



Prioritizing Factors Affecting the Hospital Employees' Productivity from the Hospital Managers' Viewpoint Using Integrated Decision-Making Trial and Evaluation Laboratory and Analytic Network Process

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Objectives: This study aimed to identify and prioritize factors affecting the hospital employees' productivity from the viewpoint of hospital managers working in the teaching hospitals affiliated to Iran, Shiraz University of Medical Sciences, in 2017. **Materials and Methods:** This was an applied, cross-sectional, and descriptive-analytical study conducted in 2017 in all teaching hospitals affiliated to Iran, Shiraz University of Medical Sciences. After identifying factors affecting hospital employees' productivity using the results of previous studies, all hospital managers (56 managers) were selected as the study population using census method to prioritize the factors. The decision-making trial and evaluation laboratory (DEMATEL) and analytic network process (ANP) techniques were used for analyzing the collected data through Excel 2010 and Super Decision 2.8. **Results:** Fifteen factors affecting employees' productivity were determined using the results of previous studies which were classified into four clusters. The results of DEMATEL technique showed that "employees' attitude toward the organization" was the most affecting factor ($r = 11.928$) and also the most affected factor ($c = 12.120$), as well as the most important factor affecting the employees' productivity ($r + c = 24.048$). In addition, the results of ANP showed that the cluster of "leadership and management styles" (relative weight [RW] = 0.274) and its factors, especially "involving employees in the decision-making processes" (L1) (RW = 0.102) and "delegation of authority to the employees" (L2) (RW = 0.100) were the most important factors affecting the employees' productivity. **Conclusion:** According to the results, adopting an appropriate leadership style and providing participatory management, involving the employees in the hospital decision-making processes, etc., had significant effects on the increases in the employees' motivation and productivity.

Key words: Labor productivity, hospital managers, teaching hospitals, Iran

INTRODUCTION

In today's competitive world, increasing the productivity, as a philosophy based on the improvement strategy, is the most important goal of each organization, and is paid attention in the activities of all society sectors so that the main purpose of

managers is the effective use of available resources, including workforce, money, materials, energy, and information. Improved productivity can enable organizations to increase their international competitiveness and growth, as well as their social cooperation. The low productivity indicates the waste of resources used by an organization which eventually

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leads to the loss of international competitiveness and whereby the reduced organizational business activities.¹ In general, it can be said that a productive organization is an organization which can achieve its goals in less time and with minimal costs.² On the other hand, because among the factors of production, the human resources, unlike other organizational resources, are known as sentient and the coordinator of other factors and also are the main levers to increase or decrease the organizational productivity, they have a special priority and should be paid particular attention. In other words, organizations which have made significant achievements and countries which have been among the advanced countries have put their emphasis on their human resources.³ Therefore, if the employees are motivated, capable, and productive, they can use other resources efficiently and productively and the aim of organizational productivity can be achieved. Otherwise, the stagnation and backwardness are the results of passive and unmotivated employees.⁴ Therefore, it can be concluded that labor productivity is the key factor affecting the overall productivity of production factors in organizations. Hence, first of all, the factors affecting labor productivity should be understood and then they should be effectively managed. In other words, trying to understand the concepts of productivity and trying to determine factors affecting it are one of the essential prerequisites for achieving the growth and development of the organization.⁵ Since the labor productivity is a function of many factors and their importance and effects on the labor productivity are not the same, it is not possible for organizations to take measures to improve all of them at the same time. Thus, for achieving the highest productivity, it is necessary to determine and prioritize the most important ones and then take some appropriate measures and develop required plans in order to improve the employees' productivity.⁶

The results of various studies in this area have shown that factors such as the leadership and management styles;^{5,7-9} individual factors;⁷⁻¹² positive attitude toward the job and organization;¹³ organizational culture;⁵ organizational structure;⁸⁻¹⁰ factors related to the organizational support; employees' compensation system; reward and incentive systems;^{7,8,10,11} holding the training courses;^{5,7,14,15} physical, psychological, and environmental factors;⁸⁻¹⁰ hospital technology and equipment; employees' motivation and job satisfaction;⁵ factors related to the job and the employees' freedom and independence at work;^{7-10,12} job stress;¹⁶ the existence of an atmosphere of cordiality and cooperation in the hospital;^{8,9} factors related to the employees' sense of commitment and loyalty;⁸ teamwork, cooperation, and communication among team members with each other and with the managers;¹⁵ and perceived organizational justice¹⁷ have effects on the employees' productivity in the organizations.

On the other hand, nowadays, the increased productivity and optimal use of limited resources and making accurate assessment of the quality of services provided are the most important objectives of hospitals and health-care centers in order to maintain and promote people's health, increase their satisfaction, and meet their expectations.¹⁸ In other words, the hospital managers can pave their way for achieving organizational goals and improve the country's development in the health sector through increasing the hospital productivity.¹⁹ However, unlike the industrial and commercial organizations, the health-care organizations, especially in Iran, have rarely studied ways to increase their employees' productivity. In other words, they have usually focused on only measuring the administrative productivity.²⁰ In the present study, factors affecting the hospital employees' productivity were determined according to the literature review and results of previous studies, and then were prioritized from the viewpoint of managers working in the teaching hospitals affiliated to Iran, Shiraz University of Medical Sciences, in 2017.

MATERIALS AND METHODS

This was an applied, cross-sectional, and descriptive-analytical study conducted in 2017 in all teaching hospitals affiliated to Iran, Shiraz University of Medical Sciences (14 hospitals). Since the human resource productivity is an issue in the field of management, the study population and experts were determined from the managers who had at least 5 years of work experience in the managerial positions and had sufficient knowledge of and familiarity with the hospital environment and the employees' capabilities. Therefore, all hospitals' chief executive officers, nursing managers and matrons, and administrative-financial managers (56 managers) were studied using census method. The managers were authorized to participate in the present study and entered the study after giving informed consent and all of them were assured of the confidentiality of their responses. The process of collecting required data was as follows:

First, factors affecting employees' productivity were identified using the results of previous studies and literature review.^{5,7-17} Then, for determining the impacts of each factor on the other studied factors and prioritizing them, two researcher-made questionnaires were used to collect the data. To gather the studied experts' viewpoints on the impact of each identified factor on the employees' productivity, a Decision-Making Trial and Evaluation Laboratory (DEMATEL) questionnaire was used. The data analysis using the DEMATEL technique led to drawing a network relation map (NRM). At the next phase and using this map, the network of factors affecting employees' productivity was developed, and to prioritize the factors using analytic network

process (ANP), a pairwise comparison questionnaire was used. In addition, the degree of inconsistency was checked for each set of experts' judgments and each related matrix using inconsistency ratio. The inconsistency ratio of about 10% or less can be considered acceptable, and if the ratio is more than 10%, the subjective judgments need revisions.²¹ To analyze the collected data, Excel 2010 and Super Decision 2.8 (www.creative-decisions.org) were used. Different steps of techniques used in the present study, i.e., DEMATEL and ANP, have been described below.

The Decision-Making Trial and Evaluation

Laboratory technique

DEMATEL technique was introduced for the first time in 1971 by Geneva Battelle Institute and was used to solve the technological and human issues, including race, hunger, environmental protection, and other problems.²² This technique provides a comprehensive method based on the graph theory and makes it possible to visually analyze the issues and structural models.²³ As diagraphs (directed graphs) can better show the relationships between the elements of a system, this technique is based on graphs and can divide the influential factors into two groups of cause and effect and show the relationship among them in an understandable structural model.²⁴ In general, the steps of applying DEMATEL technique are as follows:

1. Identifying factors that may affect the employees' productivity through previous results and literature review
2. Identifying the relationships among these factors using a pairwise comparison questionnaire completed by the studied managers and experts and calculating the average matrix (A) or initial direct relation matrix. The comparisons between each of the two factors located in a row and a column of the pairwise comparison questionnaire (a_{ij}) are made to represent the degree of influence of one element on another in which 0 = "No influence," 1 = "Low influence," 2 = "Medium influence," 3 = "High influence," and 4 = "Very high influence"
3. Determining the hierarchy of factors through sum of the i^{th} row of the matrix T (r_i), sum of the j^{th} column (c_j), ($r_i + c_j$), and ($r_i - c_j$) using the following equation:
4.
$$r_i = \sum_{j=1}^n t_{ij}, c_j = \sum_{i=1}^n t_{ij}, i, j = 1, 2, \dots, n \quad \text{Equation 3}$$
5. It should be noted that r_i indicates the total effects, both direct and indirect, which are given by the factor i to other factors, and c_j denotes the total effects, both direct and indirect, received by the factor j from other factors. When $j = i$, $r_i + c_j$ represents the total effects both given and received by the factor i . In other words, it indicates the amount of interaction which i has with other factors, and the higher its amount is, the stronger its interaction and the higher its importance in the entire system. Also, $r_i - c_j$ shows the net effect that the factor i contributes

to the system. When $r_i - c_j$ is positive, the factor i is the net cause, and if $r_i - c_j$ is negative, the factor i is a net effect

6. Determining a threshold value to obtain the digraph by computing the average of the elements in the Matrix T
7. Drawing a NRM which is constructed by mapping all coordinate sets of ($r_i + c_j$) and ($r_i - c_j$) to show the complex interrelationships. This diagram provides information about which factor has the most important effect and which one is the most important cause.²⁵⁻²⁷

The analytic network process

ANP, developed by Saaty and an extension of analytic hierarchy process, represents a decision-making problem or a complex setting as a network of elements, including criteria and other alternatives, which are grouped into clusters. A network can incorporate feedback and complex interrelationships within and between clusters. ANP can deal with both quantitative and qualitative elements and factors under multiple criteria. In ANP, pairwise comparisons are used for determining the relative importance or strength of the impacts on a studied element, and the interdependencies within the levels of clusters, and reciprocally dependent elements in a cluster are evaluated. In general, the steps of applying ANP are as follows:

1. Determining the relationships among studied elements and clusters and developing a model
2. Determining the relative importance weights of elements using the pairwise comparisons with a scale of 1 (equal importance) to 9 (extreme importance), as well as calculating the inconsistency ratio
3. Forming the unweighted supermatrix which contains the priorities of the elements derived from the pairwise comparisons throughout the network
4. Forming the weighted matrix which is obtained by multiplying all the elements in a component of the unweighted supermatrix by the corresponding cluster weight
5. Forming the limit supermatrix which is obtained by raising the weighted supermatrix to powers by multiplying it times itself. When the column of numbers is the same for every column, the limit matrix has been reached and the matrix multiplication process is stopped
6. Identifying the final priorities of the elements and alternatives based on the limit supermatrix and selecting the best element and alternative which is that with the highest priority.²⁸⁻³⁰

RESULTS

First, 15 factors affecting the hospital employees' productivity were determined using the previous studies and

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literature review which were classified into four clusters of job and motivational factors, leadership and management styles, personal factors, and environmental factors [Table 1]. The structural model of factors affecting employees' productivity has been presented in Figure 1, indicating the inner and outer dependencies.

To identify the causal relationships between factors affecting employees' productivity, the DEMATEL technique was used and the studied managers' viewpoints were taken using the pairwise comparison questionnaire and the average matrix (A) was calculated. It should be noted that, in the present study, the inconsistency ratio of each matrix was <0.1 and therefore, was acceptable [Table 2].

Then, to calculate the normalized average matrix or initial direct relation matrix (D), each of the average matrix elements was multiplied by the inverse of 27.102 (the highest sum of rows) [Table 3].

Next, the total relation matrix (T) was computed using the equation $T = S(I - S)^{-1}$ [Table 4]. The results of analyzing this matrix have been presented in Table 5, which summarizes the direct and indirect effects of studied factors. This table indicates that "employees' attitude toward the organization" was the most affecting factor ($r = 11.928$) and also the most affected factor ($c = 12.120$) among all the studied factors. Moreover, this factor was the most important factor affecting the employees' productivity ($r + c = 24.048$).

In the next step, the threshold value was determined as 0.732 by computing the average of the elements in the matrix T. Therefore, the elements whose values were greater than the threshold value were considered as the elements and factors affecting the employees' productivity in the DEMATEL NRM.

In this map, the effects of all factors affecting the employees' productivity on each other have been shown [Figure 2].

In the next phase of the study, the unweighted supermatrix [Table 6] using the DEMATEL Matrix T and NRM, weighted supermatrix [Table 7] and limit supermatrix [Table 8] were calculated using the ANP technique and the studied managers' pairwise comparisons among factors affecting the employees' productivity and therefore, the final priorities of the factors were identified.

According to the results obtained from the limit matrix, the "leadership and management styles" (RW = 0.274) and "environmental factors" (RW = 0.176) were the most important and the least important clusters affecting the employees' productivity, respectively. Furthermore, "involving employees in the decision-making processes" (L1) (RW = 0.102) and "delegation of authority to the employees" (L2) (RW = 0.100) among all the studied factors were, respectively, the most important factors

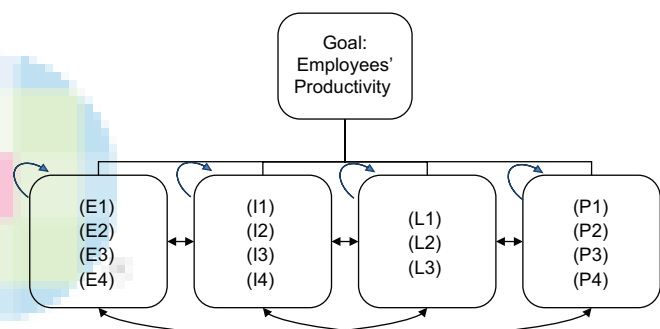


Figure 1: The structural model of studied factors affecting the hospital employees' productivity

Table 1: Factors affecting the hospital employees' productivity using the previous studies and literature review

Factors			
Job and motivational factors (P)	Perceived fairness of salaries and benefits (P1)	Environmental factors (E)	The existence of intimacy and cooperation in the workplace (E1)
	The clarity of employees' roles and objectives (P2)		The existence of appropriate working and training facilities and equipment in the workplace (E2)
	Evaluating employees' performance and providing feedback (P3)		The existence of appropriate opportunities for creativity in the workplace (E3)
	The possibility of career development and professional improvement based on the employees' merit and capabilities (P4)		Having the sense of safety and comfort at work (E4)
Leadership and management styles (L)	Involving employees in the decision-making processes (L1)	Personal factors (I)	Employees' attitude towards the organization (I1)
	Delegation of authority to the employees (L2)		Employees' technical and specialized capacity (I2)
	The existence of an appropriate reward and punishment system in the organization (L3)		Having complete confidence (I3)
			Being decisive at work (I4)

Table 2: The average matrix (A) of the studied managers' viewpoints

Factors	P1	P2	P3	P4	L1	L2	L3	I1	I2	I3	I4	E1	E2	E3	E4
P1	0	1.946	2.017	1.535	1.446	1.428	1.857	2.196	1.571	1.732	1.607	1.785	1.321	1.589	2.035
P2	1.714	0	2.196	2.071	1.982	1.982	1.839	2.089	1.928	1.91	2.017	1.696	1.571	1.857	1.839
P3	1.66	1.875	0	2.071	1.75	1.767	2.25	1.875	1.803	1.946	1.803	1.392	1.517	1.75	1.75
P4	1.803	2	2.035	0	1.928	1.678	1.821	2.125	2.339	2.178	1.91	1.464	1.41	1.857	1.75
L1	1.303	1.803	1.857	1.75	0	2.089	1.571	2.16	2.142	2.303	1.839	2	1.446	2.035	1.803
L2	1.196	1.964	1.892	2.017	2.25	0	1.553	2	2.16	2.125	2.125	1.66	1.446	1.928	1.714
L3	1.839	1.785	2.071	2.053	1.803	1.767	0	2.107	1.607	1.607	1.767	1.767	1.178	1.678	1.607
I1	2.196	1.892	2.017	2.017	2.071	1.839	1.892	0	1.607	1.839	1.875	2.178	1.625	1.964	2.16
I2	1.535	1.892	1.946	2.178	2.25	2.142	1.732	1.892	0	1.964	1.802	1.482	1.607	1.928	1.767
I3	1.41	1.875	1.66	1.767	1.964	2.035	1.714	1.714	1.892	0	2.196	1.714	1.303	1.75	1.839
I4	1.375	1.857	1.785	1.875	1.964	2	1.607	1.678	1.91	2.125	0	1.357	1.107	1.517	1.696
E1	1.5	1.553	1.392	1.517	1.821	1.571	1.625	2.125	1.392	1.714	1.203	0	1.267	1.607	2.142
E2	1.017	1.446	1.375	1.196	1.214	1.339	1.053	1.571	1.857	1.285	1.142	1.107	0	1.714	1.785
E3	1.517	1.839	1.66	1.767	2.107	1.892	1.589	2.125	1.964	1.964	1.553	1.625	1.625	0	1.696
E4	1.75	1.75	1.892	1.553	1.732	1.767	1.625	1.982	1.821	1.803	1.642	1.91	1.696	1.571	0

Table 3: The normalized average matrix or initial direct relation matrix (D) of the studied managers' viewpoints

Factors	P1	P2	P3	P4	L1	L2	L3	I1	I2	I3	I4	E1	E2	E3	E4
P1	0	0.071	0.074	0.056	0.053	0.052	0.068	0.080	0.057	0.063	0.059	0.065	0.048	0.058	0.074
P2	0.063	0	0.080	0.076	0.072	0.072	0.067	0.076	0.070	0.070	0.074	0.062	0.057	0.068	0.067
P3	0.061	0.069	0	0.076	0.064	0.065	0.082	0.069	0.066	0.071	0.066	0.051	0.055	0.064	0.064
P4	0.066	0.073	0.074	0	0.070	0.061	0.067	0.078	0.086	0.080	0.070	0.053	0.051	0.068	0.064
L1	0.047	0.066	0.068	0.064	0	0.076	0.057	0.079	0.078	0.084	0.067	0.073	0.053	0.074	0.066
L2	0.044	0.072	0.069	0.074	0.082	0	0.057	0.073	0.079	0.078	0.078	0.061	0.053	0.070	0.063
L3	0.067	0.065	0.076	0.075	0.066	0.065	0	0.077	0.059	0.059	0.065	0.065	0.043	0.061	0.059
I1	0.080	0.069	0.074	0.074	0.076	0.067	0.069	0	0.059	0.067	0.069	0.080	0.059	0.072	0.079
I2	0.056	0.069	0.071	0.080	0.082	0.078	0.063	0.069	0	0.072	0.066	0.054	0.059	0.070	0.065
I3	0.051	0.069	0.061	0.065	0.072	0.074	0.063	0.063	0.069	0	0.080	0.063	0.047	0.064	0.067
I4	0.050	0.068	0.065	0.069	0.072	0.073	0.059	0.061	0.070	0.078	0	0.049	0.040	0.055	0.062
E1	0.055	0.057	0.051	0.055	0.067	0.057	0.059	0.078	0.051	0.063	0.044	0	0.046	0.059	0.078
E2	0.037	0.053	0.050	0.044	0.044	0.049	0.038	0.057	0.068	0.047	0.042	0.040	0	0.063	0.065
E3	0.055	0.067	0.061	0.065	0.077	0.069	0.058	0.078	0.072	0.072	0.057	0.059	0.059	0	0.062
E4	0.064	0.064	0.069	0.057	0.063	0.065	0.059	0.072	0.067	0.066	0.060	0.070	0.062	0.057	0

affecting the employees' productivity. However, "the existence of appropriate working and training facilities and equipment in the workplace" (E2) (RW < 0.001) had the lowest relative weight (RW) and was known as the least important factor affecting the employees' productivity [Tables 8 and 9].

Moreover, the RW and the priority of each element (factor) affecting the employees' productivity were identified [Table 9]. The results showed that "the clarity of employees' roles

and objectives" (P2) (RW = 0.292) in the cluster of job and motivational factors, "involving employees in the decision-making processes" (L1) (RW = 0.372) in the cluster of leadership and management styles, "employees' attitude toward the organization" (I1) (RW = 0.318) in the cluster of personal factors, and "the existence of appropriate opportunities for creativity in the workplace" (E3) (RW = 0.536) in the cluster of environmental factors had the highest RWs and were the most important factors in their clusters.

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Table 4: The total relation matrix (T) of the studied managers' viewpoints

Factors	P1	P2	P3	P4	L1	L2	L3	I1	I2	I3	I4	E1	E2	E3	E4
P1	0.583	0.738	0.749	0.725	0.745	0.719	0.694	0.798	0.738	0.758	0.706	0.677	0.584	0.709	0.742
P2	0.701	0.741	0.825	0.812	0.834	0.807	0.758	0.869	0.821	0.837	0.787	0.737	0.647	0.785	0.805
P3	0.666	0.767	0.711	0.773	0.787	0.761	0.735	0.821	0.778	0.797	0.742	0.692	0.614	0.744	0.763
P4	0.697	0.801	0.811	0.732	0.823	0.788	0.749	0.861	0.825	0.836	0.775	0.722	0.635	0.776	0.793
L1	0.674	0.788	0.798	0.786	0.751	0.795	0.735	0.855	0.812	0.834	0.766	0.733	0.631	0.776	0.788
L2	0.670	0.793	0.799	0.794	0.827	0.723	0.734	0.849	0.813	0.828	0.775	0.721	0.631	0.772	0.785
L3	0.660	0.750	0.768	0.759	0.774	0.747	0.646	0.814	0.757	0.772	0.728	0.692	0.592	0.728	0.745
I1	0.725	0.816	0.829	0.819	0.847	0.811	0.769	0.809	0.820	0.844	0.791	0.762	0.657	0.798	0.825
I2	0.683	0.792	0.803	0.801	0.828	0.798	0.741	0.847	0.741	0.824	0.766	0.717	0.637	0.774	0.788
I3	0.649	0.757	0.759	0.754	0.784	0.761	0.708	0.805	0.771	0.721	0.746	0.693	0.600	0.734	0.756
I4	0.628	0.734	0.740	0.734	0.760	0.736	0.683	0.779	0.748	0.770	0.649	0.661	0.575	0.704	0.728
E1	0.598	0.683	0.686	0.681	0.713	0.682	0.646	0.750	0.689	0.714	0.652	0.577	0.548	0.668	0.703
E2	0.504	0.590	0.594	0.582	0.601	0.585	0.543	0.635	0.613	0.606	0.563	0.533	0.432	0.584	0.601
E3	0.655	0.758	0.761	0.756	0.791	0.758	0.706	0.821	0.775	0.790	0.727	0.693	0.612	0.676	0.754
E4	0.650	0.741	0.754	0.735	0.764	0.740	0.695	0.801	0.756	0.770	0.716	0.689	0.603	0.717	0.682

Table 5: The sum of influences given and received among the studied factors

Clusters	Elements (factors)	Direct and indirect effects given by each factor to the other factors (<i>r</i>)	Direct and indirect effects received by each factor from the other factors (<i>c</i>)	<i>r + c</i>	<i>r - c</i>	Type of factors
Job and motivational factors	P1	10.672	9.750	20.423	0.922	Net cause
	P2	11.771	11.256	23.028	0.515	Net cause
	P3	11.158	11.394	22.553	-0.236	Net effect
	P4	11.632	11.249	22.882	0.382	Net cause
Leadership and management styles	L1	11.531	11.635	23.167	-0.104	Net effect
	L2	11.520	11.218	22.739	0.301	Net cause
	L3	10.940	10.550	21.490	0.389	Net cause
Personal factors	I1	11.928	12.120	24.048	-0.191	Net effect
	I2	11.546	11.464	23.011	0.081	Net cause
	I3	11.005	11.709	22.715	-0.703	Net effect
	I4	10.635	10.895	21.531	-0.259	Net effect
Environmental factors	E1	9.996	10.305	20.302	-0.308	Net effect
	E2	8.573	9.005	17.579	-0.432	Net effect
	E3	11.040	10.952	21.993	0.088	Net cause
	E4	10.820	11.265	22.085	-0.444	Net effect

DISCUSSION

Human resources are one of the most important strategic resources in the organizations,³¹ and the increase in the employees' productivity is one of the priorities of each organization's progress and development.⁴ This study aimed to identify and prioritize factors affecting the hospital employees' productivity from the viewpoint of all hospital managers working in the teaching hospitals affiliated to Iran, Shiraz University of Medical Sciences, in 2017.

According to the results of previous studies and literature review, 15 factors affecting employees' productivity were determined and classified into four clusters of job and motivational factors, leadership and management styles, personal factors, and environmental factors.

The results obtained from DEMATEL technique showed that "employees' attitude toward the organization" was the most important factor affecting the employees' productivity. In other words, "employees' attitude toward the organization" was the most affecting factor among all the studied factors,

Table 6: The unweighted supermatrix of factors affecting the employees' productivity from the studied managers' viewpoints

	Goal	P1	P2	P3	P4	L1	L2	L3	I1	I2	I3	I4	E1	E2	E3	E4
Goal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
P1	0.330	0.000	0.320	0.314	0.000	0.234	0.000	0.236	0.238	0.233	0.234	0.000	0.000	0.000	0.000	0.239
P2	0.225	0.000	0.000	0.345	0.512	0.260	0.342	0.257	0.259	0.259	0.259	0.341	1.000	0.000	0.340	0.259
P3	0.206	0.000	0.332	0.000	0.487	0.246	0.323	0.250	0.244	0.245	0.253	0.322	0.000	0.000	0.322	0.245
P4	0.236	0.000	0.347	0.339	0.000	0.258	0.334	0.255	0.257	0.261	0.253	0.336	0.000	0.000	0.336	0.255
L1	0.425	0.000	0.337	0.337	0.335	0.000	0.515	0.500	0.339	0.341	0.342	0.496	1.000	0.000	0.501	0.340
L2	0.271	0.000	0.340	0.337	0.339	0.516	0.000	0.499	0.337	0.341	0.340	0.503	0.000	0.000	0.498	0.338
L3	0.302	0.000	0.321	0.325	0.324	0.483	0.484	0.000	0.323	0.317	0.316	0.000	0.000	0.000	0.000	0.321
I1	0.307	0.000	0.263	0.264	0.263	0.262	0.417	0.509	0.000	0.350	0.346	0.343	1.000	1.000	0.345	0.348
I2	0.317	0.000	0.255	0.256	0.257	0.257	0.227	0.490	0.348	0.000	0.337	0.332	0.000	0.000	0.335	0.336
I3	0.195	0.000	0.244	0.242	0.242	0.243	0.216	0.000	0.331	0.329	0.000	0.324	0.000	0.000	0.318	0.315
I4	0.179	0.000	0.236	0.236	0.236	0.236	0.138	0.000	0.320	0.320	0.316	0.000	0.000	0.000	0.000	0.000
E1	0.264	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.316	0.000	0.000	0.000	0.000	0.000	0.000	0.000
E2	0.203	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
E3	0.167	0.000	0.505	0.501	0.507	0.508	0.506	0.000	0.345	0.0506	0.506	0.000	0.000	0.000	0.000	1.000
E4	0.364	0.000	0.494	0.498	0.492	0.491	0.493	0.000	0.337	0.493	0.493	0.000	0.000	0.000	0.000	0.000

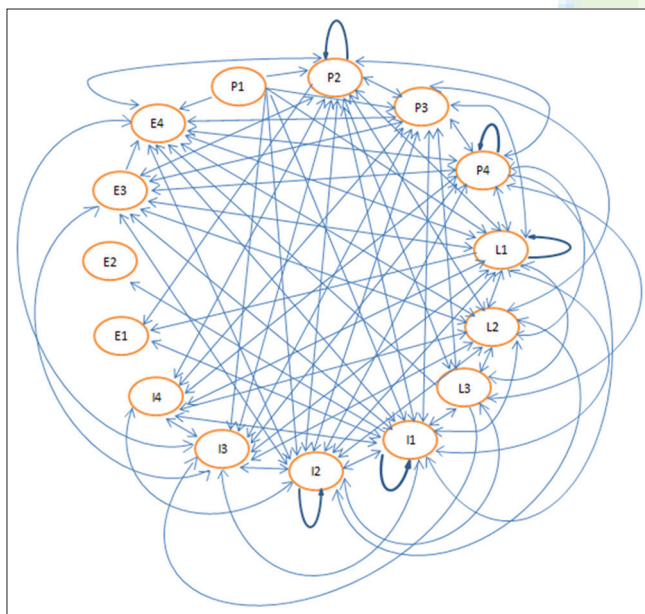


Figure 2: The network relation map of factors affecting the hospital employees' productivity from the studied managers' viewpoints

which is confirmed by the results of Kiani and Radfar,¹³ Susanty and Miradipta,³² and Abraham³³ studies.

In addition, "employees' attitude toward the organization" was the most affected factor among all the studied factors, which is consistent with the results of Kafash *et al.*³⁴ and Winter and Sarros.³⁵

Also, the results of ANP technique showed that "leadership and management styles" was the most important cluster affecting the employees' productivity, which is similar to the results of Kavita,³⁶ Babatunde and Emem,³⁷ Iqbal *et al.*,³⁸ Butt *et al.*,³⁹ Bordbar,⁵ Allahverdi *et al.*,⁷ and Bertrand and Schoar.⁴⁰ The role and importance of management in the organizations is obvious. The skilled and effective managers are the pulse of the organizations and are considered to be the failure or success factor of an organization's programs.³⁵ In general, managers have the authority to allocate the available resources, take decisions on promotions, assess the performance, etc., which may have effects on their employees. Therefore, managers can deeply affect their employees and have the ability to improve their productivity. It can be said that one of the most important managerial functions is to supervise the employees' performance in order to increase their productivity.⁴¹ Consequently, the role of management should not be ignored in the successful implementation of a human resource productivity improvement program in the health sector.⁶

Moreover, in the leadership and management styles' cluster, the "involving employees in the decision-making processes" and "delegation of authority to the employees" were the most important factors affecting the employees' productivity, respectively, which are consistent with the findings of Thomas *et al.*,⁴¹ Al-Jammal *et al.*,⁴² and Meyerson and Dewettinck.⁴³

The management of today's large and modern organizations with a variety of activities and issues seems

Prioritizing factors affecting the hospital employees' productivity

Table 7: The weighted supermatrix of factors affecting the employees' productivity from the studied managers' viewpoints

	Goal	P1	P2	P3	P4	L1	L2	L3	I1	I2	I3	I4	E1	E2	E3	E4
Goal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
P1	0.118	0.000	0.081	0.079	0.000	0.060	0.000	0.078	0.061	0.060	0.060	0.000	0.000	0.000	0.000	0.060
P2	0.080	0.000	0.000	0.087	0.129	0.066	0.087	0.086	0.067	0.067	0.063	0.115	0.328	0.000	0.111	0.065
P3	0.073	0.000	0.084	0.000	0.123	0.063	0.082	0.083	0.063	0.063	0.065	0.0108	0.000	0.000	0.105	0.062
P4	0.084	0.000	0.088	0.086	0.000	0.066	0.085	0.085	0.066	0.067	0.065	0.113	0.000	0.000	0.110	0.064
L1	0.143	0.000	0.087	0.087	0.086	0.000	0.130	0.164	0.088	0.088	0.088	0.168	0.340	0.000	0.170	0.089
L2	0.091	0.000	0.087	0.087	0.087	0.130	0.000	0.163	0.087	0.088	0.088	0.170	0.000	0.000	0.169	0.089
L3	0.101	0.000	0.083	0.084	0.083	0.122	0.122	0.000	0.083	0.082	0.082	0.000	0.000	0.000	0.000	0.084
I1	0.037	0.000	0.067	0.067	0.067	0.068	0.108	0.172	0.000	0.087	0.086	0.111	0.331	1.000	0.114	0.089
I2	0.038	0.000	0.065	0.065	0.066	0.066	0.059	0.165	0.086	0.000	0.084	0.107	0.000	0.000	0.111	0.086
I3	0.023	0.000	0.062	0.062	0.062	0.063	0.056	0.000	0.082	0.082	0.000	0.105	0.000	0.000	0.105	0.080
I4	0.022	0.000	0.060	0.060	0.060	0.061	0.035	0.000	0.079	0.079	0.078	0.000	0.000	0.000	0.000	0.000
E1	0.047	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.73	0.000	0.000	0.000	0.000	0.000	0.000	0.000
E2	0.036	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
E3	0.030	0.000	0.117	0.116	0.0117	0.117	0.116	0.000	0.080	0.117	0.117	0.000	0.000	0.000	0.000	0.226
E4	0.066	0.000	0.114	0.115	0.0114	0.113	0.113	0.000	0.078	0.114	0.114	0.000	0.000	0.000	0.000	0.000

Table 8: The limit supermatrix of factors affecting the employees' productivity from the studied managers' viewpoints

	Goal	P1	P2	P3	P4	L1	L2	L3	I1	I2	I3	I4	E1	E2	E3	E4
Goal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
P1	0.044	0.000	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044
P2	0.080	0.000	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080	0.080
P3	0.074	0.000	0.0744	0.0744	0.0744	0.0744	0.0744	0.0744	0.0744	0.0744	0.0744	0.0744	0.0744	0.0744	0.0744	0.0744
P4	0.074	0.000	0.0741	0.0741	0.0741	0.0741	0.0741	0.0741	0.0741	0.0741	0.0741	0.0741	0.0741	0.0741	0.0741	0.0741
L1	0.102	0.000	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102
L2	0.100	0.000	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
L3	0.072	0.000	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072	0.072
I1	0.086	0.000	0.086	0.086	0.086	0.086	0.086	0.086	0.086	0.086	0.086	0.086	0.086	0.086	0.086	0.086
I2	0.078	0.000	0.078	0.078	0.078	0.078	0.078	0.078	0.078	0.078	0.078	0.078	0.078	0.078	0.078	0.078
I3	0.063	0.000	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063	0.063
I4	0.043	0.000	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043
E1	0.006	0.000	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
E2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
E3	0.095	0.000	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095	0.095
E4	0.075	0.000	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075

impossible without the delegation of authority. In such circumstances, top-level managers will have to delegate some of their authorities to their employees in order to have enough time to manage their core tasks. In other words, delegation of authority is an important aspect of management and it is essential for all managers to create an appropriate balance between their involvement in activities and duties, information processing, decision-making and

problem-solving endeavors, and that of their employees in order to improve their productivity and achieve their organizational goals.⁴⁴ On the other hand, it can result in employees' higher empowerment, commitment to their job and organization, self-confidence, job satisfaction, and productivity.^{42,45}

Furthermore, the management theorists believe that employees' participation and involvement in

Table 9: The relative weights and priorities of clusters and elements (factors) affecting the employees' productivity from the studied managers' viewpoints

Clusters	Elements (factors)	RW of elements (factors) in their clusters	Elements (factors) in order of their overall priorities	RW of elements (factors) according to the inner dependencies in the limit supermatrix	Priorities of elements	RW of clusters	Priorities of clusters
Job and motivational factors	P1	0.164	L1	0.102	1	0.272	2
	P2	0.292	L2	0.100	2		
	P3	0.272	E3	0.095	3		
	P4	0.271	I1	0.086	4		
Leadership and management styles	L1	0.372	P2	0.080	5	0.274	1
	L2	0.364	I2	0.078	6		
	L3	0.263	E4	0.075	7		
Personal factors	I1	0.318	P3	0.0744	8	0.270	3
	I2	0.286	P4	0.0741	9		
	I3	0.233	L3	0.072	10		
	I4	0.160	I3	0.063	11		
Environmental factors	E1	0.037	P1	0.044	12	0.176	4
	E2	<0.001	I4	0.043	13		
	E3	0.536	E1	0.006	14		
	E4	0.425	E2	<0.001	15		

RW=Relative weights

decision-making processes allow them to influence their work and the conditions under which they work, can meet their higher level needs, including self-actualization, esteem, social belonging, and independence, and can improve their satisfaction and morale. They believe that, when the employees have a sense of partnership or being consulted, their secondary needs are met and they will work more than ever. Participation will affect the characteristics of relationships between employees and managers and will lead to a sense of value, a sense of having shared goals, greater cooperation, reduced absenteeism, enhanced work attitudes, higher individual work performance, decreased turnover, improved organizational learning culture, etc., among the employees. On the other hand, if the employees do not take part in the decision-making processes, the implementation of decisions taken by top managers can be difficult, especially when the decisions seem to be unfavorable.⁴⁶⁻⁴⁸

Furthermore, the results of ANP technique showed that “environmental factors” was the least important cluster in which the “the existence of appropriate working and training facilities and equipment in the workplace” and “the existence of intimacy and cooperation in the workplace” were the least important factors affecting the employees' productivity, which are confirmed by the results of Abachi,⁴⁹ Bordbar,⁵ Mohebbi *et al.*,⁵⁰ Talebbeydokhti *et al.*,⁵¹ Bordbar,⁵ Allahverdi *et al.*,⁷ and Tavari *et al.*⁶

CONCLUSION

The results showed that the cluster of “leadership and management styles” and its factors, especially the “involving employees in the decision-making processes” and “delegation of authority to the employees,” were the most important factors affecting the employees' productivity from the viewpoint of the studied hospital managers. Therefore, adopting an appropriate leadership style and providing participatory management, involving the employees in the hospital decision-making processes, and delegating authority to the lower levels of the organization have significant effects on the increases in the employees' motivation and productivity.

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Conflicts of interest

There are no conflicts of interest.

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