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www.emeraldinsight.com/1463-5771.htm

Received 3 July 2018
Revised 14 August 2018
2 April 2019
Accepted 16 April 2019

Artificial intelligence divulges effective tactics of top management institutes of India

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Abstract

Purpose – The performance analysis of top 50 management institutions of India is conducted to understand their efficiency in utilizing available resources. The importance of different indicators is investigated to identify most preferred strategies of top management institutions in the country in order to meet the expectations of all stakeholders. Artificial neural networks models are applied for pattern recognition and classification purpose using self-organized map algorithms. A huge reservoir of young generation is being trained every year to meet the demand of business in different sectors of economies. It becomes a matter of concern to know the performance of the management institutes to ensure the overall national progress, which can be done by enabling organizations to improve their efficiency and effectiveness, provided the right information and skills are served. Data envelopment analysis (DEA) and self-organizing maps are utilized together to take advantages of optimization and prediction capabilities inherent in each method, and they may be beneficial to assess institution's competitive position and design their own strategies in order to improve. The paper aims to discuss these issues.

Design/methodology/approach – The DEA is used to understand the utilization of resources by institutions on the bases of efficiency scores. Due to a greater flexibility and adaptability, neural technique, i.e. self-organized map, which is an artificial intelligence-based technique, a popular unsupervised learning model with a capability to capture patterns from data sets, is used. In this study, various parameters like qualification of faculty, research output of faculty members, expenditure made for functioning of the institution, etc., are considered. These academic and operational indicators are investigated in relation to the rank score and the efficiency score of top management institutions, and different strategies as a combination of input as well as output indicators are identified.

Findings – In the analysis, three types of strategies are identified. At present, the focus on salary packages of graduates seems the most utilized strategy. It is also observed that the strategy of having good performance, in terms of consultancy, peer and employer perception, has the highest success rate (in terms of score used for ranking). Results obtained using both techniques shows that due to high deviation and less explored research publications and sponsored research project is an opportunity that institutions can work upon to have maximum output. But to maintain consistency in terms of the high rank score and efficiency score, management institutions need to focus on consultancy, peer and employer perception.

Practical implications – This research identifies the different parameters categorized into various inputs and outputs for the management institutions in India for the benchmarking. It studies the importance of identified parameters in terms of success (rank score and efficiency score). Further investigation of relationship between parameters and success is conducted. Different strategies as a combination of parameters are identified. The current choice of top management institutions is revealed in terms of their preference and effectiveness of strategy. This research also provides some insight about long-term and short-term strategies, which may be beneficial to education managers or decision makers.

Originality/value – It is one of the rare papers in terms of performance measurement through data envelopment method and identification of strategy using artificial intelligence. This paper utilized a hybrid methodology that integrates these two data analytic methods to capture an innovative performance and strategies prediction in education system.

Keywords Data envelopment analysis, Management institutes, Strategy, Artificial intelligence, Relative efficiency

Paper type Research paper

Introduction

Over the last few decades in management education systems, the performance has become very important strategy to provide maximum amount of educational service within limited resources.

Expectations of all stakeholders toward the activities of management institutions are increasing. There is huge demand for sophisticated skills, application of research in

Benchmarking: An International Journal
Vol. 26 No. 7, 2019
pp. 2188-2204
© Emerald Publishing Limited
1463-5771
DOI 10.1108/BIJ-08-2018-0251

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socio-economic development through innovation and knowledge transfer. There are many studies that deal with the measurement of the efficiency of educational institutions utilizing different methods, and they identified human, financial resources (Manzini and Lazzarotti, 2006), facilities (Jackson and Lund, 2000), etc., as key inputs and graduates (CSWE, 2012), research publications and patents (Tijssen *et al.*, 2009; ACU, 2014), etc., as outputs. Several contributions aim at identifying key factors that affect efficiency in terms of quantity and quality of education production (De Witte and López-Torres, 2017; Johnes, 2004; Worthington, 2001; Freeman, 2010; Shattock, 2000, 2010).

An efficient utilization of resources in any organization optimizes benefits to all the stakeholders and supports the organization's mission and goals. Management education these days is facing challenges in terms of common competency of changes as institutions, knowledge creation, educational model social responsibility and knowledge transfer, and tapping the potential of information and communication technologies (Chitty, 2002; Orr, 2004; Prensky, 2009), and its relevance in the present context. It is not a problem of any single or few management institutes, but it is happening across the globe. All activities of different functions of management education have come under critical scanner, such as quality of students, faculty and infrastructure. Other related activities such as faculty or management development program, academic and industry interface, placement and salaries of graduates are also no longer out of investigation. The world is growing very fast and so is the corporate sector. Job requirements are changing and new employees are supposed to start their assignments from the first day of their joining. In such a scenario, students equipped with relevant skills and competencies, with a better understanding of corporate world, have more chances to grab the opportunity and retain the same for a longer period. The role of management institute preparing students for managerial role becomes very important and difficult. Although management education adds value to a student, but the level and kinds of values being provided may not be sufficient to meet expectations. There are many researchers (Boyatzis and Renio, 1989; Espey and Batchelor, 1987; Fiekers *et al.*, 2000) who have observed in their work that positive attributes gained from management studies by doing live industry projects, as per the requirement of company, and writing business reports ultimately help the graduates to become better managers. In addition to these, there are other researchers who have conducted detailed studies on benchmarking process in academic procedures and doctoral programs of higher educational institutes (Wan Endut *et al.*, 2000; Laugharne, 2002; Shaw and Green, 2002).

During this new era of globalization and internationalization, higher education institutions have received great attention from policymakers and educational leaders (Agasisti and Pohl, 2012). Augmented concern for greater efficiency within available resources and the evaluation of the performance of education systems have become an essential point in any economy (Agasisti *et al.*, 2012; Sav, 2012). In developing economies, it becomes more crucial due to scarcity of resources and increasing accountability to society (Castano and Cabanda, 2007; Fu and Huang, 2009). India is emerging to have a big opportunity in the global education industry (Education Industry Analysis, 2018). Requirement of higher education in coming decades would be a great challenge to the Government. To reduce the supply–demand gap, private sector might play an important role, as India is emerging as a knowledge base economy, with inadequate infrastructure, which leads to disaster in the delivery of education at higher or professional level. The country has around 850 universities and it is one of the biggest higher education structures in the world, facing mismatch in terms of demand and supply among high quality institutions. As middle class in India is expanding rapidly, so is the expenditure on education; thus, demand for quality higher education is also growing exponentially. Quality of management education in India has always remained an issue of significant attentions by all stakeholders which can reduce a big lot of students who are getting higher education overseas (Jagadeesh, 2000; Mulla, 2007; Debnath and Shankar, 2009).

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Despites of huge efforts and plans by the central government of India, the demand for higher education is not being met (MHRD Report, 2016). Thus, a huge chunk of the demand is being taken care by other institutions ranked as B and C category institutions, which are rated such by many magazines and professional journals. Therefore, ratings of management institutions have become point of interest among academicians, employers and students. Students, who are the main stakeholders, would like to know about the value addition through different facilities in terms of faculty qualification, corporate exposer and the level of placement, and these are the most important parameters being considered by all stakeholders. The choice of institutions by students depends upon aggregate value against fee to be paid (Debnath and Shankar, 2009). Requirement of quality education seen by students and related parameters, which can affect, like research by faculty, teaching aids and received admission applications are being considered by rating agencies. This may be considered as an opportunity to obtain information about many institutions at a single place to decide best fit as per requirements or affordability (Debnath and Shankar, 2009; Freeman, 2010). This information may be useful for other stakeholders (society, corporate, government) looking for optimization of output to make management education reachable to many. Similar to external, it may be helpful for internal stakeholder or management to utilize resources efficiently by making optimum allocation of funds and increase competitiveness in the system. Therefore, reliable information is actually the need of students, promoters as well society at large. The review of the literature reveals that most of the studies discuss performance of institutions in terms of ranking as per students' point of view. There are some papers that provide a detailed analysis and could be utilized by management to take appropriate action for improvement (Worthington, 2001; Johnes, 2004; Manzini and Lazzarotti, 2006; Jackson and Lund, 2000; Tijssen *et al.*, 2009; De Witte and López-Torres, 2017). In this work, in addition to these concerns, additional insights have been provided by conducting indicator-wise detailed analysis. Attempt is also made to detect average deviations (gaps if any) or desired outcomes in case of institutes for potential development among top fifty institutions. Successful strategies of top institutions are utilized to occupy place among top 50 institutions in spite of the difference in functioning.

In this paper, efforts are made to seek answers for the following research questions:

RQ1. Are all top ranked B-Schools fully efficient in utilizing available resources?

RQ2. What are deviations (if any) in performance of these management institutions?

RQ3. What are the most preferred strategies of top management institutions in the country?

Answers to these questions may help other institutions in order to meet the expectations of all stakeholders. This paper utilized a hybrid methodology (Athanassopoulos and Curram, 1996; Pendharkar and Rodger, 2003; Emrouznejad and Shale, 2009; Ülengin *et al.*, 2011) that integrates these two data analytic methods (first for relation between input and output indicators and second for importance of input/output indicators in relation to rank scores and efficiency scores): an innovative performance measurement and prediction approach in education system.

Data envelopment analysis (DEA)

DEA evaluates relative efficiency or compares the performance or capacity of a group or decision-making units (DMUs), measured in several ways, to identify the best. Initially, Farrell (1957) developed this method with careful measurement, but limitation of combining the measurements of multiple units was a challenge. Charnes *et al.* (1978) generalized the framework further and also made it a very popular concept. This method helped manufacturing industries to achieve world-class standards; it also helped planners and

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designers to identify performance gap in different areas of organization under consideration (considered as a DMU). DEA measures that how efficiently available resources are being used by a DMU to get a set of outputs. This proved as a critical task in the organization, as it alerts a particular organization about current global standards of performance. It is very important, as there is a general tendency of organizations to get satisfied with their performance and procedure (Greene, 1993). Once performance is compared by a benchmark, it helps to understand the need for improvement. Organizations look for best practices outside the organization, so that these could be incorporated to get competitive advantage (Chang and Kelly, 1994). Easy handling of multiple inputs to produce multiple outputs in this approach made it one of the most preferred techniques for the evaluation of relative efficiency. A non-parametric approach for the calculation of efficiency score of a DMU under consideration is just defined as relative value to the other DMUs, and it requires no absolute standard (Shammari and Salimi, 1998). Based on the characteristics of the problem in hand, input or output-oriented DEA model can be applied (Afzal and Lawrey, 2012; Abate *et al.*, 2013). This is a linear programming-based tool in efficiency measurement, particularly when organization's efficiency is being measured along with multiple dimensions. It has been applied in many other fields, such as health care (Sherman, 1984; Nunamaker, 1983; Sexton *et al.*, 1989), recreation (Rhodes, 1982), criminal justice (Lewin *et al.*, 1982), strip mining (Byrnes *et al.*, 1984) and public financing for pupil transportation (Sexton *et al.*, 1994), etc. It is one of the well-documented and popular techniques in the management (Charnes *et al.*, 1979; Forsund *et al.*, 1980; Sexton, 1986; Sexton *et al.*, 1986). Many researchers provided comprehensive and extensive bibliography in their works, which includes application and theoretical development of the technique (Tavares, 2002).

Artificial neural network

Artificial neural network uses unsupervised learning to convert total problem space into a two-dimensional map. This map uses competitive learning to solve the problem in terms of visual representation of any given data on a hexagonal or rectangular grid. For any input, the Euclidean distances between the nodes, given as a weight, are calculated. Then, the best matching unit, i.e. nodes of similar input data, is identified. As we move through all the nodes in the similar fashion, these weights appear like the actual data and one can see different patterns for all variables in the data set. Neural networks and most of their applications are actually the result of Kohonen's work in this area, and they are recognized as Kohonen's self-organizing map. This neural network (additional Kohonen layer) provides two-dimensional arrangement from N-dimensional inputs (Mangiameli *et al.*, 1996; Mingoti and Lima, 2006; Brusco *et al.*, 2012; Zurada, 2006). The training of the network uses an unsupervised learning algorithm, rate of adjustment of the network over time estimates learning coefficient and topological order is maintained by considering the weights of winning nodes (Kohonen, 1989). Networks can be pitched to relevant similarity features in the given data wherein scores of considered parameters, rank scores and efficiency score to get a particular outcome can be used to train the network. Abilities of self-organization and feature detection by this network are akin to knowledge representation in artificial intelligence. These results depict the advantage of Kohonen's (1982) network compared to the classical hierarchical methods of classification. Due to its competitive and unsupervised learning procedure, this network is also considered suitable for cluster development (Mangiameli *et al.*, 1996: Mingoti and Lima, 2006; Wehrens and Buydens, 2007; Medhi and Mondal, 2016). In this study, efforts are made to get managerial insights about score or rankings by developing clusters of institutions based on a number of parameters, which use real-life data without any knowledge of the imperfections present in the data set. It is an artificial intelligence based and a popular unsupervised learning technique with a capability to capture patterns from data sets (Haykin, 1994; Hsiang-Hsi *et al.*, 2013; Yi and Thomas, 2009).

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Selection of variables

There are many papers available in the literature that discuss different dimensions and measurement of the performance of the management institutions. Haksever and Muragishi (1998), Dreher *et al.* (1985), Hamlen and Southwick (1989) studied the quality and value of management education. A performance measure helps in monitoring strategic achievements and controlling the strategic movements of the institutions, as it is strongly related to the requirements of the institutions. For these measurements, management institutes need various parameters like highly qualified, motivated and research-oriented faculty members, talented students with adequate background and a vision for growth. The outcome may be reflected through qualified graduates who have acquired skills/competencies and a good placement. Taking clue from above-mentioned studies, in this paper, some relevant parameters, such as various resources (inputs) to attain the services (output), are considered, which could be relevant in measuring the performance of the management institutions. The various parameters are chosen in such a way that they reflect the purpose of study as accurately as possible. Important indicators of the study such as number of faculty members including different education level of the teaching faculty, financial resources including all capital and operational expenditures, graduating students, number and their salary packages, research output by faculty members at different levels, industry interface as sponsored research project, consultancy projects, perception by peer and employers (Wan Endut *et al.*, 2000; Jackson and Lund, 2000; Laugharne, 2002; Shaw and Green, 2002; Worthington, 2001; Johnes, 2004; Shattock, 2000, 2010; Manzini and Lazzarotti, 2006; Tijssen *et al.*, 2009; Debnath and Shankar, 2009; Fu and Huang 2009, Freeman, 2010; CSWE, 2012; ACU, 2014; De Witte and López-Torres, 2017) are considered for the analyzing the performance of top management institutes of India, and secondary data are collected from the Ministry of Human Resource Development website.

Data and empirical evaluation

The most reliable and available source of secondary data National Institutional Ranking Framework (NIRF) survey 2017 is utilized for empirical evaluation of top 50 management institutes of India. In this work, analysis of important characteristics of institutions is conducted mainly on the basis of NIRF survey, 2017, and some of the insight is taken from NIRF (2018) survey. Data available for top 50 management institutions of India, as per NIRF ranking, are utilized for the calculations of efficiency scores. Efficiency scores of all institutions are calculated using DEA on the basis of selected inputs and outputs. Basic DEA is conducted through Excel's Solver. It is a very useful optimization tool that can perform linear as well as nonlinear programming formulations. The process of calculating efficiency using spreadsheets is easily understandable and accessible to practitioners and students. This technique or tool has become successful. There are many papers and books available with interdisciplinary application DEA using Excel (Winston, 1994; Andersen *et al.*, 2000; Williams, 1999). Descriptive statistics of input and output indicators reveals that most of the output indicators have very high kurtosis as well as skewness values (Table I). It means that on the basis of output, institutions are not only varied in terms of magnitude but they also have a huge difference among themselves. There are some institutions that are considerably different from others in terms of consultancy, sponsored research project, followed by quality of research publication and placement of the graduates.

Efficiency scores of all the institutions are obtained and plotted (Figure 1) against ranks, revealing that focus on efficiency increases as move toward higher ranking. It can be seen that utilization of resources is being considered or it is having a considerable role in the position of management institutions.

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Input/Output indicators	Mean	SD	Kurtosis	Skewness	Range	Min.	Max.	Sum	Count
FtotalPHD	44.26	28.21	0.12	1.01	109	8	117	2,213	50
Ftotal	56.34	32.41	−0.64	0.62	124	13	137	2,817	50
Fwomen	16.34	12.87	4.65	2.04	60	2	62	817	50
Annual capital expenditure	25,955,394.46	33,582,642.37	6.34	2.33	1.66E+08	108,957	1.66E+08	1.3E+09	50
Annual operational expenditure	25,412,7621.20	27,646,4885.53	5.47	2.10	1.38E+09	21,51,934	1.38E+09	1.27E+10	50
Total annual expenditure	279,566,449.16	292,469,342.26	4.64	1.95	1.44E+09	33,23,771	1.44E+09	1.4E+10	50
Pstudents	225.22	157.01	−0.41	0.80	595	15	610	11,261	50
Psalary	1,058,462.92	644,979.49	7.53	2.04	37,32,826	267,000	3,999,826	52,923,146	50
Graduating	236.04	167.10	0.26	1.00	672	21	693	11,802	50
Publications[a]	12.06	18.56	4.43	2.18	80	0	80	603	50
Citations[a]	42.76	81.09	9.56	3.07	369	0	369	2,138	50
Top 25% highly cited papers[a]	3.56	6.23	8.78	2.82	30	0	30	178	50
Publications[b]	39.94	45.10	2.53	1.66	186	0	186	1,997	50
Citations[b]	83.30	126.50	7.55	2.66	612	0	612	4,165	50
Top 25% highly cited papers[b]	9.06	12.86	4.81	2.25	54	0	54	453	50
Sponsored research project	7,726,401.06	16,978,874.60	13.78	3.49	92,733,000	0	92,733,000	3.86E+08	50
Consultancy project	22,558,203.32	55,336,643.14	30.49	5.11	3.64E+08	0	3.64E+08	1.13E+09	50
Peer perception	25.82	47.01	11.15	3.24	244	0	244	1,291	50
Employer perception	6.48	12.73	16.40	3.76	73	0	73	324	50

Notes: [a]Publication details – Web of Science; [b]publication details – Scopus

Table I.
Descriptive statistics of input and output variables of top 50 B-school in India

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In this investigation, 14 out of 50 management institutions are identified as institutes for potential development (not fully efficient). Further investigation of these institutions about the available resources and outcome is conducted through the calculation of indicator-wise deviations. On average, results (Figure 2) obtained for each DMU reveal substantial underutilization of available resources. For instance, the average efficiency of institutes for potential development amounts to 0.68 as compared to the aggregate efficiency of all institutions, derived from applying the DEA model, which is 0.91. This indicates that there is a huge scope of improvement as far as utilization of available resources is concerned. It means that either these DMUs have to increase the output level or decrease the input level. However, decreasing inputs, namely number of seats, number of faculty, may not be a feasible solution; in that case, an emphasis must be on increasing output or the satisfaction level of their stakeholders rather than focusing only on the short-term goal.

Further analysis of deviations (Figure 2) reflects the maximum deviation in research and sponsored research, which is followed by consultancy and perception by employer and peer. It is important to note that least deviation is obtained in admitting the students

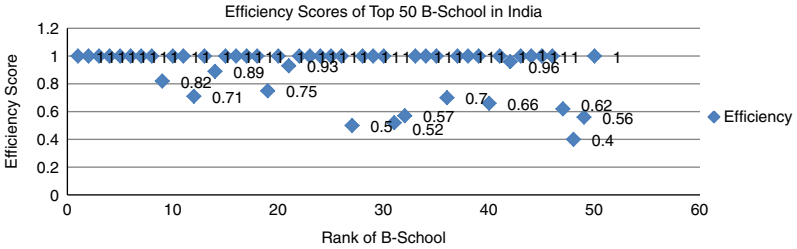

Figure 1.
Ranks vs efficiency scores of top 50 B-school in India

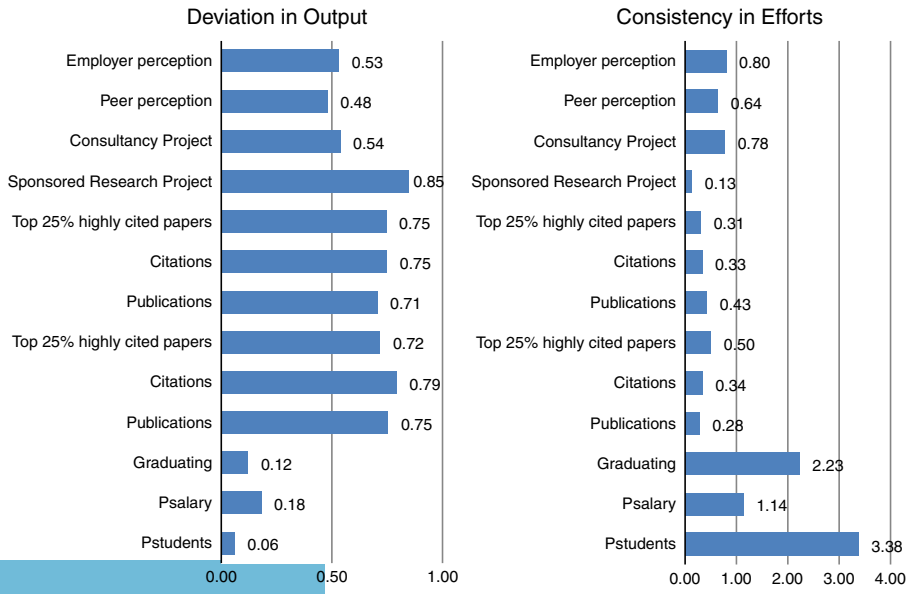

Figure 2.
Average deviations in output and consistency in efforts of institutes for potential development

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or in terms of intake, and it is followed by graduating the students and salary packages. It indicates the current area of concern where these management institutions are focused. Consistency in efforts presented in the chart shows that these preferences are being followed with a high consistency, whereas rest of the outputs receive the least focus. An overview of available data indicates consultancy, sponsored research project and perception by peer and employer as major differentiators, but it is confined to some top 10–15 institutions.

The second phase of analysis is conducted to identify the successful strategies of top management institutions through the investigation of relationship of indicators (input/output) and success in terms of rank score (score at which institutes could enter the list of top 50) and efficiency score using self-organized maps. For this purpose, Kohonen package using R (Version 3.1.3) is utilized. Information available in NIRF survey, 2017 for selected indicators, rank score and obtained efficiency scores are used to train the network. Heat maps are generated to examine the distribution of all indicators and their success. These types of networks consist of processing elements or nodes and their interconnections (Balakrishnan *et al.*, 1996). Processing elements forms three layers, i.e. an input layer, a hidden layer and an output layer (simplest form of ANN). Artificial intelligence-based systems work like human judgment process and they are capable of providing better results in complex and uncertain situations (Guo *et al.*, 2010). The system can learn from the past data, absorb the characteristics related to performance parameter and utilize information for decision making.

Using self-organized maps data for all the indicators is presented in terms of heat maps wherein each data point appears as some color. It looks like a data table that provides a general view of the numerical data. This visualization (Figure 3) represents the distribution of each indicator in the presence of other indicators, rank score and efficiency score, which reveals the importance of that particular indicator. Matching the appearance of data points in heat maps shows associations between indicators; their importance and prediction of the success due to any of the indicator can also be observed through these maps.

Heat maps (in Figure 3) depict that the focus of management institutions is considerably varied across the indicators. One can observe that consultancy, employers and peer perception have a high association among themselves as well with rank score. This simply implies that to ensure a high level of success in terms of rank score, one has to follow the combination of consultancy, employers and peer perception. It comes out to be the most effective strategy among top management institutions. In addition to this, it also reveals that there are very few management institutions that are using or are able to

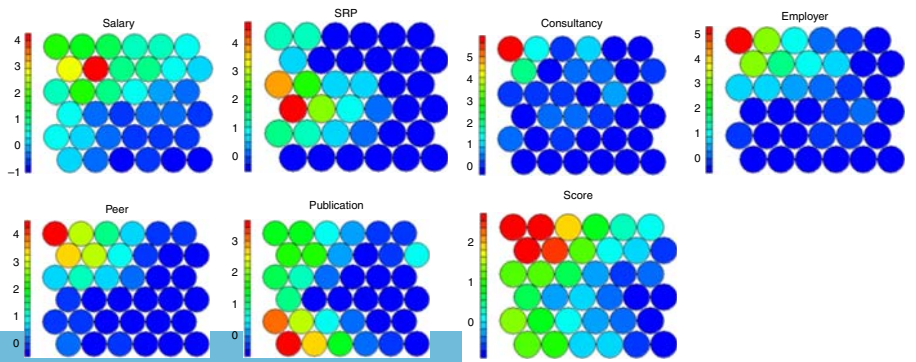

Figure 3.
Heat maps of selected output indicators along with score

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implement this particular combination as a strategy to achieve higher success. Sponsor research project and research publication seems another combination, which is being used by top management institutions; it is less effective as compared to the earlier one, but it is preferred by more number of institutions. Salary of graduates is the focus of most of the institutions, having association with the first type of strategy, and it seems second best in terms of success.

From Figure 4, we can explore the effects of indicators using node weight vectors. It seems that highest success rate (in terms of score used for ranking) is with strategy of having good performance in terms of consultancy, peer perception and employer perception among employers. But perception among employers along with salary also gives a better score. The second strategy is publications and sponsored research project, but it has shown a least contribution in terms of score. This could be one of the potential areas in which institutions can work upon. The second strategy seems successful, but then employer perception also has a vital role to achieve the desired success. The focus on salary of the graduates is most preferred, but as per observation through weight vectors (Figure 4), it becomes more effective if it is combined with peer perception and consultancy.

Further analysis of indicators in the presence of efficiency score reveals that the combination of consultancy, employers and peer perception has a high association among themselves as well with efficiency score. This combination is not only effective in achieving a high rank score but also in utilization of resources in a better way. Focus on salary packages holds some association with efficiency score but sponsored research project and publication seems negligibly associated with it. Although in terms of strategies, a small number of institutions seem to utilize most effective strategy for better efficiency, but efficiency itself has come out to be the foremost concern of most of the institutions (Figure 5).

Impact of indicators in relation to efficiency score can be observed from Figure 6. It also reveals that the combination of consultancy, peer perception and employer perception is most effective to achieve a high level of efficiency.

In this paper, investigation of all indicators, rank score and efficiency score is based on NIRF survey of 2017. It is observed that in 2018 survey, some of the institutions could not maintain the position in top 50 and were hence replaced by new institutions. One can observe by comparing these two surveys that most of the institutions replaced were from group of institutions of potential development. Just to get an idea about the focus of new entrant (as per NIRF, 2018), performance is analyzed and compared with the performance of institutions that could not retain their position in latest survey (NIRF, 2018).

It can be seen from Figure 7 that new entrant's performance in research publication and professional practices has grown more than double. A fine observation of the

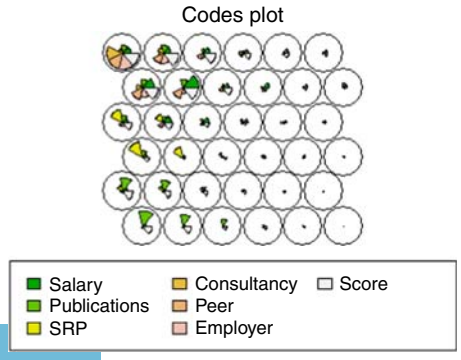

Figure 4.
Weight vectors when score in NIRF ranking is taken under consideration.

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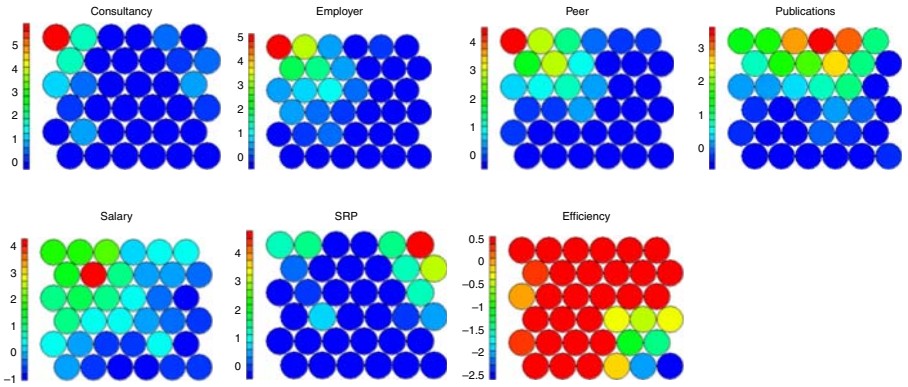

Figure 5.
Heat maps of selected output indicators along with efficiency score

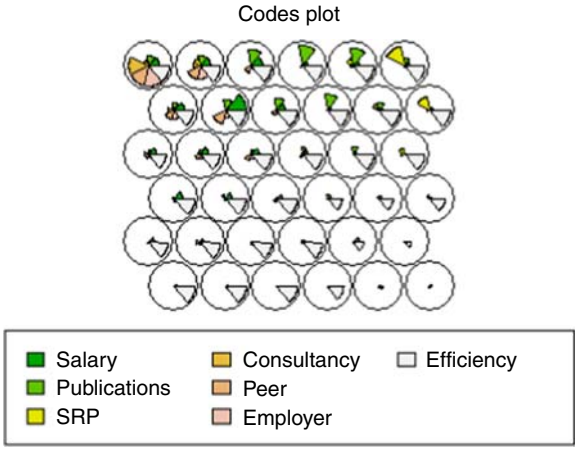

Figure 6.
Weight vectors when efficiency score is taken under consideration

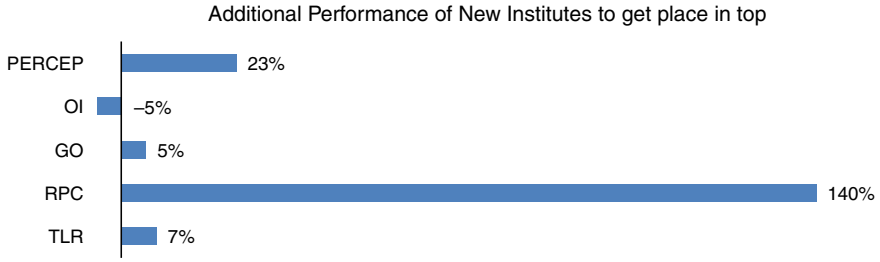

Figure 7.
Percentage of additional efforts by new entrant among top 50 in NIRF (2018) ranking

available data suggests that, in total, efforts research publication has a greater contribution. Management institutions have also considered perceptions of the institute as the next priority. It can be understood that this change in paradigm will make changes in every dimension of the system in the near future. A detailed analysis of all institutions using NIRF (2018) may be future scope of the research to understand overall changes in strategies by the institutions.

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Conclusion

This paper is an attempt to investigate the performance of top 50 management institutes of India. In addition to this, some successful strategies of institutions are also identified. For this purpose, data envelopment analysis and self-organizing maps are utilized together to take advantages of optimization and prediction capabilities inherent in each method. In the first phase of investigations, statistical summary of data indicates huge fluctuations (magnitude wise) in output indicators, particularly in case of consultancy and sponsored research project. These fluctuations highlighted the major differences among the management institutes in terms of outputs. Obtained efficiency scores of the institutions reveal the scope of potential development in some of the institutions. The analysis of efficiency scores and rank score of the management institutions indicates that institutions with high ranks are also focused on efficient use of available resources. The utilization of resources has an important role in the present position of these institutes. A detailed examination of institutes with potential development reveals that the major focus of these institutions is on graduating the student, placement and salary and huge deviations are found in terms of sponsored research project, quality of publication, consultancy and so on. Despite of huge differences in most of the outputs, variations in efficiency and focus of some institutions on a particular indicator, these institutions are able to maintain position among top 50 institutions, thereby motivating to identify successful strategies of these institutes. Thus, in the second phase of investigation, analysis is conducted by using self-organized map, a technique based on artificial intelligence. The combination of consultancy, employers and peer perception has come out to be the most effective strategy, but it is being used by very few institutions, among these top institutions. As far as the most preferred strategy is concerned, graduating the students, placement and their salary is not very effective in terms of success of an institution. There is one more strategy as research publications and sponsored research project, but preference of most of the institutions is research publications over sponsored research project. Another observation based on analysis is that the focus of new entrant in top 50 institutions is on research publications and point to be noted here is that most of the institutions that are replaced in the top 50 list had high deviations in this area. One interesting point is that new institutions got success by hitting on this area of some of the institutions in the top list who were highly focused on placement and salary. Therefore, the focus on placement and salary proves to be a short-term strategy. Mostly all the institutions with a high level of consultancy, employers and peer perception could retain their position as it is or near to the last achieved. Thus, most effective strategy comes out to be the long-term strategy and it is consistent. Research publications have become most preferred tool to compete with each other. This classification of strategy may help decision makers to identify best suited option that meets the needs of the stakeholders (management, students, corporate world). Efficiency and effectiveness in management institution has a significant role in the progress of developing or emerging countries. Due to scarcity of resources, the management of resources has to be efficient and effective. The results obtained in this research may be helpful to many others institutions going through the similar kinds of challenges. Due to globalization, many institutions may have common market in terms of prospective students and employers. Therefore, this work may be useful for other institutions of the country as well as institutions in other developing or emerging countries to design their strategy as per their access to resources or ability. In this era of globalized economy, the education sector needs to be monitored more analytically as management institutions have become an integral part of the economy. The finding of the study may be interpreted as need to look into the conventional method of functioning, evaluating and controlling the performance of any management institute. As the study is conducted on the basis of information available about top 50 management institutions and has dealt with qualitative parameter, the expert's opinion may be considered to achieve a consensus. Although this research contributes considerably in terms of international literature

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and managerial and practical implications, it can still be extended by exploring some other mediating variables that may affect the relationship between selected indicators and success, such as for how long institutions are functioning, organization's leadership or management style, role of government funding, fundamental difference of resource management practices in public and private management institutions, etc. One can further investigate to understand change in strategies of other institutes separately, which could not get place among top ranking. Interaction effect between different selected indicators can also be analyzed to gain new insights for decision making.

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