

Building Material Supply Systems Based on Internet (The Review of the Iran's Status and Proposing a New System)

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ABSTRACT

More than 50% of the total costs of a project are spent on the provision and supply of material and equipments. Buying material with conventional methods has some defects such as low accuracy, much time, many workers, the lack of data and information about suppliers and a high unreliability. Managing the material supply appropriately, we can expect that the profits of firms increase through reducing unnecessary costs such as the costs related to delays, requests and etc. supply and purchasing material electronically systems using data interchange technology under web are one of the procedures being studied seriously in advanced societies and are used in building industry. In this research, purchasing building material electronically systems are examined in the country and in addition to analyzing their effectiveness compared with the globally known systems, a new system meeting the nature of the country's building industry is presented.

Keywords: Building material, Electronic Commerce, Internet Purchase and Supply of Material.

1. INTRODUCTION

According to the research done, more than 50-60% of the total costs of a project are spent on material and equipments. It is evident that managing material appropriately, we can increase the profit of firms/organizations through reducing unnecessary costs such as the costs related to delays, requests and etc. hence, effectively managing material plays an important role in project's success [1]. Unsuitable methods of supplying material can lead to costly delays, profit decline, and probably conflict. The fact is that because of using papers in traditional methods, there are many defects such as low accuracy, spending much time, many human resources, losing data and unreliability. The organization should have more activity and exploit information technology which is employed for interchanging information and having activities, in order to solve these problems.

Today, the existing problems in purchasing and selling using papers have been solved by replacing it with electronically purchase. Electronic purchase system which is common today, has been established using "electronic data interchange (EDI)" technology to send orders, obtain receipts and to pay electronically. In the following, beside introducing electronic commerce and supply management, the characteristics and features of a sample electronic agency system is examined.

2. Electronic Commerce Description of Government

2.1. Definition

Electronic commerce is to do transactions and transfer commercial information without exchanging papers, directly using computers and through communication lines. The main aim of electronic commerce is also to bring the supplier and the customer closer and to reduce the volume and the range of supply chain. Many economists and specialists believe that a revolution like the industrial revolution has occurred that has involved the world in information arena and has exposed many economical, social and cultural aspects of human life to a great change.

The increasing growth of technology, especially information technology (IT) in the world, has relieved the temporal and spatial barriers and problems related to commercial affairs and the public access to internet has made internet commerce or in other words, electronic commerce and electronic business enjoy a special interest in developed countries, so that in recent years, they have tended to commerce electronically through gradual ceasing the traditional commerce based on papers and exchanging deeds physically. The method electronic commerce known as commerce without paper saves time, costs and human resources and has increased productivity indices, but this method has not still obtained its place in our country. It is worthy to say that since Iran must be member of WTO and if there is a domestic weakness in electronic commerce, the activity of powerful global companies may bring outcomes for the country, e.g. domestic consumers tend to more secure and easier foreign systems. Therefore, foreign companies dominate over a main part of domestic market and

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domestic products can't even be suggested in domestic market. On the other hand, domestic companies will not be able to influence on global markets and to compete with foreign competitors because of their weakness in suitably exploiting this tool. A more important point is that since there is not an advanced electronic banking system in the country, money and domestic capitals are transferred in foreign systems such as, credit card, visa, master card and completely electronic accounts such as Pay pal and E gold and even Asian accounts such as LG Card and Sony Card and domestic banks fail to absorb the main part of domestic capitals. In this way, the flow of the currency leaving the country intensifies. Some global standards are established in order to coordinate these computer communications which have been employed as a common language in commerce and are known as quality standards. [2]

2.2. The main components of electronic commerce

The main components of electronic commerce are as follows: Standard messages, A software interchanging data electronically, Network communication or communication network.

2.3. The advantages of electronic commerce (EC)

1. Globalizes the commerce and as a result, the increases sales
2. Decreases transaction costs
3. Removes temporal and spatial limitations
4. Removes the delay due to providing documents
5. Reduces making mistakes
6. Saves time, human resources and administration costs
7. Makes the flow of information smoother (easy access to information)
8. Reduces the large volume of repeated standards.

2.4. Electronic commerce tools

The main tools of electronic commerce are as follows:

1. Bar code: it is obtained by accepting the membership in the national center of numbering goods and services and every company can be assigned a code which is used in the number of the company's products and makes it to possible to identify the product throughout the world.
2. Electronic post (E-mail): it mails the letters electronically.
3. Electronic banking (E-Banking): it includes doing all of the bank's financial processes through interchanging data electronically which makes serving the customers quicker and makes banking operations more accurate [2].

2.5. The types of electronic commerce Electronic

1. Goods commerce, service commerce and information commerce between firms (B2B)
2. Goods commerce, service commerce and information commerce between firms and consumers (B2C)
3. Goods commerce, service commerce and information commerce between consumers (C2C)
4. Goods commerce, service commerce and information commerce between firms and public organizations (B2A)
5. Goods commerce, service commerce and information commerce between consumers and public organizations (C2A).

Electronic commerce is the subset of electronic business and the formula of electronic business is as follows:

Planning the companies resources+ Managing the supply chain+ Managing relations with the customer+ The companies' abilities+ Electronic commerce= Electronic Business

2.6. The substructures of electronic commerce

1. Establishing domestic and global standard systems
2. Establishing proper payment systems in transactions
3. Establishing the required communication substructures
4. Legal and juridical matters and making messaging secure for reserving people's rights
5. Security and reserving people's privacy by making regulations in this context
6. A close and bidirectional relation between commerce sector and different public sectors electronically
7. Creating an electronic state and establishing it in the society

2.7. The process of electronic commerce application in Firm

The first step: establishing the pattern of electronic commerce (a system of the method examination). The second step: selecting a development way among the following development ways:

1. Using ASP to progress generally
2. The purchase of an applied software package and installing it
3. The establishment of the internal system in the firm
4. The connection to a sector or an electronic purchase site such as an auction site
5. The establishment of an identified site for the firm
6. Employing a combination of the above ways.

The third step: Installation, communication and etc.

The forth step: Provision.

The fifth step: Performance. The sixth step: protection

2.8. Electronic payments in electronic commerce

In electronic payments, other funds such as smart cards, cheques and electronic assignments exist in addition to credit cards. The common part of all of these methods is that all of them can transfer a payment from a person to another in the network, without requiring those persons to meet each other.

Four groups are usually involved in all of these methods:

1. The inaugurator institution: bank or a nonblank institute which provides the device of electronic payment to complete the purchase.
2. Purchaser/ payer: people paying electronically to buy something or for the service done.
3. Vendor-Receive: A group that receive electronically payments in duration of trade an services.
4. Legislator: a public government controlling the process of electronic payments according to specific regulations. A legislator plays a key role in inaugurator institutions, because customers at first take receive their payment accounts from them.

2.9. The problems of the electronic commerce not being developed in Iran

- *The general factors including:[2]*

1. Not being familiar with it and people having no access to computers.
2. Not being a public training through mass media
3. Not being serious in training electronic commerce in academies and training centers
4. The commercial informing networks not being complete
5. Public unawareness of the advantages of electronic commerce
6. Most people not being familiar with English in the society

- *State factors including:*

1. The lack of the required information in commercial informing networks
2. The problems due to the existing administration system
3. The trade points not being developed in the country
4. The lack of the related cooperation and participation in electronic commerce
5. The banking system being weak in improving electronic commerce
6. The regulations being weak in improving electronic commerce
7. The ineffectiveness of the country's banking system in doing electronic commerce operations.

- *Special factors:*

1. The weakness of communication networks in using new technologies such as satellite, optical fiber, systems with a high crossing capacity and etc
 2. The lack of electronic data interchange (bank data, contracts) and ...
 3. The lack of specialist force in electronic commerce
 4. Not using bar codes widely in order to identify goods and services in the country
- The project's

3. The Project's Provision Management

It means to provide the required goods and services to complete the working field of the project. These goods and services can be maps, material, equipments or the special services provided by some sellers, supplier, or some parts of a company which are not involved in the project team [3]. Provision management is composed of six main processes [4]: (Figure 1)

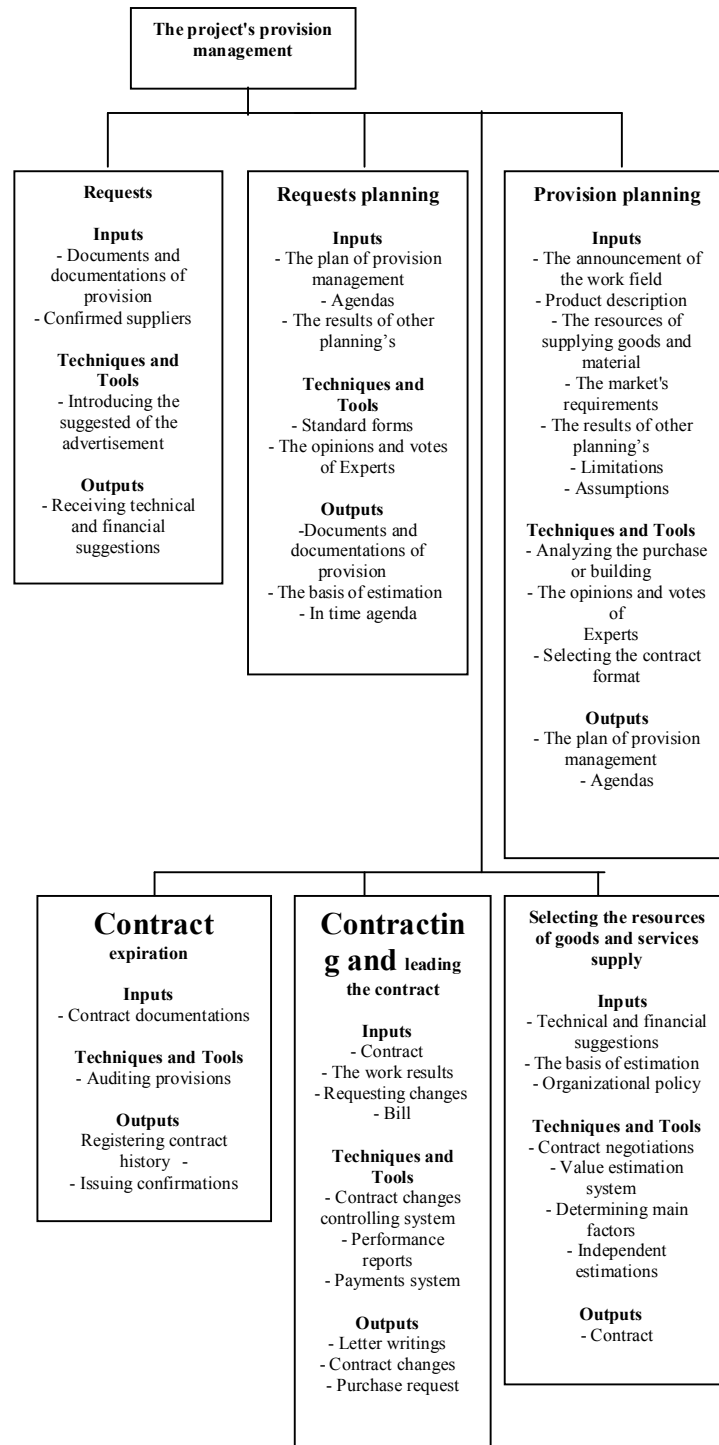


Figure1. The processes of provision planning

3.1. The Process of Planning Provisions

The process of identifying and determining is the set of the project requirements which together with the provision of goods and services can be met suitably outside of the project executive organization. In this process, the necessities, methods, procedures and the timing of their provision are also determined in addition to determining goods, services and their required amounts. In other words, provision planning is to build or buy and making this decision may need some information about other parts of the company and the sellers outside of the company in order that the market requirements, the company's specialty and the workload of resources are estimated.

Speaking simply, provision planning answers the following questions:

- What must be provided-how much must be provided?
- When is it needed?
- When must it be provided?

- How must it be provided (how the contract is?)

Timing is one of the important results of planning's which usually changes in accordance with request planning. Generally, planning's include the following parts:

- Then list of sellers and suppliers: All sellers and suppliers must be at first identifies according to the project quality plan and must then be qualifies (the fourth process).
- Calling for the bid: The necessary documentations for the bid must be provided for suppliers including all required information for giving a price.
- Judgment in the bid: Bids must be examined carefully and must be negotiated with producers in order to achieve the best conditions and prices and one must try to order them in a way that two contractors benefit.
- Ordering: They should notice firms standards and qualifications said in contract
- Quickness: after ordering, one should do the necessary actions to become sure that the conditions of the contract are met, especially the quality and the duration (the fifth process)
- Transportation
- Reception: The state of the received goods must be compared with the shipment bill.
- Warehousing: The transported items must be warehoused to be hold securely. Moving the items may need special equipments or it may need certain conditions.
- Accounts: before paying an amount for orders, the budget, the purchase order, bill and the shipment bill must be audited to identify the probable differences. [4]

3.2. The Process of Request Planning

It is the process of providing the necessary documents and documentations to support and justify the request. The provision documents and documentations are used to receive the quotations of sellers and producers. The early quotations of goods and service suppliers which are usually without financial-commercial considerations and only include the technical information are called "Proposal". After interchanging the early information with purchasers, sellers and producers, technical-commercial-financial proposals are submitted to purchaser under a "Bid" or a "Quotation".

3.3. The Process of Request

It is the process of doing the preliminaries to obtain information and receive technical and financial proposals from goods and service suppliers to meet the requirements of the project. Goods and services must be provided by reliable and confirmed suppliers. Most organizations assign mechanized information banks to hold the record of suppliers. In these information banks, basic and main characteristics of relevant producers and sellers are collected and hold using general information banks (available in market) or through valid public institutions.

3.4. The Process of Selecting Goods and Service Suppliers

It is the process of receiving their proposals in order to select an optimal producer or seller. In order to have an optimal selection, it is necessary to consider:

- Sometimes the lowest price is the criterion, but the criterions time and quality should be also considered.
- Technical sector should be examined separately from the financial sector of proposals in estimating the received proposals.
- Sometimes it is necessary to use several producer and seller simultaneously to supply certain goods and services.
- This process is sometimes repeated for certain and main goods and services.

3.5. The process of leading the contract

It is the process of guaranteeing that the performance of goods and service suppliers complies with their contract commitments. One of the most important aspects of leading contracts, is the continuous management and coordination between different executives through paying attention to an exact execution of their commitments according to their contracts. Leading contracts and using the processes of project management properly in contract relations and also integrating the results from these processes, managing the whole project is achieved.

3.6. The process of contract termination

It is the process of updating the final results from executing the contract and recording and holding information to use in future. A structured provision review from "planning to execution" and "leading contracts and treaties" is performed in provision auditing. The main aim of provision auditing is to examine, identify and determine likely successes and failures and to prevent from failures and to improve success bring factors in future and also to use these experiences in future projects of executive organizations. Generally, project provision management is to describe the relations between goods and service suppliers needing them which can not be limited to a project. Goods and service suppliers are also known as "producers", "sellers", "contractors" and "advisers" in different projects. [4]

4. Introducing electronic purchase system (EPA) [1]

EPA system is an electronic purchase system and relies on non-intelligent purchase agencies, because the role of the electronic agency is to identify the agencies of the counterpart and to establish an electronic relation between both counterparts

(contractor and supplier). This system can play also a role in buying material. However, some cases such as selecting the attractive conditions of suppliers and negotiation about how the price is paid, must be still implemented by human resources. The aim of introduction is to show that EPA can significantly reduce human tasks and errors in determining and selecting suppliers. In principle, the main aim of suggesting EPA system is to remove the existing problems in traditional purchase. (Figure 2) EPA system is designed to achieve the following aims: a. to establish a kind of relationship. The system has a relation standard (common language) among working groups. For example, the system is equipped with some standards to enter quality characteristics of every material. Otherwise, the supplier agent may not know the requirements of the purchaser agent. b. the traditional procedure of selecting the supplier is usually based on the cheapest price. However, in some cases, the cheapest proposal is not the most proper proposal. EPA system gives a simple and clear procedure to select the supplier in which all aspects are important such as: characteristics, the supplier record, price, how it is paid and other requirements are shown. C. estimating executive history, it is one of the critical processes in every trade. EPA simply estimates the performance of the supplier and gives it to customers which is based on past purchase order.

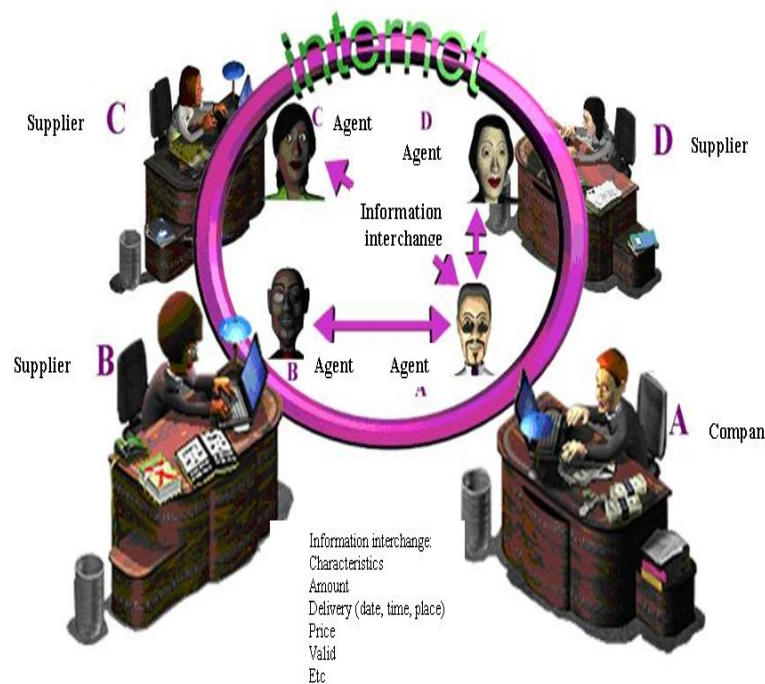


Figure2. Working framework of electronic purchase agency system in internet environment

4.1. The role of electronic agent [1]

In EPA system, electronic customer agent (that is the purchase agent of the contractor, here) is designed so that it searches and shows quickly and frequently the existing material and the appropriate suppliers and their executive scores. This agent can also set the Purchase order (PO) automatically and provide a mechanism for estimating the supplier's performance for future projects. The purchaser has to do other tasks (negotiation and submission, publishing the purchase order, speeding, auditing) (Figure 3) manually like other traditional procedures. A full description of the role the contractor agent plays is presented in the follows.

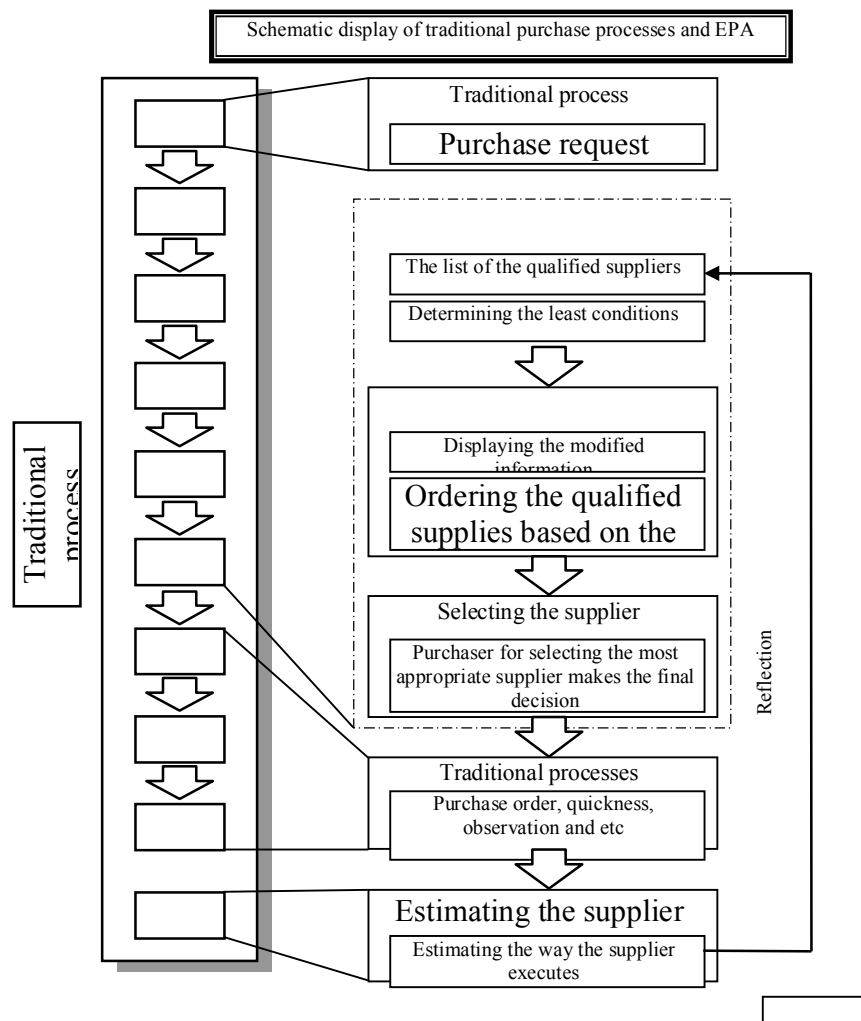


Figure3. EPA framework for purchasing building material

- Securing the system

Since the suggested system must be exact and reliable, it should have a reliable security system. A security system is divided into two parts: system part and user part. The aim of system part is to secure the communication network between the supplier and the customer. Examining the network security starts from the customer agency (client) which sends a request to communicate with the supplier agency (server). Immediately after the request arrived, the server sends a key word to communicate with the purchaser. After that, a user name and a password are sent to the server secretly. The supplier checks the arrived information and the communication results only when the user name and the password are entered correctly. On the other hand, the aim of the user part is to secure the system from illegal users. Legal users must enter their user name and password before accessing the system.

- Seeking for the required material

This part is the most important part of the system work. This part is to help the purchaser agent seek his required material from appropriate suppliers. The system must have the easiest tool to search the required information. (Figure 4)

EPA - Supplier Evaluation

P/O ID Project Vendor

Attitude

- Anticipates our requirements ☐
- Supplies quotation promptly ☐
- Regularly solicits our business ☐
- Answers all communications promptly ☐
- Willing helps in emergencies ☐
- Has sincere desire to serve ☐

Sub Total x Weight

Price

- Competitive pricing ☐
- Accurate quotation per specifications ☐
- Alternative cost saving quotations ☐
- Reasonable pricing for changes/additions ☐
- Acceptance of back charges ☐

Sub Total x Weight

Capability

- Financial strength ☐
- Ability to absorb any order related liability ☐
- Sales professionalism ☐
- Sufficiently qualified sales personnel to respond to needs ☐
- Quality assurance ☐
- Quality assurance is properly staffed in organization ☐

Sub Total x Weight

Quality

- Compliance with specifications ☐
- Materials pass inspection without problems ☐
- Absence of post delivery defects ☐
- Proper submission of document ☐

Sub Total x Weight

Delivery

- Quoted Delivery times meet requirements ☐
- Meets/improves contracted delivery rates ☐
- Adapt to delivery changes ☐
- Regular, accurate progress reports ☐
- Complete Delivery undamaged goods/materials ☐

Sub Total x Weight

Service

- Personnel availability/responsiveness ☐
- Reliability ☐
- Anticipates future requirements ☐
- Supplier warns of potential problems ☐
- Satisfactory term of payment (Credit system) ☐

Sub Total x Weight

Remark Rating score 1 = very bad, 5 = very good

Total Score =

Figure4. Estimating the performance of suppliers

- Updating information related to suppliers

Users should be allowed to add appropriate new suppliers to the database and to delete weak suppliers. After deletion, purchaser agent can't communicate with the deleted supplier.

- Helping the user select the appropriate supplier

Selecting the supplier is generally based on the cheapest proposal. However, other important aspects exist which can be used as the selection criterion (executive history score, the requirements of paying the price). The suggested system has such these information to help the selection process of the supplier.

- Helping the user estimate the executive history of the supplier

The process of estimating the supplier observes how the supplier executes and is a part of the system. This system with a simple and easy graphics helps the user in the estimation process. The main criterions are divided into six groups, i.e. work method, abilities, the way of delivering, price, quality and servicing. Each subgroup is given a score from 1 to 5 (1, very weak and 5, very good) and then, the scores of subgroups are added and the raw score determines the group of the main criteria which is also stored in the system's database. Finally, the executive score of supplier is calculated by multiplying the raw score by the defined factors. (Figure 4)

- Setting the purchase order

The last task of this system is to set the purchase order. The purchase order is provided automatically and using the information available in the database which is the selected suppliers and material, to reduce human errors. The most important task of the electronic supplier agent is to secure the system and update the information of the customer and material (which are the characteristics, unit price, the quantity stored, and the way the fund is paid for the customer) as the follows (Figures 5, 6 & 7).

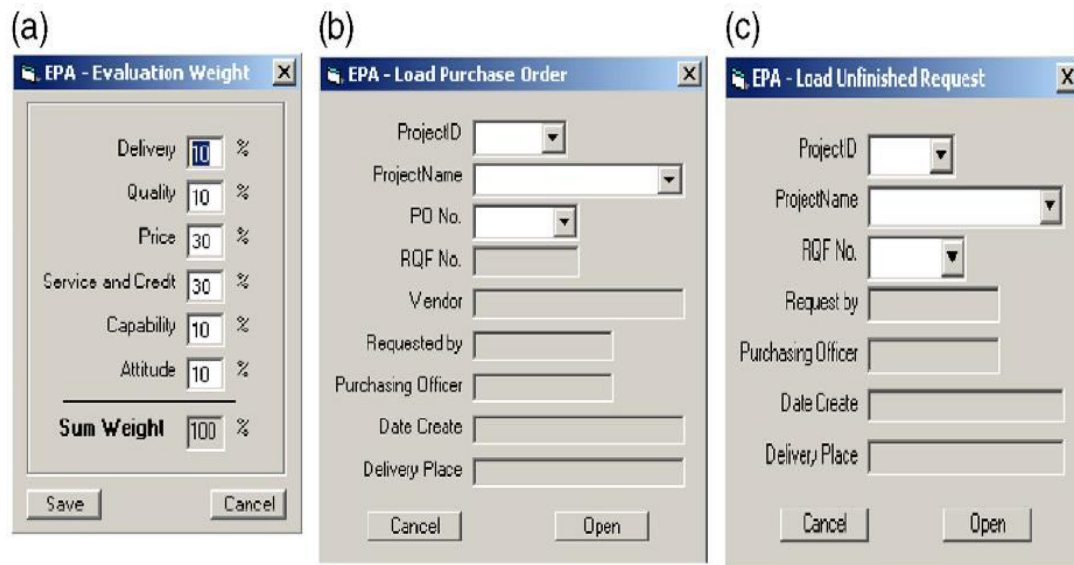


Figure 5: (a) The graphic interface determining the supplier's estimation factors, (b) The graphic interface displaying the purchase order, (c) The graphic interface displaying incomplete searches.

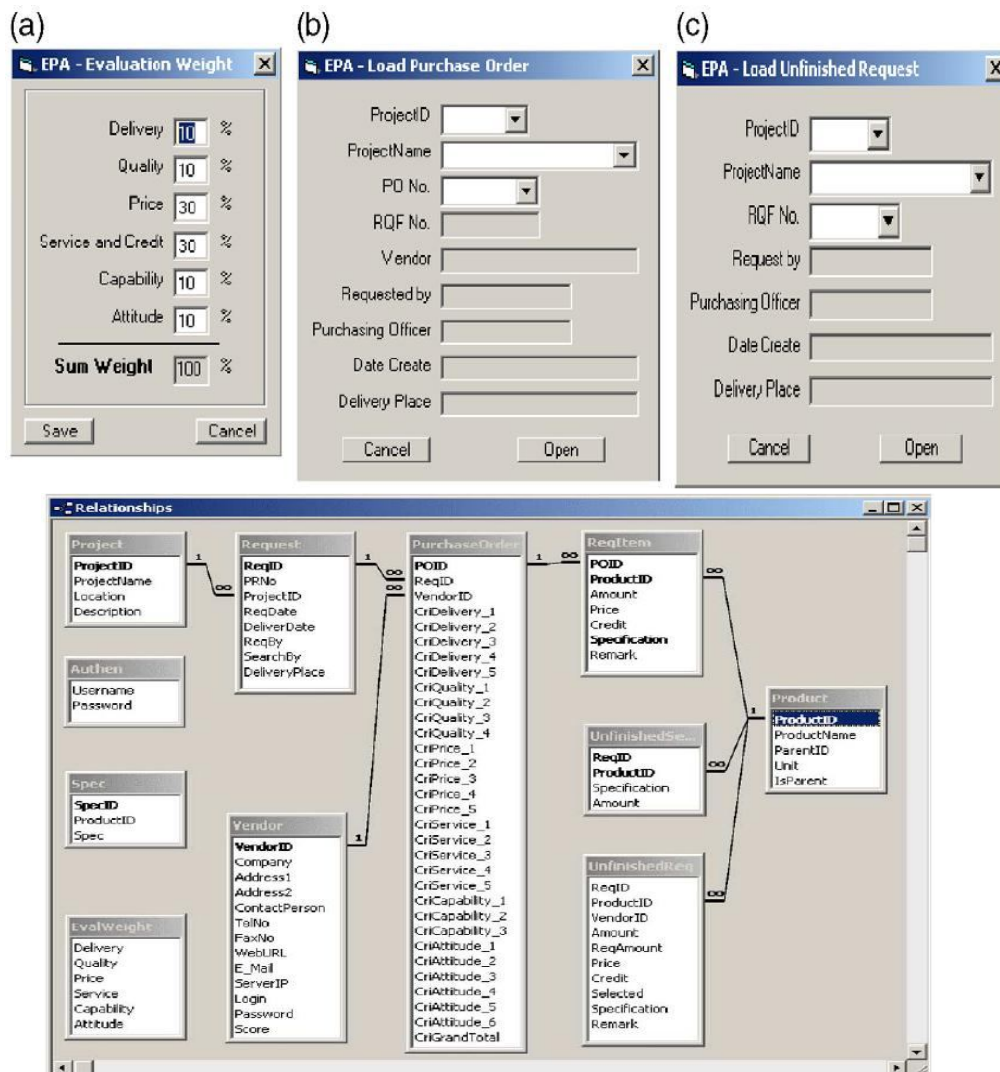


Figure6. The diagram of the relationship between tables in purchase part of EPA.

a. **Securing the system:** as it was mentioned in the previous section, the security system includes a system part and a user part. The details of both parts were explained in the section "the tasks of the customer agency".

Entering information in graphic interface of new search The search results from different suppliers Selecting proper proposals among proposals of producers.

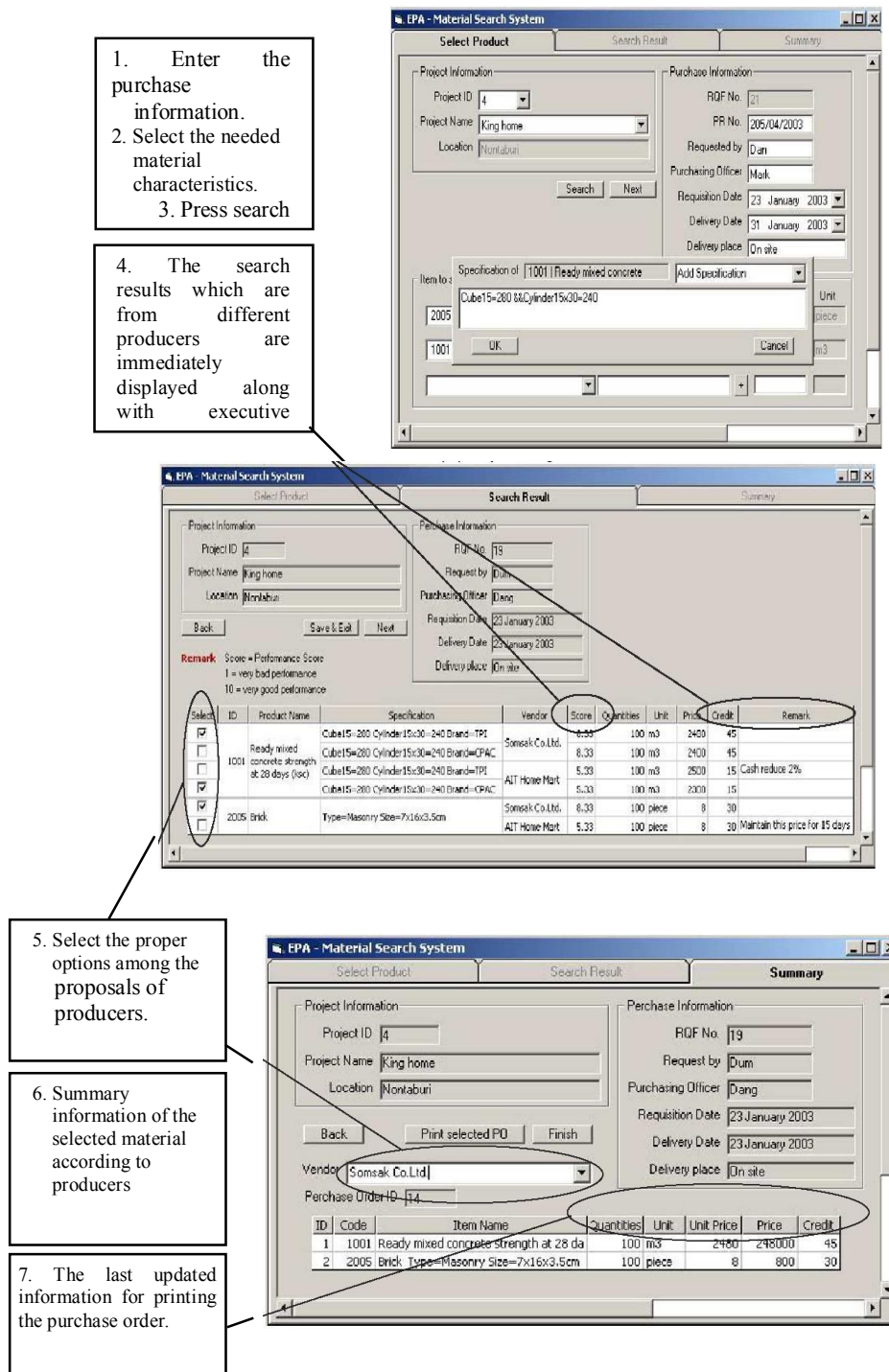


Figure 7. EPA description: searching material to purchase

5. Examining Electronic Material Purchase Systems in the Country

Now, according to the advance of sciences related to computer and internet and its publicity, it seems very necessary to notice whether internet purchase and sell is done in different commercial and industrial arenas in our country. While time has become very important in different countries in the world because the life speed has become higher, it is in our country the same?

In order to answer these questions, we searched different sell and purchase sites of the country and according to the prepared table about the certain issue building material; we can understand the difference between our countries with the global advanced internet very easily and simply. (Table 1)

Table1. The state of services offering electronic sale [5,6,7,8,9,10]

Nonprofessional	Nonprofessional	Nonprofessional	Nonprofessional	Nonprofessional	Nonprofessional	
						The number of covered companies
						Database of purchasers
*	*	*	*	*	*	The possibility of including requirements
						The possibility of updating by members
						Material coding
						The possibility of offering a bid
	*	*		*		Presenting internet purchase
*	*	*		*		Presenting material price
	*			*		Presenting material characteristics
	*					Presenting company histories
	*		*			Presenting company facilities
	*		*			Presenting company features
	*		*	*	*	Presenting company web site
*	*	*	*	*	*	Presenting address and telephone number
*	*	*	*	*	*	Introducing the presenter company
*	*	*	*	*	*	Introducing the producer company
Country	Country	Country	Country	Country	Kish	The place of activity
Iranian www.shoppingiranee.com	Intimates market www.bazarmahareh.com	Mahdi building group www.material.ir	Station www.isgah.com	Internet purchase market www.khareed.com	Development center of Kish trade www.kishhpc.com	Site name

In the first glance at very few sites existed in relation to internet sell and purchase, there was this important point that how wide the activity and the range of servicing of these sites were. Information related to the producer and presenter exist in many sites but they are very limited, as if these sites and the related companies are not very eager to repeat the characteristics, facilities and the history of the producing companies. This issue can bring customers for the presenter companies and also for these sites themselves and can make them advance in today's market. Information related to the characteristics and the material price is usually expressed completely, but more special information can be given to the user and customer. However, the possibility of internet purchase has become very limited, because there is not a comprehensive system in the country, and the sites presenting this facility try to use the newest internet and electronic purchase systems in the country, but the distance between the existing system in the country and the way of purchasing from other countries is very remarkable, especially in building material.

Most sited have elected their members and a lot of site information are updated by these members. This makes the site operators less busy, while internet damagers must be also prevented. But according to this point that there are many advertisements in many sites, we can hope that these sites will be virtual marketing centers a day. Few sites have the opportunity of bidding and using the auction system. With a more exact review of the table, we can find that almost no site has discussed about coding and has preferred the nominal search system of material and also there is also no database for purchasers to store information and different facilities. Companies covered by nonprofessional sites seem very diverse, also about those material used rarely, for this reason, only approximate values are implied in professional sites.

6. Conclusion

In section 5, we said that active electronic purchase systems of the country are in a very low level compared with valid agency systems mentioned in section 4 and they have not been used by those working in building industry. The unwillingness of reclamation sectors made the authors of this article identify and examine the reasons of this problem through doing a field study. Therefore, a standard questionnaire was provided and distributed among building material sellers, selling agents, provision units of organizations, companies and building contractors, in addition to stating the

research assumptions. Unfortunately, it didn't become possible to include the results of this study in the paper, because time was limited, but according to the interesting results obtained, some parts of the study analyzed manually are presented as the following Figures..

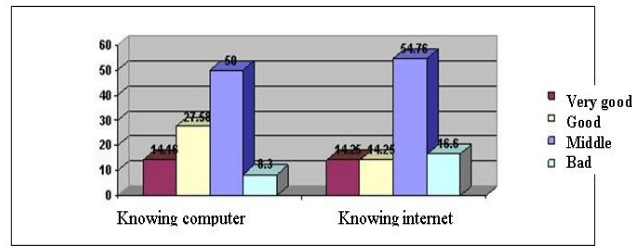


Figure8. The state of computer literacy of material users

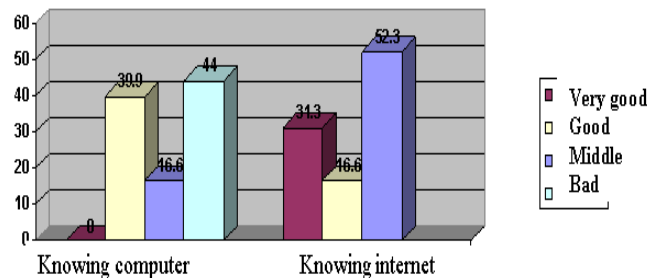


Figure9. The state of computer literacy of material sellers

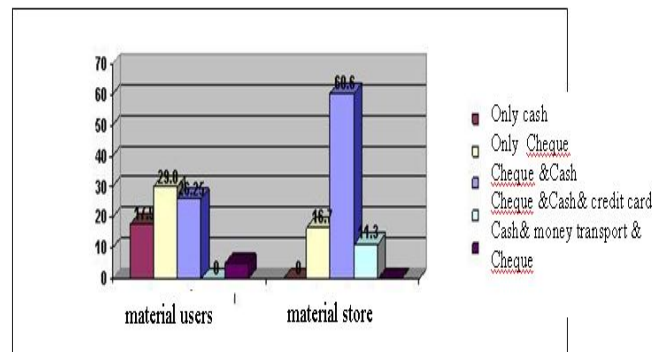


Figure10. The way of trading in statistical universe

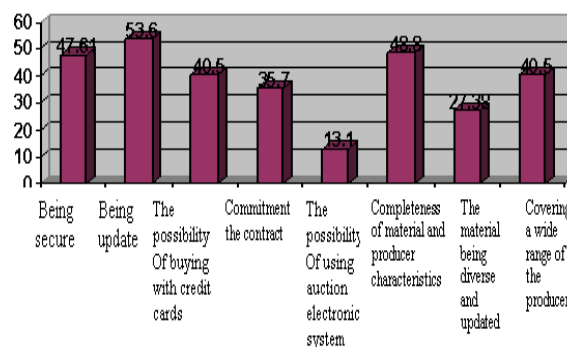


Figure11. The expectations of users of material from a proper electronic purchase system

According to figures 1 and 2, we can see that the ability of using computer and internet among those using building material, namely those executives of reclamation designs is middle and increasing. However, the ability of using computer and internet among sellers of building material is middle and decreasing. This low knowledge among members of reclamation projects and material sellers can be one the main reasons that electronic purchase systems are not used, especially by sellers. From figure3, we can easily conclude that using electronic payment systems does not currently enjoy a suitable place among them, therefore before establishing every kind of electronic purchase systems; we should do the

necessary actions to develop and facilitate the procedures of electronic payment. In figure 4, the expectations of user society from building material can be seen. If we want to order their expectations in terms of percentage, it is seen that cases such as the system information being updated, the completeness of material; characteristics and producer and security are ranked first and cases such as purchasing with credit card, covering a wide range of producers, commitment to the contract, variety and updating and the possibility of electronic auction are ranked later. According to table 2, can we claim that active electronic purchase systems can't meet the building industry needs of the country?

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