative art information and booklets at the entrance of cultural and creative parks, create a park environment suitable for creativity talents through e-paper, and provide platforms to match talents stationing in cultural and creative parks for more people viewing creative workers as well as promoting art exchange.
3. Professional quality of staff: Cultural & creative industries park managers could cooperate with schools for talent cultivation plans. Since most cultural and creative workers do not specialize in management, but are technicians, professional staff to assist in the promotion and marketing of cultural and creative fields is more important. The managers could cooperate with universities for students' practice opportunities so as to make cultural & creative industries talents younger. Moreover, general people and retired people could participate in volunteer interpretation after the talent training (e.g. professional knowledge and adaptability).

References

Alguezaui, S., & Filieri, R. (2014). A knowledge-based view of the extending enterprise for enhancing a collaborative innovation advantage. *International Journal of Agile Systems and Management*, *7*(2), 116-131.

Asanga Abhayawansa, S. (2014). A review of guidelines and frameworks on external reporting of intellectual capital. *Journal of Intellectual Capital*, *15*(1), 100-141.

Carroll, A., & Buchholtz, A. (2014). *Business and society: Ethics, sustainability , and stakeholder management*. Cengage Learning..

Charnes, A., Cooper, W.W., & Rhodes, E. (1978). Measuring the efficiency of decision making units. *European Journal of Operational Research*, *2*(6), 429-444.

Chiang, W.J., Shyu, M.L. (2016). Key Success Factors in the Business Model of B&B Industry in Taiwan. *Revista de Cercetare si Interventie Sociala, 53*, 89-96

Fairlie, R.W., & Holleran, W. (2012). Entrepreneurship training, risk aversion and other personality traits: Evidence from a random experiment. *Journal of Economic Psychology*, *33*(2), 366-378.

Finger, L., & Dutta, S. (2014). *Ask, Measure, Learn: Using Social Media Analytics to Understand and Influence Customer Behavior*. Cambridge: Oreylly.

Fremont, T., Means, G.H., & Means, R.S. (1970). Anxiety as a function of task performance feedback and extraversion-introversion. *Psychol Rep.*, *27*(2), 455-458.

Geisler, E., & Wickramasinghe, N. (2015). *Principles of knowledge management: Theory, practice, and cases*. Routledge.

Hill, C., Jones, G., & Schilling, M. (2014). *Strategic management: theory: an integrated approach*. Cengage Learning.

Kumar, N., & Steenkamp, J.B. (2013). Brand breakout:How emerging market brands will go global. London: Palgrave Macmillan.

Lerro, A., Iacobone, F.A., & Schiuma, G. (2012). Knowledge assets assessment strategies: organizational value, processes, approaches and evaluation architectures. *Journal of Knowledge Management*, *16*(4), 563-575.

Linstone, H.A., & Turoff, M. (1979). *The Delphi Method: Techniques and Applications*, MA ˙›“,)ś–ŹAddison-Wesley Publishing Company.

Meihami, B., & Meihami, H. (2014). Knowledge Management a way to gain a competitive advantage in firms (evidence of manufacturing companies). *International Letters of Social and Humanistic Sciences*, *3*, 80-91.

Murry, J.W., & Hammons, J.O. (1995). Delphi: A Versatile Methodology for Conducting Qualitative Research. *The Review of Higher Education*, *18*(4), 423-436.

Ngah, R., Abd Wahab, I., & Salleh, Z. (2015). The Sustainable Competitive Advantage of Small and Medium Entreprises (SMEs) with Intellectual Capital, Knowledge Management and Innovative Intelligence: Building a Conceptual Framework. *Advanced Science Letters*, *21*(5), 1325-1328.

O'Connor, J. (2015). Intermediaries and Imaginaries in the Cultural and Creative Industries. Regional Studies, *49*(3), 374–387.

O'Connor, J., & Gibson, M. (2014). *Culture, creativity, cultural economy: A review*. Australian Council of Learned Academies

Sanchez-Gutierrez, J., Mejia-Trejo, J., Vargas-Barraza, J.A., & Vazquez-Avila, G. (2016). Intellectual capital, impact factor on competitiveness: manufacturing industry SMEs in Mexico. *Measuring Business Excellence*, *20*(1), 1-11.

Zukin, S., & Braslow, L. (2011). The Life Cycle of New York's Creative Districts: Reflections on the Unanticipated Consequences of Unplanned Cultural Zones. *City, Culture and Society*, *2*, 131-140.

Thakur, R., & Hale, D. (2013). Service innovation: A comparative study of US and Indian service firms. *Journal of Business Research*, *66*(8), 1108-1123.

Tsai I.C. & Lei H. S. (2016). The Importance and Satisfaction of Collaborative Innovation for Strategic Entrepreneurship; *Eurasia Journal of Mathematics, Science and Technology Education*, *12*(3), 569–582

Vesela, D., & Klimova, K. (2015).Creative Industries and the Place of the Arts in University Interpreting-translation Programmes. *Procedia-Social and Behavioral Sciences*, *191*, 580-583.

Wang, M. (2016). Effects of Expatriates' Cultural Intelligence on Cross-Cultural Adjustment and Job Performance. *Revista de Cercetare si Interventie Sociala*, *55*, 231-243.

Wu, J. C., & Lin, C. (2013). *A Balance Sheet for Knowledge Evaluation and Reporting*. Active Citizenship by Knowledge Management & Innovation: Proceedings of the Management, Knowledge and Learning International Conference 2013 (pp. 342-348).

Zettl, H. (2013). *Sight, sound, motion: Applied media aesthetics*. Cengage Learning.