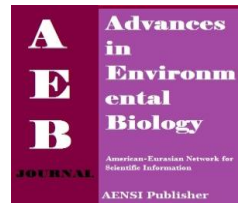




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## The Effect of Radiology Services Outsourcing on Efficiency and Effectiveness of Hospitals' Radiology in Tehran

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### ABSTRACT

**Introduction:** Nowadays, Outsourcing of health services became an important issue and a cost- effectiveness solution which is known all around the world as a competitor in the field of health service providing. The aim of this study was to evaluate the effect of radiology services outsourcing on efficiency and effectiveness of hospitals' radiology in Tehran. **Methods:** This study is a case control and cross-sectional study and the standard questionnaires are used to evaluation the supervisors and patients' satisfaction and the organizational commitment. Also the financial documents are used to evaluate the costs and incomes during 2012-2013. The data are analyzed by using the SPSS21 and chi-square, T-test, Mann-Whitney and Fisher tests. **Findings:** The findings show that the outsourcing can affect the satisfaction of patients and the organizational commitment of radiology employees while it has no effect on the supervisors' satisfaction. Also the outsourcing has a positive effect on the ratio of income to cost and the ratio of the qualitative Xs to un-useable ones and it has no effect on the ratio of equipment to the personnel. **Conclusion:** The results show that even the outsourcing increases the efficiency but decreases the effectiveness of the organization So the managers should pay attention to the human aspects as well as the financial aspects in the outsourcing contract.

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## INTRODUCTION

One of the important issues in the most of developed countries is the health source because more than 5% of GDP and 5-10% of government costs are assigned to this part. In this field, the hospitals are known as the biggest and most cost full performing units of the health care systems. The hospitals have consumed about 50-80% of the total costs of the health section and a big share of educated personnel is hired with their highest levels [1]. Moreover, the state enterprise in the investment section has caused a severe pressure on it and has led to transference of the activities to the NGOs in means of performance improvement [2]. Many performances of health care sections have been transferred during recent years. The services that are transferred to the hospitals include the café, nutrition, laundry room and other house-keeping services. Nowadays, many actions have been transferred such as radiology services [3]. Recently, in Iran, some cures have been transferred to the private sections to increase the health service quality, increase patients satisfaction and decrease the costs [4].

So based on the documents and evidences, in hospitals, the transferred units have been divided based on the cures, paraclinic and supporting services that they provide. The highest percentage of transferred services is 33% among the health care-paraclinical services and physiotherapy, radiology and sonography and also house-keeping services, maintenance and facilities have the highest range of transferred services. (100%) [5].

Because of many different reasons, the organizations try to transfer the domestic activities to the outside and make their bodies as small as possible [6].

Alvani introduces the effects of outsourcing as a factor of cost reduction that increases the organizational concentration on the main activity, saves the time for doing the domestic activities, reduces the risks through sharing a unit in an un-safe industrial environment, improves the customer services, reduces the employees and

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increases the competitions among different parts of the organization [7]. Outsourcing can manage the sources, increase the quality and the satisfaction of people who are in charge. Based on the quality of outsourcing among different sections of a hospital we can use it for administrating the hospitals and we can evaluate the satisfaction through specific indices [8]. Brayson's methods of tenure reduction The indicators of performance explain the as the following: The desired results of the hiring process, training, quality and quantity of the working manpower, in the section which is assigned to the contractor, personnel training costs, increase in the organizational activity and improvement in the power of changing, freedom and availability of human resources which should be assigned for their main activities such as decision making and supervision [9]. Kunaviktikul *et al.* defines the health care quality as the fulfillment of all physical needs by doing the professional cares, psycho-social supports, satisfaction with care [10] and being sure about offering sufficient cares to the patients [10,11]. Many researchers introduce the amount of satisfaction among patients in the field of hospital services as one of the most important indices of effectiveness and quality of offered services in different sections [12]. It seems that the evaluation of patients' satisfaction is one of the most important results of the health system [13,14].

Moreover, the evaluation of the cures by the patients is a way for evaluating the health services' quality [15]. Peiravi has been said that since 2011, in Iran, the ministry of health has faced the hospitals to evaluate the satisfaction of patients and doing the necessary interventions to attract their satisfaction [16]. We have to note that even the companies around the world are moving toward the outsourcing to reduce the costs, reach the technology and etc. but the difference between the organizational cultures and the complexity of managing the relationships leads to failure or dissatisfaction [17]. So the results show that we have to use a way to provide the services with the lowest price and to get the highest performance to reduce the hospital costs, help the hospital to survive and provide the most effective services to the patients to reduce the costs and attract their satisfaction so this study aims to evaluate the effect of radiology services outsourcing on efficiency and effectiveness of hospitals' radiology in Tehran.

#### *Method:*

This study is a descriptive study, and its related results are collected through application and in a limit time between May and December of 2013. This study was done in two Education-cure hospitals in Tehran. The statistical sample of this research are all the supervisors of sections related to radiology, even the outsourced radiology (N=18) or not-outsourced radiology (N=12), all employees of radiology section, the outsourced (N=8) and not-outsourced ones (N=12) and all the patient of both sections during a complete month (N=1200).

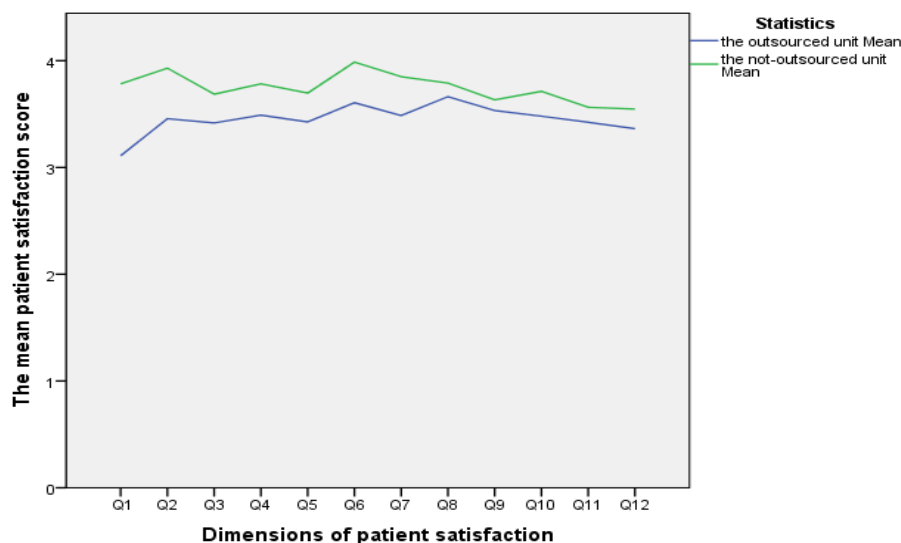
So since the load of patients was equal to 1200 people for one month in each hospital the sample volume was evaluated for measuring the satisfaction of patients as 291 people (based on the Morgan's chart). So in each hospital 300 people (n+10 for reducing the errors) were selected through simple random sampling. The method of conducting was also used for the evaluation of supervisor's satisfaction and the organizational commitments in the radiology section. For doing so, the standard questionnaires were used [18]. The questionnaire of patient's satisfaction was containing 15 questions, the questionnaire of supervisor's satisfaction was containing 14 questions and the questionnaire of organizational commitment was containing 15 questions that were scored by the Lickert method. Collection of data related to the income and costs of a radiology section during a full year was done by using the documents of 2012-2013. After data collection, the data were analyzed through SPSS 21, the descriptive statistics (in the means of frequency, Mean, standard deviation) and the differential statistics (kolmogorov-smirnov Test, T-test, Mann-Whitney test and the Fisher test) were used as well.

#### *Findings:*

The findings of the research show that the average of the patient's satisfaction in the outsourced unit equals to 41.46 (+\_7.3) out of the maximum score of 60(=69%) while in the not-outsourced unit it equals to 45 (+\_6.94) out of the maximum score of 60 (=75%). This shows that the satisfaction is less among the patient of the outsourced unit than the public section and the least average belongs to the followings: the patient satisfaction in the outsourced unit of radiology section about the overall rotation system (3.11), satisfaction with the available opportunities in the unit (3.36) and the behavior of the personnel during admission (3.41).

The kolmogorov-smirnov test was used to evaluate the normality of distribution of data. The results showed that the score of the patients satisfaction was abnormal (p-value=0.000) so the averages of two units were compared by using the un-parametric Mann-Witney test. There was a meaningful difference between the satisfaction of patient in 2 units and since the p-value is very small it shows the big difference between the averages and it means that the effect of outsourcing on the patient' satisfaction is very high. The results have also shown that in the outsourced unit, most of the patient (43%) were admitted 16-20 minutes after entering the section while in the not-outsourced unit most of them (42%) were admitted 5-10 minutes after entering the section. The findings also have shown that the most of patient (40%) were imaged 16-20 minutes after entering the outsourced unit while in the other one, most of them (33.3%) were imaged 5-10 minutes after admission. Based on the chi-square test, there was a meaningful difference between the 2 units in means of waiting time(p-value=0.000) and also there was a meaningful difference between the 2 units in means of admission and

imaging(p-value=0.000). The small p-value in both units shows that the waiting time between admission and imaging of the patient was long. The waiting times are shown in the table1.



**Diagram 1:** The Comparison of The mean of each dimension of Patient satisfaction.

The results have also shown that 225 patient of outsourced unit (75%) and 277 patient of not-outsourced unit (92.3%) were suggesting these units to others and this difference is shown through the chi-square test(p-value=0.000). So the outsourcing can affect the suggestion of units to others.

**Table 1:** Frequency of the waiting time between arrival and admission of patients.

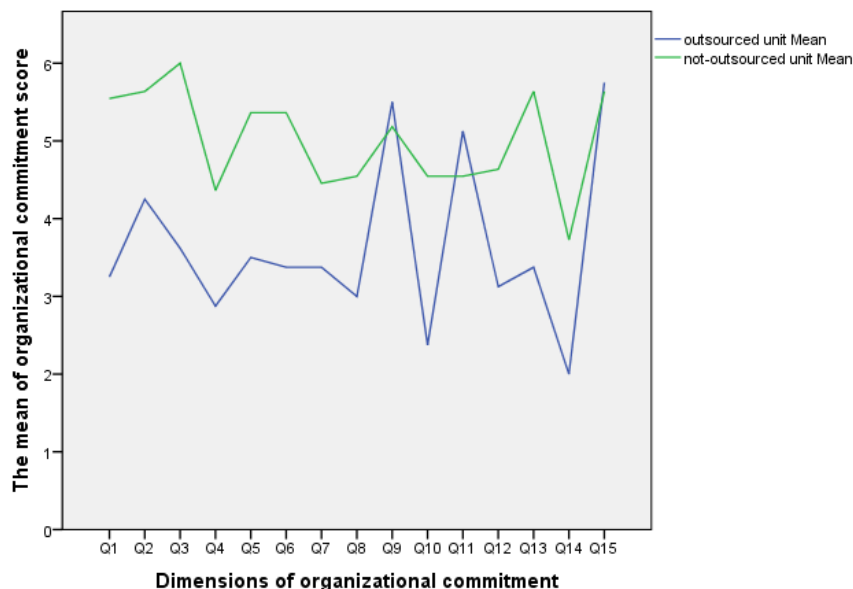
		the waiting time between arrival and admission						Total	
		5-10	11-15	16-20	21-30	31-45	<45		
Hospital	outsourced unit	Number	25	73	129	60	12	1	300
		Frequency	8.3%	24.3%	43%	20%	0.4%	0.3%	100%
	not-outsourced unit	Number	126	104	54	11	2	3	300
		Frequency	42%	34.7%	18%	3.7%	0.7%	1%	100%
Total		Number	151	177	183	71	14	4	600
		Frequency	25.2%	29.5%	30.5%	11.8%	2.3%	0.7%	100%

**Table 2:** Frequency of the waiting time between admission and imaging.

		the waiting time between admission and imaging						Total	
		5-10	11-15	16-20	21-30	31-45	<45		
Hospital	outsourced unit	Number	19	58	121	66	23	13	300
		Frequency	6.3%	19.3%	40.3%	22%	7.7%	4.3%	%100.0
	not-outsourced unit	Number	100	91	63	28	9	9	300
		Frequency	33.3%	30.3%	21%	9.3%	3%	3%	%100.0
Total		Number	119	149	184	94	32	22	600
		Frequency	19.8%	24.8%	30.7%	15.7%	5.3%	3.7%	%100.0

The findings showed that the average of satisfaction among the supervisors in other sectors from outsourced unit was 29.26 (+\_5.65) out of maximum of 70 while from the other unit it was equal to 28.97(+\_5.1) out of 70. The satisfaction of the supervisors in other sectors from the outsourced unit was equal to the satisfaction rate of them in the not-outsourced unit. The least average in this issue was about the on-time access to the radiological portable systems (2.72) and the acceptance of suggestions with the means of (3.05). For the normality evaluation of the data related to the supervisors' satisfaction, the kolmogorov-smirnov Test method was used. The results showed that the distribution of the supervisors satisfaction was normal (p-value = 0.515) so the T-test was used to compare the results of two units. Based on the results there was no meaningful difference between 2 units, statistically. This means that the outsourcing has no effect on the satisfaction of supervisors.

The mean of organizational commitment in outsourced unit was equal to 54.5 (+\_15.3) while it was 75.2 (+\_11) in the other unit. Since a higher score shows a higher commitment, the results show that the commitment of the employees in a public radiological section is more than in an outsourced unit. The least averages among the items related to organizational commitments belong to the followings: giving a higher value to their organization compare to other organizations [2], satisfying about working in this organization (2.37), accepting all kinds of jobs for holding the job (2.87).



**Diagram 2:** The Comparison of The mean of each dimension of organizational commitments.

The kolmogorov-smirnov test was used to evaluate the normality of the data distribution in relation to the organizational commitments.

The results of the test show that the score distribution was normal ( $p$ -value= 0.983) so the T-test was used for the comparison of two score averages in the 2 units. The results showed a meaningful difference between the organizational commitments of the personnel in two hospitals. ( $p$ -value=0.003). the small amount of  $p$ -value shows that the outsourcing has a big effect on the organizational commitment. The income of the outsourced radiological unit is more than the not-outsourced unit while its costs are less. The outsourcing can increase the income by 1% and decrease the costs by 44%. So it has a big effect on the income and cost. The number of Xs in an outsourced unit for a full month was 1320 (1315 Xs were qualitative and 5 were un-useable) while the number of Xs in a not- outsourced unit for a full month was 1300 (1275 Xs were qualitative and the 25 items of the rest were un-useable) the ratio of the qualitative Xs to the un-useable ones was 263 in the outsourced unit and 51 in the not-outsourced unit. The findings showed that the number of un-useable Xs in the not-unsourced units is 5 times more than this number in the outsourced unit. There was a meaningful difference between the qualitative Xs. Of the hospitals that is shown in the table2\*2 by using the chi-square test( $p$ -value=0.000). The small amount of the  $p$ -value shows that the outsourcing has a very big effect on the ratio of the qualitative Xs to the un-useable ones. 12 people were working in the not-outsourced radiological unit and all of them had master degree while in the outsourced unit 8 people were working that 2 of them had associate degree, 4 had bachelor, and 2 had MA. The number of radiology systems in each unit was equal to 2 and the ratio of the equipment to the employees was 0.25 in the outsourced unit and 0.166 in the not-outsourced unit. The number of the personnel in the outsourced unit was 4 people less than the not-outsourced unit but based on the Fisher test, there was no meaningful difference between the ratio of the equipment to the employees in 2 units ( $p$ -value=0.884) this means that the outsourcing has no effect on the ratio of employees to the equipment.

#### *Discussion and interpretation of the findings:*

This study was done to evaluate the efficiency of the radiology section of the hospitals. The results show that the average weighting mean of the patient's satisfaction is equal to 41.46 in the outsourcing radiology unit while it equals to 45 in the not-outsourcing unit. The results show no higher value for the patient' satisfaction in the outsourced radiology unit. So outsourcing can have a negative effect on the patient' satisfaction which is consistent with the findings by Badreldin, Amerion and Mohaghegh. Badreldin introduces the longevity of the waiting time as the main reason that leads to the dissatisfaction of the patient [19].

Amerion says that the minimum satisfaction (78%) is in the radiology section because there is no enough information to make readiness for radiology [14] while Mohaghegh says that the main reason behind, is spending in-adequate time for advising in the pharmacies [4]. In the current study, we introduce the overall rotation system as the main reason of dissatisfaction in the outsourced unit (3.11) and having inadequate receptionists in the hospitals confirms these findings. Because the number of 5 assistants in the 3 nightshifts for imaging unit including radiology, MRI, bone scan, and other services is not enough so it leads to the inefficiency of the overall rotation system. The second factor with the least satisfaction is about the facilities that are seen in both outsourced and not-outsourced units.in the not-outsourced unit, this average equals to (3.36) it

shows that this amount is due to the insufficient servicing for moving the wheelchairs while it equals to 3.54 in the not-outsourced unit which is due to the insufficient facilities of the section. The third factor which has the least average is the behavior of the employees during the admission (3.41) that can be justified by their tiredness and the difficulty of their job. So to solve the problem we have to reduce the volume of the works and teaching the necessary communicational skills.

The results also showed that the most of the patient in outsourced (43%) were admitted 16-20 minutes after entering the section while in the not-outsourced unit most of them (42%) were admitted 5-10 minutes after entering the section. Badreldin in a study entitled: the satisfaction level of the patients about the pharmaceutical services in the hospitals of Saudi Arabia, showed that the main factor of dissatisfaction among patients is the dissatisfaction with pharmaceutical services and also the longevity of the waiting time [19]. Amerioon in a study entitled "the satisfaction of admitted patients about the admission in the military hospitals" showed that the main dissatisfaction (19.2%) is in the pharmacy and due to the long waiting time. And also the minimum satisfaction was in clinics because the patients had to stay long [14].

This study enumerates the longevity of waiting time and reception as a result of insufficient number of employees. The results show that the outsourcing may have a negative effect on the waiting time of the patients also based on the results 225 patients of outsourced units(75%) and 227 patients from the not-outsourced units (92/3) were suggesting these units to their friends and it shows their satisfaction about this issue.

In the evaluation, it was shown that the average of satisfaction from the outsourced unit was equal to 29.26 while it was equal to 28.97 in the not-outsourced unit. The satisfaction of the supervisor in both units was somehow the same and there was no statistical difference among them.

The results of the studies by Ferdosi *et al.* showed that the amount of the satisfaction of the employees was 63.96 about the unit's performance and 64.55 after the transfer [20]. Tabibi *et al.* in their study entitled: " the evaluation of the outsourcing strategies in the supportive services of hospitals that are affiliated to the ministry of health" showed that the transfer of the supportive services leads to the increase in personnel's satisfaction [21]. Tourani *et al.* studied the effects of the outsourcing on the employees satisfaction positively [22]. On the other hand, Bahrami found out that the organizations do their organizational activities through the outsourcing of the activities and reducing the costs. These activities lead to an increase in unemployment and decrease the standard level of the employee's life and increase their satisfaction as well [23]. Zhirafer *et al.* in a study entitled:" the relationship between the Contract management and the employees satisfaction in the social science universities" showed that there is a meaningful relationship between the employees satisfaction before and after the performance. The performance of the Contract management has reduced the satisfaction of the employees [24].

In this study, the least average among the items related to the supervisor' satisfaction was about the on-time access to the radiological portable systems (2.72) that can be a result of the insufficient physical power in the radiology section and less attending to the admitted patients due to the financial interests. The acceptance and offering of suggestions also have the least average. in the evaluation of the effects of the outsourcing on the organizational commitment of the radiology's personnel we found out that the average scores of the organizational commitments are 54.5 and 75.2 in the outsourced and not-outsourced sections, respectively.

Since a higher score shows a higher commitment, the results show that the commitment of the employees in a public radiological section in more than an outsourced unit. The negative relationship between the data average shows that the outsourcing has a meaningful and negative effect on the organizational commitment of the radiology's personnel.

Up to now, there has been no study done to evaluate the effects of the outsourcing on the organizational commitment of the personnel and to compare the personnel's commitment under the control of a constructor or the government. The organizational commitment is low among the personnel who are under the control of a constructor and its due to the presence of short-term and temporary contractions among the employees and it results in a lesser and weaker commitment about the organization. As we can see in this research the lowest averages belongs to the items related to organizational commitments in the outsourced unit (Qs, 14 with the mean = 2) so the government should solve this problem through new laws and managing the private companies.

Barzegar *et al.* in a research entitled:" the impacts of outsourcing on the personnel's efficiency in the electricity distribution industry of Shiraz" found out that there is a meaningful relationship between the outsourcing (in the means of cost reduction, quality improvement and reduction of employees number ), the organizational commitment and employees' satisfaction. The cost reduction and services' quality improvement lead to organizational improvements, increase the salaries of personnel, and decrease the number of employees to support those who are formal employees and have more work experiences. So all of these factors have led to an increase in the organizational commitments and job satisfactions [25].

In the current study the number of personnel reported in outsourced group is less than the non- outsourcing. In this study about the impacts of outsourcing on the cost and income we can see that the income of the outsourced radiological units is more than the not-outsourced unit while its costs are less. The outsourcing can increase the income by 1% and decrease the costs by 44%.so the outsourcing may have a positive effect on the

cost reduction and the ratio of income to costs. The findings are all consistent with the studies by Richardson [26], Tavala [27], Chandera [28], Moschoris [29], Gandolfi [30]. Omrani *et al.* showed that the outsourcing of laboratories can be count as a managing method that includes the following: fundraising and the management of the NGOs., cost elimination, profitability improvement and the laboratory performance [31]. Ferdosi *et al.* found out that the outsourcing may increase the customers' satisfaction (70%) and its transfer leads to the performance improvement and cost reduction and also it improves the quality of services [2]. Tourani *et al.* have said that the pharmacies' transfer leads to cost reduction [22].

Yigit, in a study done in Turkey found out that the goals of transfers in Turkey's hospitals include: cost reduction, services' quality improvement, participation in risks and raising the profits [32]. In this study the ratio of income to cost in an outsourced radiology section equals to 1.48 while in a not-outsourced unit it equals to 0.83. which is similar to findings of Amerioon. This ratio was equal to 1.20 and 0.82 in the outsourced and not-outsourced units, respectively [14]. The findings by Chandra are also similar with our findings [28]. Some of the works are pointing to the negative results of outsourcing. For example the study by Ferdosi *et al.* can show these effects. The findings show an increase in the nursing force from 29% to 36% per bed as a result of outsourcing. But this goal is the result of an increase in the bed prices and the total cost of the hospital after outsourcing. The strategy of hiring nurses from out of the organization led to the efficiency reduction and so the strategy was not effective enough [20].

This study shows that the number of un-useable Xs in the not-outsourced unit is 5 times more than the outsourced one. This number equals to 5 in the transferred unit while in the not-outsourced unit it equals to 25. And this may be one of the reasons that we mentioned for cost reduction. The ratio of qualitative Xs to the un-useable ones in the outsourcing unit equals to 263 while its 51 in the unit which is not yet outsourced so there is a meaningful relationship between the two hospitals in means of the ratio of qualitative Xs in both places. This means that the effect of the outsourcing on the qualitative Xs was high. This results show the efficiency and the service quality in the outsourcing unit, Which is consistent with the studies by Yigit [32], Ferdosi *et al.* [2] while Richardson *et al.* in a research entitled "the laboratory science in Antario" found out that if the public and private laboratories in the Canada be combined then the prices decrease but there would be no changes in the service quality because the ordering is decreased [26].

In the current study, the number of personnel in the outsourced group is 4 members less than the other group and this may lead to a reduction of the outsourcing unit costs. the reduction of personnel number after outsourcing is consistent with the studies by Omrani [31], Tourani *et al.* [22], Kouji [33]. But in the comparison of the employees proportion and the equipment there was no meaningful difference according to Fisher. This means that the outsourcing has no effect on the ratio of the equipment to the employees. The results of the study showed that the outsourcing may increase the efficiency of the radiology section and this is consistent with the most of the studies [22,2].

#### Conclusion:

The results show that even the outsourcing increases the efficiency but decreases the effectiveness of the organization in the other words, sometimes the managers try to outsource the services to justify the reduction of the costs without paying attention to the characteristics and the human and organizational aspects. So the managers should pay attention to the human aspects as well as the financial aspects during the outsourcing. So outsourcing should have the following characteristics:

- Increase the monitoring, evaluation and management of the units reported in the health sector
- Increase the laws and rules about the transfer of services in the health sector.
- Increase the financial supports of government for the professionals of each major to open a company. (this may increase the competition in the market and remove the market from the exclusive mode so the companies may try harder to attract the customers).

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