Implementation of Electronic Support Services in an Internet Service Provider: A Case Study

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ABSTRACT

Information technology (IT) has created special facilities in businesses and affected almost all business processes from receiving a customer's order to producing, and even delivering services and products. But, in the meantime, one of the major challenges of electronic commerce has always been providing support services electronically. And one of the problems that electronic businesses is encountered with is providing services to the customers effectively and efficiently since in this type of business, the seller is faced with small packages, large number of customers, and the constraints of time, cost, and human resources. In this research, a decision support system is presented that can effectively be used in providing customers service in electronic businesses using records related to the customers services in the database and based on the models of decision tree and decision table. Also, using other databases, such as telecommunications, telephone answering, sales, etc, the research attempts to provide decision support system for the senior director to make major organizational decisions.

Keywords: Providing Support Services, Electronic Commerce, Decision Support System

1. INTRODUCTION

In recent decades, modern information technology has significantly affected the position and function of many communities, organizations and individuals; and parallel to the tremendous progress that has been made in this area, the fate of communities, organizations and individuals are increasingly dependent on the modern technology. Obviously, in such a situation, it is increasingly important to understand the impact of information technology [1].

In recent years, information technology industry was considered as one of the market factors (together with five factors of capital, workforce, raw materials, management, and machinery) in developmental investment in economic so that it is regarded not as a development tool, but as development center. Paying attention to this industry was not because of its mere economic nature, but because of its increasing role in facilitating communication. Information technology caused information revolution be made in the world that created dramatic changes in human life and its relationship, and changed classic framework of development from capital-centered to knowledge-centered [2].

Although, due to the rapid progress of information and communication technology (ICT), business has grown rapidly in the world and consequently in Iran, most efforts, especially in Iran, have been made to mechanize intra-organizational activities- such as organizational integrated systems (ERP)- inter organizational communications through the organization's portals, or communication with customers for measuring their satisfaction, selling products, delivering, and …. But much less attention has been given to the issue of support service and most companies have sought to sell more products, rather to provide more services to the customers. And one of the reasons why Iranian companies failed compared to foreign companies can be their lack of attention to the second part of the sales activity, i.e. proper after sale services.

Providing electronic support service in the companies that offer small packages in high volumes is of great importance since they have many customers. And since the companies offer small packages, they make little profit so the more the sales volume and the number of customers, the more profit they make. Therefore, in their view, providing appropriate services to the customers, especially after sale services, is very significant.

The ISP Company, taken as a case study in this research, is of the same nature. Despite having in-person and distance (by telephone) support team which includes a total of 75 elite experts, the company failed to achieve an acceptable level of customer satisfaction. Most cases that made customers dissatisfied include failure to respond them properly when they encountered difficulties, paying fee for support services, sending experts to the site lately, and …. Thus, these problems led the company's executives to mechanize support services systems.

The company is an internet services provider (ISP) that after selling its product package (internet traffic, internet subscription and sometimes hardware modem) sends its experts for installation and delivery services and in case of problem in the internet, the subscriber can call the support phone number and fix it.
2. IMPACT OF INFORMATION TECHNOLOGY ON THE ORGANIZATION

Information technology has had a significant impact on the organizational life. Information technology has facilitated the interaction between individuals and organizational groups, and also inter-organizational relationships. It also allows individuals and groups to improve the quality of decision making through speeding up access to appropriate information and collecting and evaluating them. IT has also affected on the composition and structure of the manpower. It enables an organization to better react in an environment and operate super actively. Siborra (1997) described how to use information technology in a virtual organization to maintain flexibility in highly ambiguous environments. He believed that in very unstable environments, traditional strategy-structure relationship will be failed to make flexibility in an official and formal organization. To reduce the tension between strategy and structure, information technology, which provides more flexibility for organizations and enables them to process more information about their organization, is used [3].

Studies show that information technology causes the work and workforce to become knowledge-based. Therefore, with the development of information technology, the composition of the workforce will be changed and non-knowledge and hand workers are replaced with knowledge ones. In general, information technology and knowledge worker can be seen as complementary.

Ei Pert believes that in the present world, organizations compete over two things. On the one hand, they compete over physical benefits which he calls physical world, and on the other hand, over virtual world of information. Thus, managers should design and manage their organizational structure based on two new parameters. He further says that information technology plays a significant role in the organizations' virtual world so that in the competitive world, IT helps the organizations' managers to increase the added value, and prevents the waste of resources and energy [4].

The information technology considerably affects the organization's hierarchy, organizational centralization or decentralization, and reducing the complexity of bureaucratic organizations. Robins believes that IT will allow the organization to simultaneously realize centralization and decentralization [5]. So, according to the conducted researches, this is an accepted principle that compared to operation technology, information technology needs a different structure, and it will also have a significant impact on the organizational structure, and the type of the organization required. Accepting the presumption, we express some assumptions related to information technology, organizational structure, and the type of the organization required:

2.1 Information Technology And Organizational Hierarchy

Information technology allows the organizations to get the experts' knowledge under their control, so the need for technical expertise will be reduced in the organization. It is logical that when management levels were reduced in the organizations, fewer line and staff managers will be needed. The process is more created by reducing or minimizing the size of middle management. As a result, machines and mechanic structures will be replaced with organic and professional structures.

2.2 Information Technology And Job Content

When the work is redesigned, job content is changed, and since with the development of information technology, the nature of some of the organization's activities is changed, job design and job content will also be changed.

2.3 Information Technology And Changes In Monitoring

The fact that employees' work are done online and stored electronically provides the possibility of further monitoring. In fact, IT is a means that facilitates controlling and monitoring.

2.4 Information Technology And Organization Being Virtual

Given the information technology pervasiveness and advantages that it can bring to the organizations, the pressure to virtualize the organization has been doubled. IT causes virtual organizations to develop.

3. PROVIDING REMOTE SERVICES

Ability to respond quickly and effectively and providing customer needs are considered as obvious characteristics of successful competition of many organizations. Therefore, to increase the efficiency and effectiveness of the company, provide desirable services and goods, align the company's required characteristics with the customers' needs for obtaining their consent, not only information and knowledge should be increased, but this should be managed [6].

In traditional business, consumer services and support only included addressing customer's problems in the store, but nowadays client support includes any help, assistance and technical support before, after and during the transaction [7].

Internet has transformed our life, and methods of communicating with others. Basically, it has more or less changed almost all aspects of human society. In recent years, the importance of internet and information technology has significantly increased - both in commercial and private space (especially with the increase of Internet users and internet services). The company's employees and their work environment have undoubtedly been affected by the Internet.
and information technology in terms of designing the job, working conditions and many other things.

As internet and (more widely) Information and Communication Technology (ICT) have developed in the last two decades, new and different facilities have been provided for doing work and structuring the organizations. Moreover, costs relating to immovable assets (such as real estate) are lowered because requirements relating to the location for the organization are reduced [8].

The advent of the internet as a vehicle for trade and business has developed a new way of customer services named e-services that improves the speed and quality of providing services by facilitating support service process. Customer service is one of the key issues in e-commerce. For many consumers, this is a way to distinguish between good and bad websites in e-commerce. When an electronic service system is designed, it must keep the following points in mind:

- The first step in consumers support services is a structured website with comprehensive information;
- Organizations have poor records to answer the requests made through email and this will hurt their credibility;
- Electronic services can dramatically increase the requests, most of which are insignificant. To address these requests and choose important ones, an appropriate strategy should be developed.

All websites should have a part for providing electronic support services to customers. Cost is a major issue: the lower a product's profit, the fewer support services can be provided [7].

Person-to-person services are expensive so websites should offer general information for many raised questions as soon as possible by reducing unnecessary communications. Website quality can reduce incoming queries. Although the main objective of websites is to answer questions, their specialized functions in offering electronic support services are as follows:

- **Common and important questions**: a set of most common questions about a product or services. These questions are usually written. If the number of the questions is high, we should divide them into logical groups.

- **Comprehensive assistance**: In each page, a special section can be considered for giving assistance. This section should guide people to another section that contains information on all support services of the website. If the people are asked to do complex tasks, such as using sophisticated search engines or implementing the process of buying products, assisting sections should be considered in these areas. Thus, once the people click on the assisting section, they are connected to the specific page they need.

- **Science-based systems**: These systems are the same as common questions system. The user can write a question using key words. In response, he/she is provided with a set of information.

4. **DESIGNING A SYSTEM FOR PROVIDING REMOTE SERVICES (CASE STUDY)**

This research aims to implement a system that on the one hand, reduces staff costs such as manpower and transportation, and on the other hand, increases level of customer satisfaction like not being delayed on the phone, not being waited for on-site experts, and…. It also aims to use senior manager's decision making system that helps the senior manager to make more realistic decisions with the help of the system's databases and other databases of the existing systems.

To this end, we examined the section of providing services to the customer and inferred that it is possible to replace the expert with an online system. For this purpose, we interviewed with some of the senior experts of this section and found that it operates in two areas: initial installation and error removal. In the initial installation section, the expert does the initial setups of the subscriber's internet connection on-site and according to subscription information of the customer, enables and delivers his line. In the error removal section, when a subscriber is faced with a problem, he calls the company and fixes it and if the problem isn't solved, the expert presents there and attempts to resolve it. These measures and supports require a strong and broad team of experts that imposes heavy time and financial costs to the company.

DFDs of each activity were designed with the information obtained from flowcharts experts. Studying the company's databases, we came to the conclusion that installation and error information is in the company, but as they are scattered in different systems, such as telecommunications systems, sales systems, support systems, and … they are not used timely and appropriately, and they cannot be reported together, so the manager receives separate reports from different parts and acts upon them. Therefore, it was found out that by using these databases, and adding several new fields to them, skyrocketing costs of supporting can be reduced and the system can be made available online to the customers to use it easily at any time and place to solve the problems.
With the help of information gained from the client and installation databases (customer's records), telecommunications databases (customer's telecommunications records), and connection databases (that consist of the status of the customer's moment connection), the implemented system tries to install and remove the error with which the customer is facing. If the system was finally able to meet the customer's needs, it stores the result in the support database; otherwise, assigns it to the expert and inform the customer by sending an appropriate message to him that the expert will contact him with the specific number given to him, and updates the support database after he met the customer's needs.

On the other hand, a support system of the senior manager decision was implemented. Using the support database (that has been created by the expert and designed system), answering phone (that created by the answering phone calls), sale database (that contains financial and sale information), and telecommunications connection database, the system enables the manager to compare the organization's cost with sales and revenue, observe customer's level of satisfaction realistically, and make better decisions about most customer's needs, purchasing equipment and other cases.

When the customer communicates with the system, the fields related to accountability and error removal are filled respectively and recorded in the database table along with the customer-specific code. To identify the process of supporting and on-site installation, it was examined by the experts, and best process was achieved and outlined in flowcharts and DFDs.

The analysis of the installation support and error removal led to a conceptual model that with its help, central mechanized system of installation/error processing is provided to the customer and they can meet their demands by referring to it. The proposed system consists of two main parts:

4.1 Installation System

Using this system, the subscriber can install the modem himself. After installing the modem on the computer, he can do necessary settings for connecting to the internet with this option. Firstly, the subscriber is asked for the subscription and phone number, if his information is entered correctly, the system checks the subscriber's internet activation status. If the subscriber is new, the internet, and subscriber's username and password will be activated within 72 hours after signing the contract. The subscriber should install the modem on the activation date which is mentioned in the subscriber's contract, and if he does it earlier than the date, he will not be allowed to install and asked to do it on the due date.

If the connections are established and activation date is arrived, the subscriber can go to next stages, choose the type of his modem, and do the internet setting by password and username that is provided to him by the system.

4.2 Error Removal System

After a series of surveys on the error databases and interviewing the experts, four main categories of error were identified that accounted for about 95% of the requests, and each of which had some steps for being removed.

For each step, a weight was considered that prioritize steps smartly (weighting table was initially prepared and applied according to the senior experts' view). This speeds up the central server accountability to the customer, and reduces the volume of the request in action. For example, if there is a communication problem in a part of the city, the step of communication problem is prioritized so previous steps are not done and the speed increases. Four main categories of error were as follows:

4.2.1 Speed-Slowness Error

When the subscriber is faced with speed-slowness error, he can analyze the reason using this option. The system goes through the following steps using the weighting table, such as table 1. And if the error was removed, next steps cannot be followed by offering proper reports.

<table>
<thead>
<tr>
<th>Speed &amp; bandwidth</th>
<th>Line length</th>
<th>Communications</th>
<th>Lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.38</td>
<td>0.32</td>
<td>0.19</td>
<td>0.11</td>
</tr>
</tbody>
</table>

To remove the error of speed-slowness, minimum and maximum range of data exchange and noise of the lines are firstly examined, if there are problems in these parts, the subscriber will be referred to the section of needed guidance for the problem of speed and bandwidth and the problem will be solved; otherwise, minimum and maximum length of communication line are checked, if there is a problem, the subscriber will be referred to the section of needed guidance for the problem of line length and a message is sent to the technical experts' section to examine the telecommunications ports problem. If not, the status of the telecommunications ports are checked, then the status of the company's communication (Internet service provider (ISP)) with telecommunications and telecommunications' communication with the subscriber's location are examined, in case of problem, in addition to showing the message "please wait, you will be contacted", the subscriber is asked to wait for the expert to call.

If none of the above problems were found by the system, it means that the internet has been delivered to the subscriber without any problem so if the problem still exists,
it is definitely related to the internal lines and the like. Therefore, following solutions are offered to the subscriber:

- Check telephone internal lines
- Ensure that your browser and operating system are operating properly
- Restart the computer

If the subscriber is still faced with the problem, the system allows him to wait for the expert to call by receiving a reference number.

4.2.2 Error 404

When the subscriber is faced with the error 404, he can choose this option to remove it. Based on the weighting table No. 2, the system goes through the following steps:

Table 2: Weighting the order of implementing different processes of removing the error 404

<table>
<thead>
<tr>
<th>Filter\Activatin</th>
<th>Activatin</th>
<th>Line\Telecommunications</th>
<th>Line\Link light</th>
<th>Lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filter</td>
<td>Activatin</td>
<td>Line</td>
<td>Telecommunications</td>
<td>Line light</td>
</tr>
<tr>
<td>0.27</td>
<td>0.22</td>
<td>0.18</td>
<td>0.12</td>
<td>0.11</td>
</tr>
</tbody>
</table>

To remove the error 404, the system firstly examines the set-up IP (Internet protocol) in the browser using processing of the filtering, and if unauthorized IP was set up in the browser, the subscriber will be referred to the section of needed guidance for removing the unauthorized protocol. Otherwise, the system checks the operating status of the subscriber's internet line with activation processing. It happens when the client's subscription status is disabled due to competent authorities order or ISP (Internet service provider) problems; therefore, the system informs the client showing the message of "there is an error in internet connection, please wait a little you will be contacted". But if there is not a problem in activation, the system will examine minimum and maximum length of the telecommunications line.

This section is exactly the same as the section for testing the line length in speed-slowness that if speed-slowness is very high, it almost closes to the final state then it will be impossible to open the browser page. But if there was not any problem, the status of telecommunications ports will be examined. This step has exactly the same situation of telecommunications ports status in the speed-slowness. If none of the above processes work, then the system processes the link light and examines if the status of the subscriber's modem and browser's IP is correct. The subscriber might not do the modem settings correctly or the settings were changed for some reasons, so he is referred to the section of needed guidance. Sometimes, the subscriber may set an authorized IP in his browser, the system, in this case, detects the problem and asks him to delete it.

If none of the above problems were found by the system, it means that the internet has been delivered to the subscriber without any problem so if the problem still exists, the subscriber will be asked to check the internal lines of his house, ensure that his browser and operating system are operating properly, and finally restart his computer again.

If the subscriber is still faced with the problem, the system allows him to wait for the expert to call by receiving a reference number.

4.2.3 Error Of Seeing Company's Website

Sometimes the subscriber may be referred to the company's web site as he opens every page of the internet so he can explore the reason by referring to the section of seeing the company's website, and solve the problem. To do so, the system goes through the following steps using the weighting table No. 3:

Table 3: Weighting the order of implementing different processes of removing the error of seeing company's website

<table>
<thead>
<tr>
<th>Expiration</th>
<th>Traffic</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.45</td>
<td>0.45</td>
<td>0.10</td>
</tr>
</tbody>
</table>

Firstly, the company examines the expiration date of the subscriber's contract, if the date was passed, it asks the subscriber to renew the contract. Secondly, the system checks the subscriber's remaining traffic, if his remaining download traffic is finished, it asks him to buy more traffic. Then, it checks operating status of the subscriber; this step is also exactly the same as activation processing in the error 404.

Moreover, if the subscriber forgets his username, password, or the password of his wireless modem, the system allows him to visit the site and get them.

Another important point about this system is that it is smart and this makes it an expert smart system. In the first step of designing process, according to the statistics obtained from the experts, weighting table of each step of the error was drawn; accordingly, special algorithms were designed. But, given the errors happen over time, and given that if an error happens, its related code is stored in the supporting database, and senior manager can update the weighting table. This is one of the facilities that has been provided for senior managers and enables them to choose a time interval, press a button and change the weighting table according to the frequency in this time interval.

This means that if the implementation order of the speed-slowness error is as follows according to the weighting table,

- Checking speed rate
- Checking noise rate
- Checking line length
Checking security of the telecommunications ports

It may change over time according to the system's detection based on the frequency of different recorded errors and according to the senior manager's confirmation. Although, this order may not firstly be so important, when we are faced with 50000 requests per day, responding speed will be of great significance, thereby the order of implementing the algorithms will also be very important.

5. RESULTS OF IMPLEMENTING ONLINE SYSTEM

By implementing the above-mentioned system and testing it on a sample of 50 subscribers, significant improvement in the results was observed that was provided to the manager in form of managerial reports and helped him to make more realistic decisions. Implementation of the system was 85% successful, i.e. the system, in 88% of cases, could perform the expert's role as good as possible. As seen in Figure 1, 54% of the people who visited the site have been responded, 34% of references were wrong – they were the cases that the subscriber has been responded but he still has referred to the expert so they can be considered as the system's success and only 12% of the visitors have been failed to be responded by the system and were referred to the expert.

On the other hand, as seen in Figure 2, the rate of customer's satisfaction has risen from about 60% to about 84% that indicates customers' satisfaction increased of after-sale services. Increasing customers' level of satisfaction was one of the most important factors for the managers to accept the system.

Various managerial reports were provided to the manager, like the report of the most frequent errors, most failures of telecommunications devices, the centers with the highest error rate, identifying experts who have had the greatest success in customer satisfaction, rate of the system's success at different intervals, and…. A sample report example that shows the rate of sales and failures of modems and switches can be seen in Figure 3.

Type of the customers' requests that is shown in Figure 4 is among the most important reports that can reflect the status of offering services to the customers and their problems.
Choosing each of them, the manager can see the details related to their steps. For example, 64% of errors are related to speed-slowness that by choosing it, the manager can see the details, as seen in Figure 5, that indicate 31.25% of the problems are related to bandwidth, 31.25 to line length, 21.88% to telecommunications problems, and 15.62 to line problems.

The reports prepared by the system enable the manager to better see the company and customers' problems and take action to resolve them.

Designing the system discussed in this paper, we came to the conclusion that it has many advantages for the company in long and short-term. Here, some of these advantages are mentioned briefly. Designing the system will result in higher levels of customer satisfaction because the customer is involved in installation and error removal and there is no need for him to depend on the expert and wait for him. He can simply meet his technical requirements without spending money. Above all, most customers don't like to share their personal computer (PC) with others and there is a general impression that the expert may activate the options of monitoring and searching the computer when he installs some programs on it. Moreover, the process of responding to the customer has been mechanized and it makes that the subscriber not to receive different solutions for his problem but in the expert respond system, the subscriber, in most cases, is received different responses by different experts.

This system is also useful for the company as it reduces manpower in the expert level. Implementing the system, the company can easily reduce its costs and cut 75-member expert system to about one-tenth or even more. It can also eliminate senior managers' dependence on the middle manager's reports. Designing proper databases and using senior reporting system, the reports like statistics, referral to experts, most frequent error, expense and revenue, errors related to the company or telecommunications, and ... can be seen at any time so senior managers no longer wait for middle managers' reports. This is considered as one of the greatest advantages of this system and an extra reason for managers to accept it. The system breaks middle managers' information monopoly, reduces the level of middle managers by 90%, and changes their role to senior managers' advisors.

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