

JOURNAL   
of Applied Economic Sciences



Volume XIII  
Issue 7(61) Winter 2018

ISSN-L 1843 - 6110  
ISSN 2393 - 5162

## Editorial Board

### Editor in Chief

PhD Professor Laura GAVRILĂ

### Managing Editor

PhD Associate Professor Mădălina CONSTANTINESCU

### Executive Editor

PhD Professor Ion Viorel MATEI

### International Relations Responsible

PhD Pompiliu CONSTANTINESCU

### Proof – readers

PhD Ana-Maria TRANDESCU – *English*

### Redactors

PhD Cristiana BOGDĂNOIU

PhD Sorin DINCĂ

PhD Loredana VĂCĂRESCU-HOBEANU



European Research Center of Managerial Studies in Business Administration

<http://www.cesmaa.org>

Email: [jaes\\_secretary@yahoo.com](mailto:jaes_secretary@yahoo.com)

Web: <http://cesmaa.org/Extras/JAES>

## Editorial Advisory Board

PhD Claudiu ALBULESCU, University of Poitiers, France, West University of Timișoara, Romania  
PhD Aleksander ARISTOVNIK, Faculty of Administration, University of Ljubljana, Slovenia  
PhD Muhammad AZAM, College of Business, Universiti Utara, Malaysia  
PhD Cristina BARBU, Spiru Haret University, Romania  
PhD Christoph BARMAYER, Universität Passau, Germany  
PhD Amelia BĂDICĂ, University of Craiova, Romania  
PhD Gheorghe BICĂ, Spiru Haret University, Romania  
PhD Ana BOBÎRCĂ, Academy of Economic Science, Romania  
PhD Anca Mădălina BOGDAN, Spiru Haret University, Romania  
PhD Elena DOVAL, Spiru Haret University, Romania  
PhD Camelia DRAGOMIR, Spiru Haret University, Romania  
PhD Giacomo di FOGGIA, University of Milano-Bicocca, Italy  
PhD Jean-Paul GAERTNER, l'Institut Européen d'Etudes Commerciales Supérieures, France  
PhD Shankar GARGH, Editor in Chief of Advanced in Management, India  
PhD Emil GHIȚĂ, Spiru Haret University, Romania  
PhD Dragoș ILIE, Spiru Haret University, Romania  
PhD Cornel IONESCU, Institute of National Economy, Romanian Academy  
PhD Arvi KUURA, Pärnu College, University of Tartu, Estonia  
PhD Rajmund MIRDALA, Faculty of Economics, Technical University of Košice, Slovakia  
PhD Piotr MISZTAL, Technical University of Radom, Economic Department, Poland  
PhD Simona MOISE, Spiru Haret University, Romania  
PhD Mihail Cristian NEGULESCU, Spiru Haret University, Romania  
PhD Marco NOVARESE, University of Piemonte Orientale, Italy  
PhD Francesco PAOLONE, Parthenope University of Naples, Italy  
PhD Rajesh PILLANIA, Management Development Institute, India  
PhD Russell PITTMAN, International Technical Assistance Economic Analysis Group Antitrust Division, USA  
PhD Kreitz RACHEL PRICE, l'Institut Européen d'Etudes Commerciales Supérieures, France  
PhD Mohammad TARIQ INTEZAR, College of Business Administration Prince Sattam bin Abdul Aziz University (PSAU), Saudi Arabia  
PhD Andy ȘTEFĂNESCU, University of Craiova, Romania  
PhD Laura UNGUREANU, Spiru Haret University, Romania  
PhD Hans-Jürgen WEIßBACH, University of Applied Sciences - Frankfurt am Main, Germany

# JOURNAL

of Applied Economic Sciences

## **Journal of Applied Economic Sciences**

Journal of Applied Economic Sciences is a young economics and interdisciplinary research journal, aimed to publish articles and papers that should contribute to the development of both the theory and practice in the field of Economic Sciences.

The journal seeks to promote the best papers and researches in management, finance, accounting, marketing, informatics, decision/making theory, mathematical modelling, expert systems, decision system support, and knowledge representation. This topic may include the fields indicated above but are not limited to these.

Journal of Applied Economic Sciences be appeals for experienced and junior researchers, who are interested in one or more of the diverse areas covered by the journal. It is currently published quarterly in 2 Issues in Spring (30<sup>th</sup> March), Summer (30<sup>th</sup> June), Fall (30<sup>th</sup> September) and Winter (30<sup>th</sup> December).

Journal of Applied Economic Sciences is indexed in SCOPUS [www.scopus.com](http://www.scopus.com), CEEOL [www.ceeol.org](http://www.ceeol.org), EBSCO [www.ebsco.com](http://www.ebsco.com), and RePEc [www.repec.org](http://www.repec.org) databases.

The journal will be available on-line and will be also being distributed to several universities, research institutes and libraries in Romania and abroad. To subscribe to this journal and receive the on-line/printed version, please send a request directly to [jaes\\_secretary@yahoo.com](mailto:jaes_secretary@yahoo.com).

# Journal of Applied Economic Sciences

ISSN-L 1843 - 6110

ISSN 2393 – 5162

## Table of Contents



1	<b>Eleonora SANTOS, Shahed KHAN</b> Foreign Direct Investment Policies and Catching-Up	1821
2	<b>SUHARYONO, Kumba DIGDOWISEISO, Eko SUGIYANTO, ZULMASYHUR</b> Causality on the Growth-Governance-Fiscal Decentralization Nexus: An Analysis of Time Series in Indonesia	1854
3	<b>Cecília OLEXOVÁ, Lenka ŠTOFOVA</b> Multi-Criteria Decision Analysis of Socio-Economic Factors of Tax Evasion	1864
4	<b>Štefan SLÁVIK, Ivana MIŠÚNOVÁ HUDÁKOVA, Katarína PROCHÁZKOVA, Branislav ZAGORŠEK</b> Business Strategies of Start-Ups	1874
5	<b>Vladimir SCHERBAKOV, Elena SMIRNOVA</b> Global Supply Chain Imperatives	1889
6	<b>Ayaz Aladdin oglu ALIEV, Tatiana Grigorievna BONDARENKO, Igor Talievich KERI, Anzor Uvaysovich SOLTAKHANOV, Anna Alexandrovna VERSHININA</b> Predicting Levels of Innovation-Led Development as Exemplified by State-Owned Oil Company	1902
7	<b>L'udmila BARTÓKOVA</b> Input Output Analysis of Agriculture and Food Sectors in Selected European Countries	1908
8	<b>Muhammad ABRAR, Bambang JUANDA, Muhammad FIRDAUS, Dedi Budiman HAKIM</b> The Effect of Special Autonomy Funds on Economic Growth and Income Inequality in Aceh Province	1918
9	<b>George ABUSELIDZE</b> Georgia's Capital Market: Functioning Problems and Development Directions in Association with EU	1929
10	<b>Oksana V. TAKHUMOVA, Marsel A. KADYROV, Evgenia V. TITOVA, Denis S. USHAKOV, Mariia I. ERMILOVA</b> Capital Structure Optimization in Russian Companies: Problems and Solutions	1939



11	<b>Jozef LUKÁČ, Slavomíra STAŠKOVA, Marek MEHEŠ, Pavel BLAŠČAK</b> The Slovak Republic as a Partner in the Import and Export of Sugar	1945
12	<b>Aizhana MALDYNOVA, Zhasym OSMANOV, Daniyar GALIYEV</b> Formation of Marketing Strategy for Promoting an Innovative Product	1951
13	<b>Zhanara S. NURTAYEVA, Karlygash E. KARYBEKOVA, Zhadyra E. MUKHTAROVA, Faya A. SHULENBAYEVA, Aigul A. NURPEISOVA</b> Formation and Development of the Dairy Market and its Economic Efficiency in North Kazakhstan (Akmolinsky Region)	1957
14	<b>Luca GRILLI, Massimo Alfonso RUSSO</b> The Management of Human Resources in Health Industries: A Multicriteria Approach	1972
15	<b>Elmaira ORAZGALIYEVA, Saira YESSIMZHANOVA</b> Marketing Management of the Competitive Advantages of Pharmaceutical Companies	1975
16	<b>Zhuldyz MEIMANKULOVA, Samazhan UMIRZAKOV</b> Strategic Management and Development Market of Dairy Products on the Basis of Increasing Domestic and Innovation Production	1984
17	<b>FAISOL, M. PUDJIHARDJO, Dwi Budi SANTOSO, Arif HOETORO</b> The Impact of Public Expenditure and Efficiency for Economic Growth in Indonesia	1992
18	<b>Gulmira K. NURMANBEKOVA, Ainur Y. KAIYRBAYEVA, Bakyt B. KALYKOVA, Zharkin Z. TAZHIGULOVA, Gaukhar M. RAKHIMZHANOVA</b> Factors of Sustainable Development of the Agricultural Sector in Kazakhstan	2004
19	<b>Gulzhan MUKASHEVA, Kuralay ZHAKISHEVA, Anar YERNAZAROVA, Sapiya TAZHIKENOVA, Dametken ZHUMANOVA, Gulnara KURMANOVA</b> Economic Problems of the Development of Agro-Industrial Complex: Mechanism of Solution	2017
20	<b>Larysa YAKYMOVA</b> Gender Differences in Behavior Patterns in Voluntary Pension Systems	2031
21	<b>Blanca Estela Bernal ESCOTO, Malena Portal BOZA, Duniesky Feitó MADRIGAL</b> The Impact of Advertising on Micro-Enterprises in Baja California, Mexico	2042



22	<b>Elvir M. AKHMETSHIN, Albert V. PAVLYUK, Elnur L. HASANOV, Elena A. SVERDLIKOVA, Marsel A. KADYROV</b> Institutional Mechanisms for Implementation of Entrepreneurial Potential of the Population of the Region	2052
23	<b>Orose LEELAKULTHANIT</b> The Impact of 21 <sup>st</sup> Century Skills on the Life Satisfaction of the General Public	2064
24	<b>Oleksandr Mykolayovych LEVCHENKO, Anna Oleksandrivna LEVCHENKO, Olha Volodymyrivna HORPYNCHENKO, Ilona Oleksandrivna TSARENKO</b> The Impact of Lifelong Learning on the Country's Development in Dimension of Innovative Oriented Economy: Comparative Analysis	2076
25	<b>Gulbakhyt ZHOLDASBEKOVA, Altynay MAUKENOVA, Aiman KHAJIEVA, Nagima AVGAMBAYEVA</b> Conditions and Problems of Integration of Higher Educational Institutions and Business: An Outward Glance	2084
26	<b>Youness SAHIBI, Moustapha HAMZAOU</b> Inequalities and Pro-Poor Growth: The Effectiveness of the Redistributive System	2094
27	<b>Woraphon WATTANATORN, Sarayut NATHAPHAN, Kedwadee SOMBULTAWEE</b> Is it Worth Paying High Fee? The Evidence from Bank Affiliated Mutual Fund	2107
28	<b>Milla Sepliana SETYOWATI, Titin Fachriah NUR, Muhammad Fadli HANAFI</b> Tax Regime Shifting: What Happened to Capital Flow?	2114
29	<b>Akhona MYATAZA, Rangan GUPTA</b> Political Cycles in the United States and Stock Market Volatility in other Advanced Economies: An Exponential Generalised Autoregressive Conditional Heteroscedasticity (EGARCH) Approach	2122
30	<b>Bagdat SPANOVA, Gulmira NAKIPOVA</b> Non-Profit Sector as a Subject of Social Services	2133

## The Management of Human Resources in Health Industries: A Multicriteria Approach

Luca GRILLI

Dipartimento di Economia

Università di Foggia, Largo Papa Giovanni Paolo II, Foggia, Italy

[luca.grilli@unifg.it](mailto:luca.grilli@unifg.it)

Massimo Alfonso RUSSO

Dipartimento di Economia

Università di Foggia, Largo Papa Giovanni Paolo II, Foggia, Italy

### Suggested Citation:

Grilli, L., Russo, M. A. 2018. The management of human resources in health industries: A Multicriteria approach. *Journal of Applied Economic Sciences*, Volume XIII, Winter, 7(61): 1972 – 1974.

### Abstract:

In this paper we consider the problem of optimal management of human resources in a very peculiar framework that is Health Industry. Starting from a case study we consider a general problem of optimal mobility between employees that offer their services in a multidimensional Health Industry in a wide regional area. The case we have in mind is the possibility for a number of employees in the same Health Industry to move in different locations according to both personal and strategic reasons. The firm management must consider a number of variables and criteria in order to define a final ranking between the employees in the same category; consequently, a typical multicriteria decision problem arises. In this paper we propose a possible solution that takes into account quantitative criteria and optimal business strategies in order to define the optimal allocation of resources.

**Keywords:** health industry; multicriteria analysis; human resources; mobility

**JEL Classification:** O15; P36; D81; C44

### Introduction

The problem of optimal allocation of human resources is a very important issue above all in the case of Health Industries where a public or a controlled company manages the health services of a geographical region with many locations (Chen *et al.* 2004, Dowling, Schuler and Welch 1991, Grilli and Russo 2017, Hendry 2012, Leonard, Graham and Bonacum 2004). The health service is a 24 hours - 365 days service and must always guarantee a very high level of performance. In this study we consider, for sake of simplicity, three kinds of employees that are: nurses; rescuers and drivers. In general, a typical working day consists of three shifts (8-14; 14-20 and 20-8) with a fixed minimum number of nurses, rescuers and drivers in order to provide an appropriate health service.

Let us suppose that the region consists of  $k$  (integer) hospitals with a minimum number of employees sufficient in order to provide the health service also in the case of absences or leaves.

The health firm management must allocate or re-allocate periodically and optimally, all the employees in all the hospitals in the region (Grilli and Russo 2017).

The allocation of human resources takes into account different specific criteria that go from personal, familiar to working-economical issues. The management must re-allocate the employees in the area considering a number of criteria approved by all involved parts. In order to obtain this goal it is necessary a bargaining process that should involve workers, unions and firm management in order to find a number of criteria, related to residence, seniority, family status and also meritocratic aspects.

We consider a specific case-study proposed by a controlled Health Firm in the southern Italy, as shown in the section 3. The model has been successfully adopted by the health firm and can be considered in a most general framework.

### 1. The Methodology

We consider a general case of a firm with a fixed number of employees indicated by:  $L_i$  with  $i = 1, \dots, n$ . The employees can be also of different types and categories. As stated before the health company must guarantee a 24 h – 365 days service provided in three working shifts of 8 hours each. The workers can be allocated in a geographical area with a fixed number of towns:  $T_i$  with  $i = 1, \dots, m$ .

The Health Firm has to find an optimal allocation for all the  $n$  employees taking into account a number of criteria that are fixed and shared in advance. Let denote by  $C_i$  with  $i = 1, \dots, k$  each criterion. In our case, the bargaining process with unions, workers and management has produced and selected the following criteria:



- Work Experience (in other health-companies):
  - less than 2 years = no points;
  - between 2 and 5 years = three points;
  - more than 5 years = six points.
- Work Experience in the firm: 6 points for each year (365 days);
- Children: eight points for each under-age child and four points for every adult-child in the family nucleus;
- Certified disability: 12 points;
- Work experience in the specific location in which the employee should be moved: 2 points for every year of service, up to a maximum of 10 points.

In order to compute the ranking in each town, all the employee of the company is invited to complete a survey that includes the following information: personal data, position, hire date in the company, city of residence, previous positions (with hire date and date of contract end), family status, under-age children and adult children, disability conditions, favourite work towns (up to four), work experience in each favourite work town.

Once the survey has been completed, the data undergo a review process in order to avoid errors and inconsistencies. The validated data is computed according to the selected criteria and a final ranking is obtained for each town and for each position involved in the analysis. The final rankings in each town and for each position allow the human resource manager to select and move employees among the different work locations by means of quantitative criteria. In the following section we present a case study in which this procedure has been applied.

## 2. Case Study

In this section we present a case study in which the previous methodology has been applied. We consider the case of a controlled health company in a region in Southern Italy which manage the emergency ambulance service in a wide area consisting of 34 towns.

The company counts about 275 employees divided into three main categories: nurses; rescuers and drivers. The problem is to manage optimally the mobility of employees in each town. It is a typical problem of ordering procedure in a multivariate context (Grilli, Russo and Sfrecola 2011, Grilli and Russo 2008).

Following the methodology illustrated in the previous section, the employees have completed a survey containing the following information: personal data; position; hire date in the company; city of residence; previous positions (with hire date and date of contract end); family status; under-age children and adult children; disability conditions; favourite work towns (up to four); work experience in each favourite work town.

We have collected 275 survey that are: 87 rescuers; 86 nurses and 102 drivers. Data have been validated in order to apply the selected criteria that are: Work Experience (in other health-companies); Work Experience in the firm; Family Status; Disability conditions; Work experience in the selected location.

In Table 1 we present an example (simplified) of data obtained (personal details have been erased) in the case of one workers' category:

Table 1. Town X. Selected data from the survey. In this table we have erased all the personal data and other information that are not relevant in the example.

Worker	Work Experience in this firm (days)	Previous Work Experience	Number of sons (TOTAL)	Under-Age Children	Work Experience in the selected town	Disability Condition
A	3163	3614	2	1	9	Y
B	3346	3942	4	3	6	N
C	3407	1976	0	0	6	N
D	2615	1644	1	1	4	Y
E	3103	1005	1	1	2	N
F	3042	0	1	1	2	N
...	...	...	...	...	...	...

In the following Table 2 we present an example of the results of computations for one worker category.

Table 2. Town X. Criteria: C1 Work Experience; C2 Seniority in the present firm; C3 under-age children; C4 adult-children; C5 Certified Disability; C6 Work experience in the selected town.

Town X		Date: 31/12/2017						
Ranking	Worker	C1	C2	C3	C4	C5	C6	Score
2	A	6	52	8	4	12	10	92
1	B	6	55	24	4	0	10	99
4	C	6	56	0	0	0	10	72
3	D	3	43	8	0	12	8	74
5	E	3	51	8	0	0	4	66
6	F	0	50	8	0	0	4	62
...	...	...	...	...	...	...	...	...

The health firm management, provided with rankings for all workers' category, can decide optimally how to re-allocate the human resource according to the firm and service needs.

The present method has been usefully tested and the firm currently applies this method for the management of the human resource in term of spatial allocation.

### Conclusions

We have presented a method to solve the problem of optimal allocation of human resource in the health industry in the case of a big number of employees and different working locations (in different towns). The problem has been addressed by a big health public company with about 300 employees in 34 towns. The human resource manager has the problem of optimal reallocate the employees according to specific needs that are often service related. The health service has peculiar characteristics since it must be ensured 365 days per year, 24 hours per day. The company was not able to apply quantitative methods in order to decide how to distribute the workers among the different towns. The decision process started with a consultation with the stakeholder including workers' unions in order to define the criteria to be adopted in order to create the final rankings.

Once obtained the list of criteria and weights for each criterion, a method of ordering data by means of a multicriteria method has been proposed and the firm has successfully applied it. We think that similar methods can be adopted in other similar contexts in which there are a big number of employees to be re-allocated in different locations.

### References

- [1] Chen, L. *et al.* 2004. Human resources for health: Overcoming the crisis. *The Lancet*, 364(9449): 1984-1990.
- [2] Dowling, P.J., Schuler, R.S., and Welch, D. E. 1991. *Human Resource Management*. Wadsworth.
- [3] Grilli, L., and Russo, M. A. 2017. Optimal Allocation of Human Resources in the Emergency Ambulance Service, *Applied Mathematical Sciences*, 11(63): 3121 - 3128.
- [4] Grilli, L., and Russo, M.A. 2008. *Decision Making in Financial Markets by Means of a Multivariate Ordering Procedure*, in *Mathematical and Statistical Methods for Insurance and Finance*, Perna, Cira; Sibillo, Marilena (Eds.), ISBN: 978-88-470-0703-1, Springer.
- [5] Grilli, L., Russo, M. A., and Sfrecola, A. 2011. Quali-Quantitative Indicators for Decision Making in University Activities Evaluation. *Journal of Applied Sciences*, 11(4): 713--718.
- [6] Hendry, C. 2012. *Human Resource Management*. Routledge.
- [7] Leonard, M., Graham, S., and Bonacum, D. 2004. The human factor: the critical importance of effective teamwork and communication in providing safe care. *Quality and Safety in Health Care*, 13(suppl 1): i85-i90.

**JOURNAL**   
of Applied Economic Sciences

ISSN 2393 – 5162

ISSN - L 1843-6110