Investigating Online Shopping System in Iran as a Developing Country

B. Zibanezhad, M. Makhlughian, and A. Salajegheh

Abstract—The lack of necessary reliable infrastructures in developing countries has reduced electronic commerce growth and development. Online shopping system analysis and design was evaluated in Iran as a developing country. National banking & delivery systems along with cultural & training challenges were evaluated too. Based on Iran governmental services constraints, we presented an appropriate architecture for large scale online shopping systems. Some of design phase diagrams are presented that could be useful for software developing companies.

Index Terms—B2C, Electronic Commerce, Online Shopping System, SDLC Phases.

I. INTRODUCTION

As electronic services are dependent on many governmental and private organizations, they grow and develop slowly in developing countries. A case in point could be online payment services which could be used whenever traditional banks change their systems into modern ones or shipping rates and services change to cost-effective ones that encourage customers to buy their requirements from online shopping systems. In this paper we try to focus on electronic commerce especially online shopping systems in Iran. Software and hardware infrastructures, payment methods, delivery methods, online purchasing culture and training are discussed. Our research is based on SDLC phases in software engineering. Preliminary investigation, analysis, and design phases have been done. Remaining phases including implementation and test can be done by presented diagrams in section 4. Technical specifications of Iranian banks such as SAMAN [8], PARSIAN [11] banks were evaluated. We also evaluated national delivery system in contrast with TNT and DHL briefly. In design phase, system modeling done based on previous phases evaluation and its output was physical model of the system. Diagrams such as sequence, activity are presented in section 4. Out of 1449 submitted websites in open directory project, 304 ones are related to "بازرگانی" (EN: Business) and "خرید" (EN: Shopping) categories (~21%) [16]. Both Iran and Italy (a developed country) have approximately 32 million internet users [17] but Iran has 117 submitted websites in "خرید" (EN: Shopping) category while Italy has 2,970 ones. Regarding to our experiences,

Manuscript received August 12, 2012; revied September 24, 2012.

B. Zibanezhad is with Islamic Azad University, Najafabad Branch, Isfahan, Iran (e-mail: b.zibanezhad@gmail.com).

M. Makhlughian and A. Salajegheh are with Islamic Azad University-South Tehran Branch, Tehran, Iran (e-mail: molood.makhlughian@gmail.com, salajegheh@iau.ac.ir).

evidence and Iran potentials (more than 32 million internet users) we can conclude that governmental organizations haven't done their job and mission well. Online shopping system proposed in this paper can be useful for other developing countries. Since we have designed and presented design phase diagrams in this paper, it can also be considered as a manual for software developing companies in the ecommerce field.

The remainder of this paper is organized as follows: In section 2, we will talk about external organizations and people which have relation with our system; preliminary investigation and analysis phases are presented in this section. Based on previous phase we have presented the appropriate architecture for implementation in section 3. Design phase diagrams with sufficient explanation for each one are presented in section 4.

II. PRILIMINARY INVESTIGATION AND ANALYSIS PHASES

In this section we discuss about different external organizations and people which make effect on the system. We will also do system feasibility and mention system implementation benefits. By the way, we don't claim that our research encompasses all aspects of an online shopping system but we believe that it could be a great step forward.

A. Some Major Reasons for "Why Ecommerce Has Not Been Developed in Iran as We Expect?"

Ecommerce, especially online shopping systems have started lately and are growing slowly in Iran. We should discuss about it and find the reasons in a large scale. Some major reasons like, low attention of statesmen to this field, lack of having sufficient and strong adopted laws that leads to unreliability for merchants and customers, low attention to ecommerce training and increasing the culture of using online services, low attention to improve banking system infrastructure and technologies, lack of needed numbers of IT experts in contrast with Iran population, low attention to academic education related to electronic commerce in universities. As we focused on above reasons in our country and consulted with experts, we got some specific challenges including:

• Online services usage is low. This is a cultural challenge which needs long-term training and changes. Based on our paper purpose; training and culture improvement should be done in following fields: new technologies training like internet and its services, online shopping and payment training, informing people about benefits of online services. We should mention that Iranian leave their old and daily habits hardly and we believe that limiting people to use online

services is the best motivation. This motivation should be started from governmental services that most of people are faced with them.

• Lack of confidence and trust on virtual services. Create a sense of confidence is a hard-to-implement process according to unreliable ICT infrastructures. Secure payment gateways, reliable and cost-effective shipping system; permanent and fast internet connections are the most important issues that should be considered in this field. Most consumers feel they lack control over what Web merchants could do with their data afterwards, such as selling them or sharing them with third parties without their permission. Besides this, there is always the risk that hackers could steal information, either during transmission or directly from Web servers. Regretfully (for Web vendors), all these factors affect their exposure and have a clear impact on sales volume [2].

• Non-cost-effective transaction fee (i.e. price per transaction). Iranian banks get 2% to 5% fee per transactions. We believe that in developing countries which merchants should be encouraged to enter virtual electronic environment, current rates are high and it could be a great help to do these services free of charge.

• Lack of cost-effective integrated national delivery system. Delivery system is one the most major external organizations. Having integrated and reliable system which support delivery to most of the areas of country is necessary. Iranian national delivery system [14] can supply delivery to any area but its old-style management cannot support online and real-time relations. As we investigated; TNT and DHL can support real-time cost estimation and some other services by web services. Now, in Iran each merchant can make a contract with national delivery system and they guarantee to deliver products to customer location and get the money back to merchant after a period (i.e. an offline payment method).

• Product producers (suppliers) do not believe ecommerce until they profit from its benefits. Considering motivations or maybe some limitations from trading department can force them to enter the electronic commerce world.

We finalize this subsection with the following sentence: electronic services like online shopping systems are expected to make some results in long-term and it is not logical to expect quick feedback and benefit from them, so, the sooner you start the faster you will obtain its benefits.

B. Evaluating System Infrastructure

1) Banking system analysis

The Shetab (Interbank Information Transfer Network) system is the only electronic banking clearance and automated payments system used in Iran. The system was introduced in 2002 with the intention of creating a uniform backbone for the Iranian banking system to handle ATM, POS and other card-based transactions. Prior to its introduction, some Iranian banks were issuing cards that only worked on the issuing banks ATMs and POS machines. Since the introduction of Shetab, all banks must adhere to its standards and be able to connect to it. Furthermore, all issued credit or debit cards must be Shetab capable. As of the end of 2003, the Shetab system had 2,926 ATMs and 16,070 POS units connected to it [18]. Now, Shetab is one of the greatest steps forward in banking system which help merchants to

make a contract with a specific bank and don't be concerned about which credit card customers use. As we investigated in Iran, nowadays, two private and two governmental banks are have online payment gateway. Governmental banks are not interested to make contract with private companies but private banks cover a wide range of customers. Kishware [12] is one of the leading banking solution providers which service to Iranian banks as an acquirer (i.e. technical support company). Iranian banking systems use web services technologies for making a point to point connection between merchant and payment gateway websites. They provide some functions for making or reversing a transaction. Data transfer is done based on SOAP protocol and XML descriptive language is also used. At the banking side, they all use HTTPS protocol for providing better security. After making a contract, they give merchants a technical specification which describes all web methods and some sample PHP, ASP or etc. programs. Reverse transaction methods do not work usually and refunding partially is not possible. There is no management panel at bank side for merchants. Also their offline support (Telephone) is not well and need to be improved. By the way, starting mentioned departments and paying more attention to IT issues in Iranian old-style management system is a great step forward. The requirements, and hence technical solutions, to on-line payments differ depending on the circumstances, the amount being paid, and how the payment fits into the overall purchasing process [3]. Preparing different payment methods (online, offline) can help merchants to support wide range of customers.

2) Delivery system analysis

We discussed about Iranian national delivery system and its challenges in section 2.1., here we just mention that presenting low cost shipping methods as shopping cart discount can be a great encouragement for customers. To see the list of available shipping methods refer to [15] (unfortunately this page is not available in English language).

3) Software and hardware development

Most of Iranian people use internet and PCs. Unfortunately, ADSL penetration is 0.01% [20] and only 250,000 users have access to high-speed Internet service in Iran [19]. High-speed Internet service is one of the most important needs of online shopping systems. Web developers should use basic and low size designs for e-shops that help customers to load web pages and finalize check out process rapidly. Also using reliable and rapid hosting services for e-shops is necessary. Merchants (or product suppliers) should integrate their resellers by intranet and do integrated warehousing; it helps them to deliver products from the nearest reseller to customer. We believe that due to very low ADSL penetration in Iran, ICT government trustees should enforce Internet Service Provider (ISP) companies to present such services in an intranet environment.

4) Training and advertising to increase online services usage culture

Training should be proposed and applied for different user groups. These groups consist of Governmental managers in different levels, Technical and IT men, Customers (public people), Merchants operational staffs, and Merchants managers in different levels (but not limited to these groups).

Here are some proposed training and advertising programs: Preparing films with the aim of training online shopping processes and introducing its benefits, Using National Iranian Television for public training and advertising, Running related conferences, Forcing banks to limit their services to virtual ones, Considering motivations for product supplier managers, Paying more attention to educational training.

Merchants should pay more attention to Electronic Commerce Customer Relationship Management (ECCRM). It chiefly relies on Internet- or web-based interaction of companies with their customers. As the term suggests, ECCRM is specifically aimed at supporting electronic commerce, which, in the following, will be understood as the activities related to initiating, negotiating, and actually executing business transactions online [1]. Janis Gogan concluded in [5] that an ecommerce manager cannot be "too sensitive" to cultural and structural features, since that could result in activities that are too costly and unfocused. Yet, the manager certainly cannot ignore cultural and structural features, either. The effective manager will recognize that all information and communications technologies are double-edged swords: they offer the opportunity to shrink the globe, but they also usher in new challenges associated with managing across multiple cultural and structural divides.

As we have experienced in Iran, the best way to change and increase public people culture is to force and limit them to use proposed *virtual* services. This will not be started without government attention and growth. Electronic government should grow as fast as possible and enforce public people to use its virtual services.

C. Do Feasibility Process and Describing Major System Implementation Benefits

We did feasibility and below you can see some major aspects of our study which can be considered as a manual for others:

- Create or improve network between merchant departments or agents
- Hardware and software improvement
- Improving warehousing and sales units by running a paperless or improved software
- Running proper software in management level and get more strong reports
- Operational and technical staff training
- User classification to run a better security and access control
- Strong virtual online shopping system with creating account possibility for customers
- Security issues and log files, SSL protocol existence. We should also pay attention that security needs have changed in communication and business processes. Security on the internet is no longer defined as only Security measures for an ecommerce provider against an untrustworthy customer but also vice versa. Consequently, privacy, data canniness, and security are demands in this area [6]. The confidentiality, integrity, and availability of information on the Internet are three basic security concepts [4].
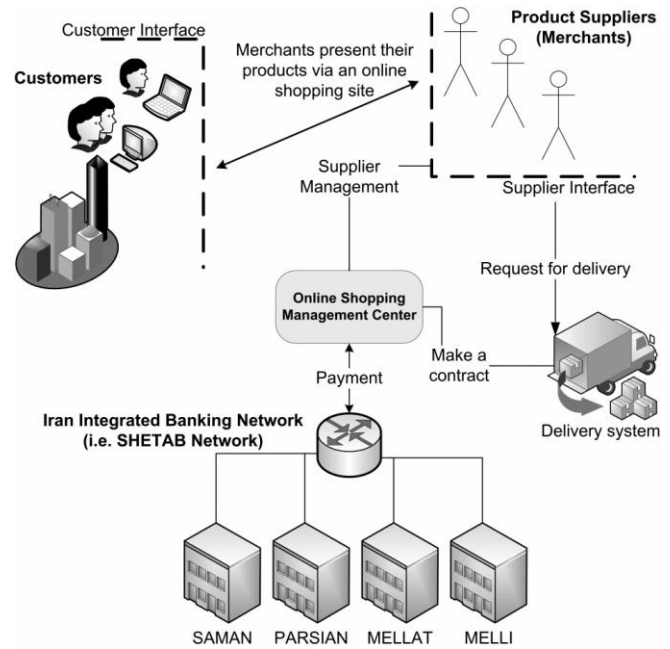- Banking and delivery systems evaluation

Fig. 1. Appropriate architecture for large-scale online shopping system in developing countries

Also we listed some major benefits of system implementation which can be used as motivation for people (customers, suppliers and etc.): Better and improved services, Higher performance, Stronger control, Reduced costs.

III. APROPRIATE ARCHITECTURE

We believe that the architecture depicted in Fig. 1 is the appropriate one for large-scale online shopping systems in developing countries. As we investigated, this architecture is not our proposed and other countries are using similar ones.

Considering an Online Shopping Management Center (OSMC) which plays an interface role for all external organizations and people and also make a non-governmental platform can help merchants. Some major OSMC duties are listed below:

- Making contract with payment gateways. All merchants will make a contract with OSMC that is more responsible and swift than governmental organizations. All payments are deposited to OSMC account. Then based on OSMC-merchant contract, each merchant will receive his/her money after a period.
- Making contract with delivery system. OSMC makes contract with some national and international delivery systems and it will be merchant choice to select some of them and provide them for his/her customers.
- Merchant's management. As customers are directed to OSMC website for choosing the payment and shipping methods, OSMC can control merchants strongly.

We supposed that OSMC is a private swift company that can handle all governmental limitations and play as a better platform for merchants. We think that ISP companies are appropriate ones to play OSMC role.

IV. DESIGN PHASE

After analyzing system requirements and proposing architecture for online shopping system in Iran, we present all

required and necessary diagrams in this section.

Payment process and states are based on SAMAN bank specification [13] (unfortunately the website and specification are not in English version). We investigated and implemented PARSIAN, MELLI [10] and MELLAT [9] payment methods, although their web services name, parameters and etc. are different but they all use approximately similar payment method which leads to online transaction without possibility for refunding completely or partially.

Design phase consists of data modeling, data design (i.e. database design), database documentation, and software & hardware investigation processes [7]. We implemented all these processes plus implementation and test phases of SDLC and the result was an online shopping management system, but due to limited pages and research papers purpose, only data modeling process with some of its related diagrams are presented here. Diagrams are designed in Microsoft Office Visio 2007.

System relation with external organizations and people are depicted in Fig. 2. As we mentioned in previous section, in proposed architecture we supposed online shopping management center which is the interface of suppliers with banking and delivery systems. Suppliers are product producers or merchants who want to sell their products on their own shopping site but due to some constraints do not want to face with government organizations. Suppliers make

a contract with online shopping management center that involves payment and shipping support.

The whole shopping process is depicted in Fig. 4. It includes: view and search products, add products to cart, view shopping cart, create new account, account login, filling out shipping address form, confirming rules and conditions, selecting payment gateway and do payment processes which can be traced in Fig. 4. Payment details are depicted in Fig. 5.
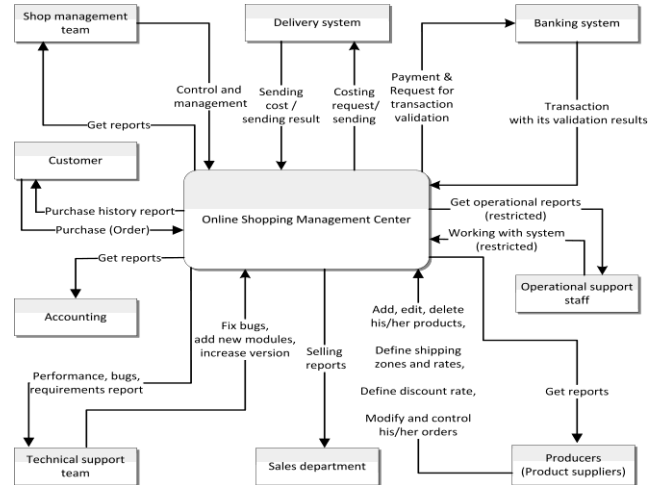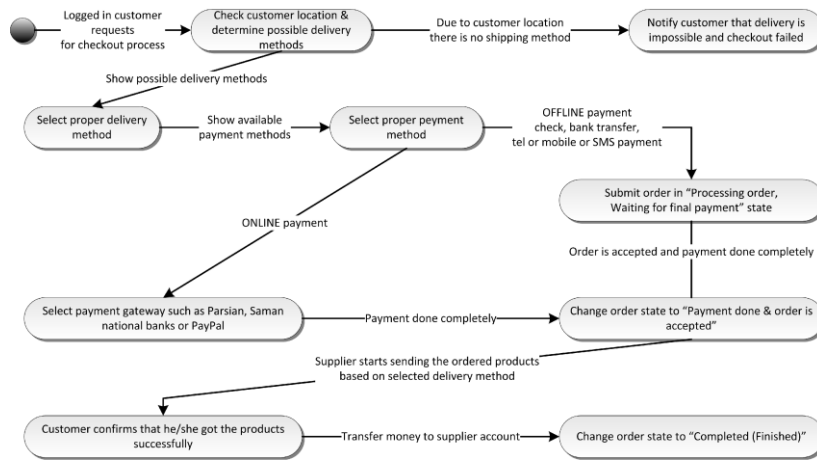

Fig. 2. Level-0 diagram

Fig. 3. Activity diagram, shipping and payment processes and their effects on order states
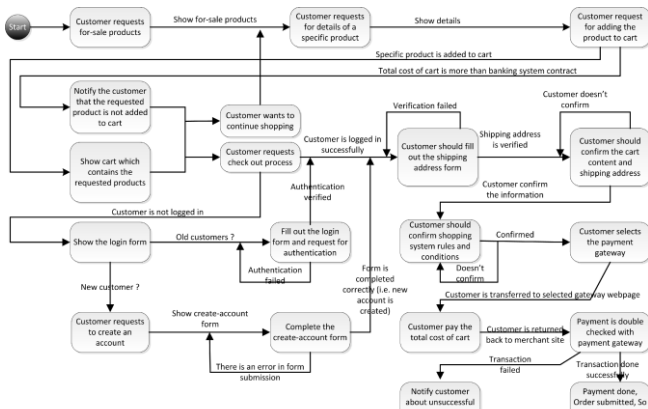

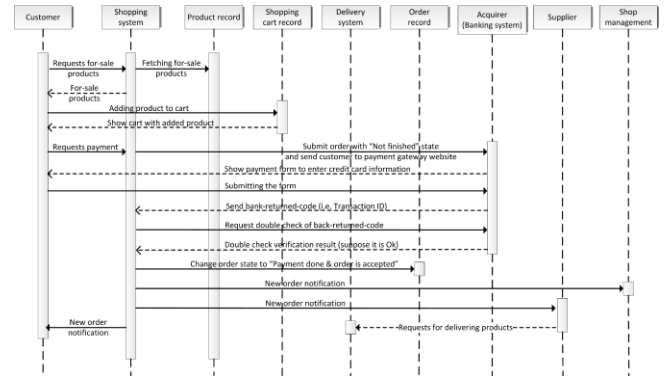Fig. 4. Activity diagram, the whole online shopping process

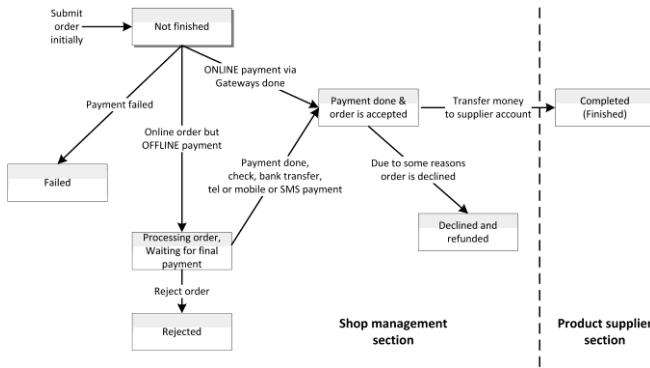Fig. 5. Sequence diagram: relation between people and organizations over time

Fig. 6. Order state diagram

Side effects of submitting an online transaction is designed as a sequence diagram and depicted in Fig. 5. As acquirer is the technical section of each bank in Iran and merchants are faced with its web services, banking system is labeled with acquirer. Bank-returned-code is a digital ID which relates to merchant transaction. It is unique and published by banking system. That is necessary to check the bank-returned-code whether it is not published by unauthorized third party. We considered order notification to some people and organizations which can be customized base on organization chart. Hitherto we discussed about the whole shopping architecture and shopping & payment processes; now we want to show order and customer state diagrams. Then we will show how payment process takes effect on order states. Order state diagram is depicted in Fig. 6. A customer add some products to shopping cart by navigating product categories. Finally he will decide to start check out process. After detecting shipping and payment methods the system will pass the customer to payment gateway but before that it will submit the order in "Not finished" state. It shows that customer submitted the order but the payment process has not finished yet. Payment can be done by online or offline methods. If done in offline mode, the system wait for final payment otherwise it will reject the order after a period. "Declined and refunded" state occurs when payment done successfully but due to some reasons it could not be completed. Some reasons such as "payment done partially", "customer wants to cancel the order", or some unexpected problems like "new government rules", "shipping or payment contract changes" or etc. may occur.

When customer starts checkout process, he must pass the shipping and payment steps. In shipping step, available shipping methods are listed based on customer location and customer should select the proper one. Then, in payment step he should select payment gateway (depend on his Credit Card) and he will be passed to payment gateway web page to pay the cart total. As you can see in Fig. 3, finally, if payment and delivery done successfully and customer acknowledgment was received, online shopping system center will transfer the money to supplier account based on their contract

REFERENCES

[1] N. Madeja andD. Schoder, "Impact of Electronic Commerce Customer Relationship Management on Corporate Success–Results from an Empirical Investigation," in *Proce. the 36th Hawaii International Conference on System Sciences (HICSS'03)*, 2002.

[2] I. Araujo, "Developing trust in internet commerce," in *Proc. the 2003 conference of the Centre for Advanced Studies on Collaborative research* (Toronto, Ontario, Canada), 2003.

[3] P. A. Putland, C. Ward, A. Jackson, and C. Trollope, "Electronic payment systems," *BT Technology Journal,* vol. 17, Issue 3, 1999.

[4] B. Gehling and D. Stankard, "eCommerce security," in *Proc. the 2nd annual conference on Information security curriculum development* (Kennesaw, Georgia), 2005.

[5] J. Gogan, "Intersecting cultures and eCommerce: a case study," in *Proc. the 2006 ACM SIGMIS CPR conference on computer personnel research*: Forty four years of computer personnel research: achievements, challenges & the future (Claremont, California, USA), 2006.

[6] C. Schlager, T. Nowey, and J. A. Montenegro, "A Reference Model for Authentication and Authorisation Infrastructures Respecting Privacy and Flexibility in b2c eCommerce," in *Proc.the First International Conference on Availability, Reliability and Security*, 2006.

[7] G. B. Shelly, T. J. Cashman, and H. J. Rosenblatt, S*ystems Analysis and Design*, 2002.

[8] Saman Bank (National Iranian Bank). [Online]. Available: http://www.sb24.com/

[9] Mellat Bank (National Iranian Bank). [Online]. Available: http://www.bankmellat,ir/

[10] Melli Bank (National Iranian Bank). [Online]. Available: http://bmi.ir/

[11] Parsian Bank (National Iranian Bank). [Online]. Available: http://www.parsian-bank.com/

[12] Kishware. [Online]. Available: http://www.kishware.com/

[13] Saman Electronic Payment. [Online]. Available: http://www.sep.ir/

[14] I. R. I. Post Company. [Online]. Available: http://www.post.ir/

[15] I. R. I Post. [Online]. Available: http://www.post.ir/HomePage.aspx?TabID=3473&Site=PostPortal&Lang=fa-IR

[16] Open Directory–World: Persian. [Online]. Available: http://www.dmoz.org/World/Persian/

[17] Middle East Internet Usage and Population Statistics. [Online]. Available: http://www.internetworldstats.com/stats5.htm

[18] Shetab Banking System–Wikipedia, the free encyclopedia. [Online]. Available: http://en.wikipedia.org/wiki/Shetab_Banking_System

[19] Communications in Iran–Wikipedia, the free encyclopedia. [Online]. Available: http://en.wikipedia.org/wiki/Communications_in_Iran

[20] ADSL Penetration in Iran. [Online]. Available: http://its.um.ac.ir/Article89.html

Bahareh Zibanezhad received her B.Sc. degree in Software Engineering, from the Yazd University, Yazd, Iran in 2006 and her M.Sc. degree in Software Engineering from the Azad University-Najafabad Branch, Isfahan, Iran in 2010.

She has published over a dozen papers in service oriented architecture research areas which one of them is "Applying gravitational search algorithm in the QoS-based Web service selection problem" published in Journal of Zhejiang University. She is now doing her research in web service composition and methods of dynamic reconfiguration of service-based environment.

M. Makhlughian received her B.Sc. degree in Software Engineering, from the Azad University-Parand Branch, Tehran, Iran in 2008 and her M.Sc. degree in Software Engineering from the Azad University-South Tehran Branch, Tehran, Iran in 2012.

She had published an article "Web Service Selection Based on Ranking of QoS Using Associative Classification" in International Journal on Web Service Computing (IJWSC). Available: http://airccse.org/journal/jwsc/current2012.html.

Her research interests include Web Service technology, Service-Oriented Computing, Service Annotation, Selection and Composition, Ontology Engineering and Data Mining.

Afshin Salajegheh is assistant professor of Islamic Azad University-South Tehran Branch, Tehran, Iran, Department of Computer Science and Software Engineering. He is interested in Service Oriented Architecture, Software Architecture, Software Product Line and Data Mining research areas.