

An Integrated Multi-Dimensional Framework for Internet-Base Book Shop Architecture: A Case Study from Iran

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Abstract: Today, several of business corporations use internet for introducing, selling and marketing their services or products. But they need a virtual store for successfully in virtual world. There are several researches about internet-base stores architecture that all of them focused on one aspect of factors that influenced on website quality but there is not an integrated multi-dimensional framework. This article reported an integrated multi-dimensional framework that guide companies for designing a good shop store. This framework include all aspect in term to technical issues, marketing issues, shape design, navigating issues, psychological issues, customers and site owners ideas and etc. For extracting problems that are available in shopping website architecture, have used questionnaires and interviews to collect customers and web owner's ideas. When problems had determined, authors have used techniques, standards and methods according literature review. Finally, ideas of four successful website owners had collected for their experiences using and have made an integrated multi-dimensional framework according to information and techniques. For testing that framework, has done a case study for designing a book shop in Iran. Results of using that show successfully in book shop architecture.

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1. Introduction

According to global Internet usage statistics published by World Bank, there are currently 2267233742 people (World Bank Group, 2012) who have access to Internet and statistic show good penetration in internet area over the world (see Figure.1). Also, in recent years internet operators in Iran have good grown. Today there are 23 million internet operators in Iran (Information & Telecommunication Company of Iran, 2011). It is about 33 percent of Iran population. Iran has the first place of Middle East in internet growth with 9.1 percent (Miniwatts Marketing Group, 2011). Iranian operators are the 50 percent of Middle East internet operators (World Bank Group, 2012). Trends indicate that Internet usage will continue to grow significantly in the coming years. According to Internet Week's survey, more than two-thirds of the travel and hospitality companies view the Internet site as a significant competitive weapon within their industry and about 60 percent describe the Internet as being substantial in acquiring new customers (Chia-Chi Sun, Grace T.R. Liu, 2009). To use the Internet to its fullest potential and keep up with new technology, book shops continuously redesign their websites for

ease and convenience, and upgrade web technology to make their Websites more personalized for customers. They also initiate web campaigns, develop brands and integrate branding strategy on the web, gather customer information, improve customer service, and streamline online sales. (Johye Hwang, Yoo-Shik Yoon, 2012). So, internet in Iran has become a new channel for the commercialization of products and use a new way in commercialization named Electronic Commerce.

Electronic commerce (e-commerce) requires little additional investment by companies (a website is sufficient) and internet-base selling increase speed of selling process and that cause customer satisfaction. A website offers a business not only a platform to promote products or services but also another avenue to generate revenue by attracting more customers. Unfortunately, not all websites successfully turn visitors into customers. For turning visitors into customers we need to design a good website according to several items.

There are several researches surveying factors that effect on website quality and good architecture for website. Some of them focused on website usability and design (Younghwa Lee, Kenneth A.

Kozar, 2006), content (Erham Sengel, Seminal Oncu, 2010), quality (Joanna P.C Tong & *et al.* 2005), user acceptance and user satisfaction (Wen-Chih Chiou, *et al.*, 2010). Some other focused on website strategy and the goal of site architecture. The others focused on psychological, social and cultural issue in designing. Some researches that emphasized issue of consumer purchase process is important (Chia-chi Sun, Grace T.R. Lin, 2009). But newest literatures focused on strategic planning for internet-base shopping (Wen-Chih Chiou, *et al.*, 2010). But there is

an important gap in that research. Integration between different factors that affected on selling web site architecture is an important element that needs attention. There is not a comprehensive integrated framework that include of all aspect of factors such as customer satisfaction, technical issues, shape and design issues of website, ease to use, speed of customer selling process, integration to shopping strategy and etc.

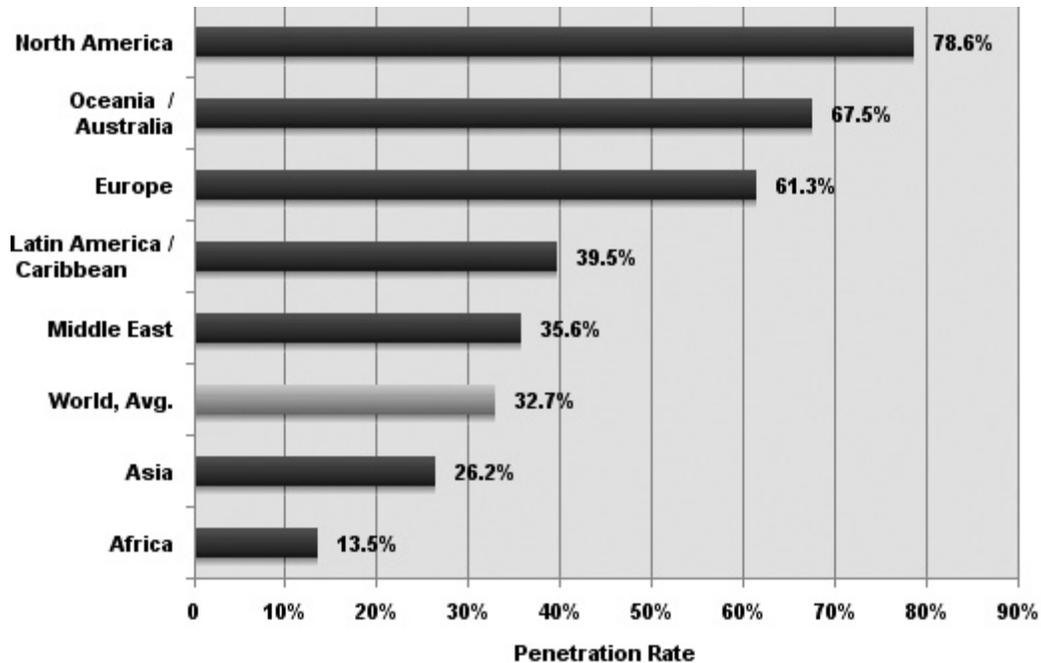


Figure 1. World Internet Penetration Rates by Geographic Regions (Miniwatts Marketing Group, 2011)

In this paper, we present an integrated multi-dimensional framework for this type of web site architecture. The framework include of techniques for needs assessment, goal/task analysis, user interface design, and rapid prototyping. Each of these techniques can be used to produce effective solutions across multiple content arenas. For framework extracting we used literature review, questionnaire and interviews. We used three type questionnaire in this research that two of them used for making framework (include customers and web owners questionnaire) and another type have been used in techniques of framework implementation. Finally, we did interviews with some manager of successful web selling service such as “Amazon”, “ebay”, “ibs” and “whsmith” for using their experiences in my research. All the questionnaires and interviews were doing with internet service such as Email and Chat-Service.

The framework that we offer in this article is a comprehensive framework for designing a good book shop website that it include of several aspects of a ideal internet-base book shop. In the following section, we review the literature then describe method of research then describe the framework with all of aspects and techniques with a practical approach. Finally, we offer some conclusions of research in the last section.

2. Material and Methods

We used literature review, questionnaire and review methods in this article. At first, we used articles review for understanding other researches and identifying important factors in website architecture and internet shopping then we use two separate questionnaire according the literature reviews and expert’s ideas for understanding the customers and internet book shop owners ideas.

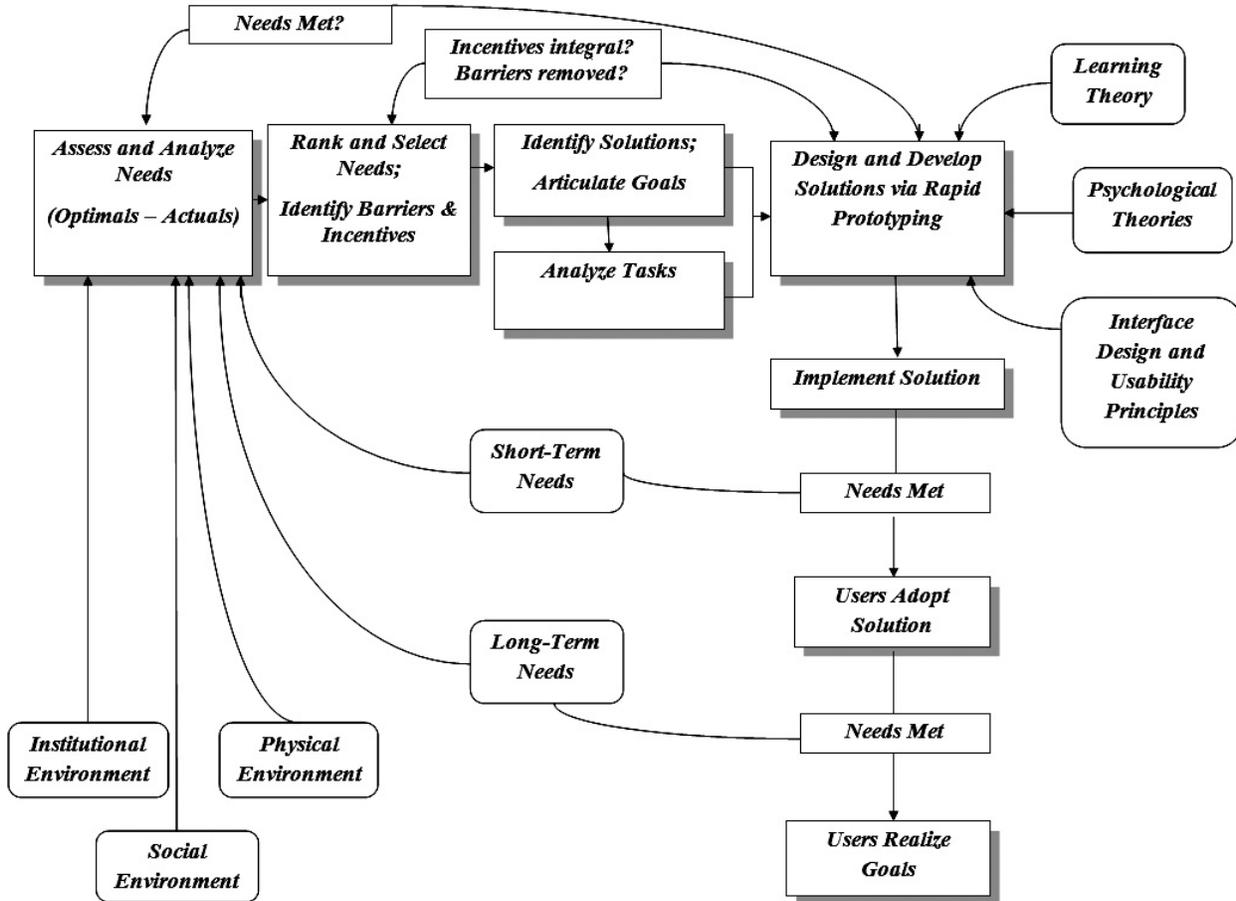


Figure 2. The graphical chart of framework

In customer questionnaire, we asked questions and their ideas about a good internet-base book shop specifications. Most of the questions in this questionnaire was about ease of use, being user-friendly, book shop service quality, customer's needs, information communication technology in their ideas, their knowledge in information technology and etc. That questionnaire was reviewed by two experts and was tested in sample of 20 peoples with 92.8 percent Cronbach's Alpha. We didn't have any information about customers population. So, we used Cocran's equation for sample size selection. According Cocran's equation under 95 percent limit of confidence and 5 percent standard error, the sample size determined 320. So, we sent 410 questionnaires and receive 327 perfect questionnaires. In web owner's questionnaire, we asked questions about technical issues, selling issues, their limitations and opportunities, sources of information and etc. This questionnaire was reviewed by experts and was tested with 95 percent Cronbach's Alpha (n=20). According the e-commerce organizing committee statistical report, there are 346 shopping websites in Iran

(Information & Telecommunication Company of Iran). So, the sample size according Cocran's equation under 95 percent limit of confidence and 5 percents standard error, the sample size was determined 200. So, we send 256 questionnaires and receive 232 questionnaires. All sampling methods were stochastic. There are some other questionnaires that were used in framework implementation. That describes them in following parts. Finally, we used interviews with 4 successful site shopping manager such as "Amazon", "ebay", "ibs" and "whsmith" for using their experiences in our research.

3. Framework and Implementation

According our research we can design a bookshop website through an integrated framework. The framework has been shown in the figure 2. Each component is described in the paragraphs that follow.

3.1. Need Selection, Assessment, Analysis

How can developers of new tools and resources ensure that their creative, resource-rich, visually appealing, and easy-to-use products are actually

useful to the intended populations? They can do so by basing their design on a thorough needs assessment, an inquiry process supported by numerous design methodologies. Needs assessment can be used to explore what is currently occurring and how individuals feel about it, and it can identify potential solutions. There are a variety of techniques of collecting needs information, including qualitative and quantitative approaches. (Qualitative approaches include examining existing materials and sites, conducting interviews and focus groups, and observing practice, whereas quantitative approaches include surveys and rating scales, among others.) These methodologies are frequently used in tandem. When it is not clear what needs exist and how they might be measured, however, qualitative methods are most useful. Our methods included document review, interviews, focus groups, surveys and observation. As needs data are being collected, needs analysis begins. For all qualitative data, we take a naturalistic approach, using content analysis to identify themes expressed by respondents and noted in document reviews and observations. As the themes emerge, we test them as other needs data are collected and analyzed. Those that are confirmed are then used to categorize needs data in a conceptually clustered matrix. This makes it possible to identify the relationships among the themes and make comparisons between them for different respondent groups. It is also possible to quantify the frequency with which various themes are indicated in this corpus of data. These analysis techniques are standard for qualitative data and lend themselves well to needs analysis.

Data from surveys and other quantitative measures are analyzed, using conventional descriptive statistics. These outcomes add meaning to the qualitative findings, providing indications of degree and illuminating aspects of the situation that would not otherwise be apparent. For the book shop project, the design team leader used the themes confirmed in the data to code each piece; a tag indicated the respondent group supplying each piece of information. Each theme was further broken down into subthemes, as shown in Table 1.

The needs identified in both types of analysis are further examined, to select and prioritize those to be addressed. Considerations here are organizational goals, the consequences of needs not being met, and the available time, budget, and expertise for project. It is also important to identify the barriers users may face and incentives they may associate with use of the future product; these will be important factors during design of website. Since we were developing internet-base book shop in response to a designing a website, certain parameters in this project design

were already specified for us. We had already determined that we would be developing a Web-based book shop to collect and evaluate customer buying history and offer sales recommendations. Nonetheless, we were able to use the needs analysis to validate the assumptions we had made about the end website, how it would be used, by whom, and in what environments (Table 2). In all cases but one, the needs that emerged aligned well with the initial project goals we had proposed to our funding agent.

Table 1. Themes and sub-themes for need assessment

Four major themes identified through the qualitative analysis process:

Goals/assumptions for the book shopping website design project

Collection of customer buying history

Other functions of the book shopping tool

Policy(site strategy)/confidentiality/security/liability

Sub-themes identified for the theme “Goals/assumptions for the book shopping website design project”:

Definition of stakeholders

Characteristics of stakeholders

Implications of the book shopping website design tools for stakeholders

Implications of the book shopping website design tool for customers

What stakeholders want

What customers want

What specialists want

Barriers to collection of customer buying histories

3.2. Solutions and Goals identifications, Tasks Analysis

Potential solutions are identified and their strengths and weaknesses evaluated. (For instance, Web-based customer education might be considered, along with customer education delivered by a computer educator as part of selling service.) When the best solution has been identified, project goals are drafted to describe what users will be able to do as a function of using the project materials. Both short-term and long-term goals are included. As goal statements are drafted (Table 3), they are immediately examined to ensure that they effectively describe the most important stakeholder needs. Goals and component tasks are then analyzed by breaking down the goals into subordinate parts. The goal or task analysis stage is sometimes referred to as an “information processing analysis” To achieve this goal, what does the user need to know or be able to

do—what tasks need to be undertaken? For each task, what are the subordinate components and individual actions? The result is frequently a flow diagram detailing the goal/task analysis (Figure 3).

Table 2. Assumptions and Validating of them

Validating assumptions about users and environments:

- We wanted to design a tool that would serve the book shopping practice of tomorrow but would not completely lose sight of the capabilities of today. An early concern was the prevalence of customer computer access, so we paid special attention to the results of our computer use survey. We found that a surprising number of customers had access to computers (80% at home and 59% at work) and the Internet (67% at home and 50% at work), felt comfortable using this technology (75% felt either “extremely” or “somewhat” comfortable), and had e-mail accounts (71%). As a result of the positive response, we felt comfortable retaining the assumptions for a Web-based tool.

A discrepancy between initial project goals and identified needs:

While attempting to design for the book shopping practice of tomorrow, we found that most stakeholders voiced needs from the practice of today. Primary book sale managers wanted printable output from sale statistical that they could include in a customer’s chart; they were less interested in online displays of customer pedigrees and risk data, since most did not have access to computers in their rooms. So the project team struck a compromise, addressing the need for printable output while still endeavoring to explore the use of interactive computer based displays to present information in interactive ways that might enable new understandings of the data presented.

The goal statement and task analysis form the basis for the Web site’s functional requirements (Table 4), which are lists of required characteristics.

Table 3. Project Goals Identified as Additional

1. Customers and salesman will be able to learn more about customer buying history, customer needs and sale statistical as part of the history collection and evaluation process.
2. Customers will be better prepared to communicate with salesman during shopping visits.
3. Customers will be drawn back to the Web site to update their personal histories, in part because of special features such as e-mail birthday reminders that can increase their satisfaction.

3.3. Architecture and Design

Once the goal and related tasks are fully understood, the project team can begin the Web site design. We brainstorm about the experiences we want to create for the users as they go about achieving the goals we have set, keeping in mind the barriers they face and any incentives on which we may be able to capitalize. We apply what we know from learning and psychosocial theory in this process. As we begin to visualize the Web site, we start to adapt the flow diagrams (produced during the previous task analysis) to develop a blueprint for the Web site. For each page in the projected Web site, we create storyboards that suggest the content and layout

of the page and the functionality and navigation controls to be provided. The graphic design is purposely ignored until the contents and functionality are finalized. Holding to the principle that “form follows function” (Heather Creech, 2001), the look and feel (Steve James, 2007; Meaghan Whelan, 2008) of a web site are developed after its functionality, to better support it. As we create storyboards, we reference guidelines for good user interface design. The guidelines we use address content design and the design of navigation and user input. We have developed our set as the result of many years of practice, which includes design, development, and evaluation of multimedia products; evaluation of successful educational and informational products; and reviews of the literature on instructional design, interface design, and usability testing. For the book shop site, we designed two separate interfaces, one for customers and the other for salesman. Customers needed to be able to create a personal account, record buying history, draft questions to ask their support system, access recommendations generated by the Web site on the basis of their buying history and request a book. In addition, we wanted customers to be able to receive reminders of birthdays, anniversaries, and special events. Salesman needed to be able to quickly access and review selling history information for each customer and review the resulting recommendations generated by the Web site and selling and answering according customer requests.

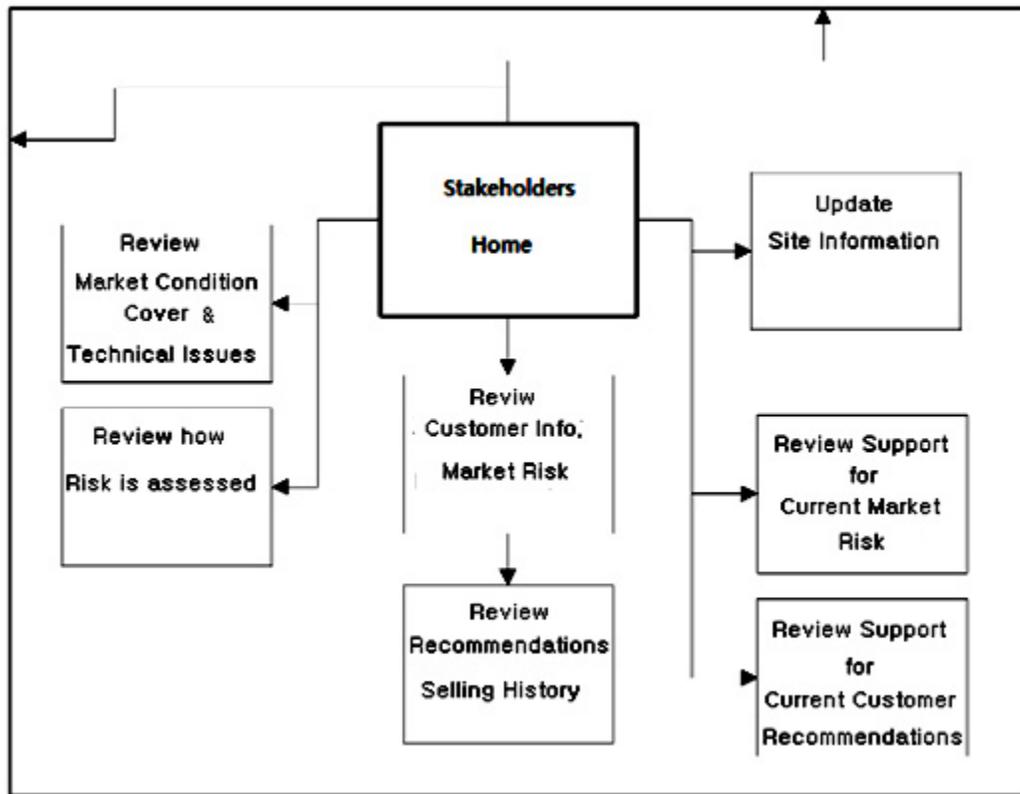


Figure 3. Analysis of Goals/Tasks.

Table 4. Functional Requirements Generated for the site owner's Page, "Review Market Risks and Recommendations"

Ideal: To be read and understood in 5 min

Information contained:

- _ Number of positive hits (quantified risk)
- _ Indication of general population risk or higher risk
- _ Risk-based recommendations
- _ Comments by customer relevant to selling
- _ List of the selling issues the tool addressed

Incomplete or missing selling history information identified Option to see entire selling history (graphic pedigree or table)

We faced special design challenges as we implemented the user interface guidelines to meet these user needs. We describe two of these challenges here. In the first design challenge, which concerned the intended audience and site objectives, we were attempting to meet the needs of two very different populations, but some of their needs were held in common. For example, we made the advantages of the site explicit to the first-time visitor (customer and

salesman) without requiring registration, by providing this information:

- A rationale for collection of personal information history
- Identification of advantages of website book selling for collection of customers
- Graphic examples of what users need

The second design challenge concerned the structure of the site. We knew that salesman and their customers would use the site only if it was very easy

to do so. We knew we had to collect and display complex information in as clear and simple a manner possible, in formats that would be understandable to all parties. Finally, we felt it was important to embed additional, supporting information for salesman and customers in an easy-to-access manner. As the design emerges, it is refined through rapid prototyping—an early, iterative, method of staged development and evaluation. Repeated cycles of prototype development, evaluation, and revision take place. We rely predominantly on two evaluative techniques during prototyping—cognitive walkthroughs and user testing. We often use “think aloud” protocols with both of these techniques, in which a user is asked to think aloud as he or she uses the prototypical site to accomplish a goal. Cognitive walkthroughs involving evaluation of a site design by a group of the designers’ peers, help determine the ease with which a user might perform needed tasks. We base these evaluations on heuristics such as our user interface guidelines or those advanced by Nielsen (Karey Patterson, 2005). Issues requiring attention are noted in these sessions. To help us determine which issues are worthy of our attention, we go further, asking evaluators to judge how important an issue is for the effectiveness of the Web site and indicate how difficult they feel it would be to address in revision.

The product of these two measures is used to rank order and select the issues for revision. User testing can also be conducted at early stages. Users are in a unique position to provide early, authentic feedback—they know what they need and want and can respond to the design when they can “try out” the site for themselves. The inclusion of users as evaluators is also critical for another reason: Design experts are often experienced technology users and can frequently overlook problems that more novice technology users will have with a Web site.

The book shopping Web site evolved considerably through the paper prototyping process. Seven salesmen participated in prototype evaluation sessions, as did 19 customers. Between these sessions, results were circulated and discussed among members of the design team and project specialists. All Web pages underwent numerous revisions, with each revision bringing the page closer to addressing users’ needs with the best possible user interface. For example, we developed ten different versions of the customer’s home page during the paper prototyping process. In the early prototype, a number of competing functions were vying for attention. Through prototype evaluation, we were able to provide a more primary focus for the functions, which guided users through the account creation. We moved these functions from the lower right of the

page to a more prominent location and added embedded roll-over text messages informing users about what these functions did and how they operated. Only so much can be determined from evaluation of a paper prototype for a Web site. When the programmers began developing the web site and implementing the undergirding information history evaluation algorithms (a complex undertaking), we had to freeze the Web site design to enable them to produce a functional site. When the first computer-based prototype was completed, we resumed evaluation, beginning with a pilot test involving 105 persons. We obtained some encouraging findings. Although persons who used website spent a considerable amount of time gathering information about an account history (mean, 12.6 hr; range, 1–120 hr), they were generally satisfied with book shop site:

- 94 percent found it easy to create a account, and 70 percent found it easy to make changes to their account.
- 75 percent found the glossary helpful
- 92 percent were satisfied with how the site looked
- 77 percent found the overall quality of the site either good or excellent
- 76 percent would recommend it to friends
- 70 percent agreed or strongly agreed that it was easy to get from one part of the site to another.
- 54 percent found it not at all difficult to complete the opening account history; only 4 percent found it very difficult.

The internet-base book shop was compared to usual other internet-base book shop, with reference to standards, to measure the accuracy and completeness of the account history gathered. When completeness and accuracy of database of site identification were measured, the site owner was found to be an improvement over other internet-base book shop. Further analysis is being undertaken to compare the risk information generated. We followed the pilot test with a cognitive walkthrough, to clearly identify issues that needed to be addressed in the Web site revisions (Table 5).

These issues were confirmed or discounted through user testing with both customers (n=36) and salesman (n=4), and a list of needed revisions was created. We tested the subsequent revisions to the site a final time with 20 persons, to confirm the usability of the site, and made a few final revisions. Final changes were made to update the information history evaluation algorithms and recommendations, using the latest scientific evidence, and the site was completed.

Table 5. Issues Identified During Cognitive Walk-through for Participant Home Page**Navigation:**

Step links may not “read” as clickable links to new users.

Directions to “begin with step 1” may result in users not reviewing rest of home page.

Event reminders are in an awkward location well below the “main steps”; may not be used.

Data retrieval:

When confidentiality setting is changed, there is no sense of completion for user—display does not indicate change has been acted on.

Speed:

Roll-over graphics take too long to download over some modem connections.

Failure:

Session time-out is too short for the reading and discussion that often needs to take place.

Information display:

Text used for “roll-over” content is too small.

3.4. Implement Solution and Realize Goals

A critical time period for users occurs early in their use of a Web site. If they perceive that some short term needs are met, they are likely to adopt the site. If they adopt the site and use it, there is a reasonable probability that their long-term needs will be met or, if not met, at least positively influenced. This is the success for which every Web site developer hopes.

4. Discussions

Today, we see a lot of sites on the internet that offer a service or product to persons. But not all of them are successful in their business (Wen-Chin Chou, Yi-Ping Chery, 2012). Successfully or unsuccessfully in business through internet rely on several factors that affected on their website’s quality such as navigation, customer needs assessment, human interface, etc (Younghwa Lee, Keneth A. Kozar, 2006). The rapid growth in the use of the WWW protocol for commercial purposes has been noted by many researchers (Chia-Chi Sun & *et al.*, 2009; Rajiv Mehtal & *et al.*, 2002; Seyhmus Balogu & *et al.*, 2006). This growth is due to a number of factors including the perceived strengthening of a compa-ny's competitive position (Chia-chi Sun, Grace T.R. Liu, 2009) and the fact that the Internet can allow a small company to project a corporate presence equal to that of a much larger firm (Seyhmus Balogu, Yakup A. Rekcan, 2006). The increasing amount of website architecting work being

carried out in organizations implies that such work should be carried out in an efficient and effective manner. It can therefore potentially be beneficial for organizations to have some form of methodology, techniques and frameworks for guiding through website architecture. Researchers and practitioners have commented that web-based systems are different in a number of respects to existing types of information technology systems. Hence, existing website architecture methodologies, standards and best practice guides for traditional information technology systems may be inappropriate for new website architecture. Dianne Cyr (Dianne Cyr *et al.*, 2010), Wen-Chin Chou (Wen-Chin Chou, Yi-Ping Chey, 2012) and Erham Sengel (Erham Sengel, Seminal Onco, 2010) argued that the business website architecture is radically different from the usual ways of website architecting, and imposes a completely different structure and approach on website reviewing and architecting.

Chia-Ling Hung stated that web-based shopping website architecture differ from other website architecting in terms of the purpose and audience for which they are architected, their use of communications technology and multiplatform accessibility and their non-sequential nature, due to their reliance on hypertext links to other web documents (Chia-Liang Hung *et al.*, 2011). Researchers and practitioners have also commented that the business website architecting process for web-based systems is different from that for existing types of information systems. John Hwang commented upon the new architecting activities involved in website design over traditional systems design activities (John Hwang, Yoo-Shik Yoon, No-Hyeun Park, 2011). These included increased interaction and infor-mation handling, in particular navigation and pluralistic design. However, some other researchers did not investi-gate the actual techniques used for website design within organizations (Chia-Chi Sun, Grace T.R.Liu, 2009; Joana P.C Tong & *et al.*, 2005; Younghwa Lee, Kenneth A. Kozar, 2006). N. Rao Kowtha argued that as well as involving new design activities, web-based development projects also typically involve shorter development times and product life cycles (N. Rao Kowtha, Thimothy Whai Ip Choon, 2001). There has been little if any research showing how shopping website should be designed and carried out within shopping centers, and the actual methodologies, standards, techniques used for such work. Seyhums stated that the architecture of shopping web-based design still mostly traditional approaches and don’t include customer ideas and new dimension of shopping website design (Seyhamus Balogu *et al.*, 2006).

Joanna P.C Tong also commented that there is no rigorous systematic approach to shopping website architecture, and that most current shopping website architecting rely on the knowledge and experience of individual designers (Joanna P.C Tong, et Al, 2005). Cyr had commented upon the cultural issues involved in web-based shopping architecture, but had not really examined. It is important that the overall purpose of any new information technology system be established before architecting. However, determining the overall purpose of an organization's website may be complicated by the variety of potential users of the website, different customer needs, strategy of organization, cultural issues and etc. Rao had stated that requirements analysis is an important aspect of shopping website architecture in terms of content, structure, access and corporate identity (N. Rao Kowtha, Thimothy Whai IP Choon, 2001). Seyhmus Balogu had commented upon the need for website designers to understand both the marketing and technical issues of website design (Seyhmus Balogu, Yakup A. Rekcan, 2006). He had stated that since web applications execute business logic, the most important models of a web-based system should focus on the business logic, not on presentation details (Seyhmus Balogu, Yakup A. Rekcan, 2006). Chia-Ling Hung had commented on the need for web designers to have an understanding of the human computer interface issues of website architecture including navigation, function and graphics (Chia-Liang Hung & *et al.*, 2011). Hwang had argued that website architectures need to have navigational design skills, in order to avoid producing messy websites (Johne Hwang, Yoo-Shik Yoon, No-Heyeven Park, 2011). He had commented that there is a wide range of web development tools commercially available (Johne Hwang, Yoo-Shik Yoon, No-Heyeven Park, 2011).

Chia-Ling Hung had also commented upon the wide range of web development tools that are available for web development projects, and the need for web architectures to know several of these (Chia-Liang Hung & *et al.*, 2011). However, none of these researchers had investigated the use of such website development tools in actual commercial, industrial, cultural, psychological practice. Shopping website architecting requires a thorough understanding of systems architecture design principles in order to determine what will be executed on the client and server sides and what communication between client and server will occur in addition to marketing issue, customer needs, psychological issue, cultural issue and etc. Overall it appears that a number of researchers have commented upon various individual aspects of shopping website architecting and the manner in which they should be carried out.

However, few if any researchers have investigated a integrated comprehensive framework that include most aspect in actual commercial/industrial practice. The research project reported in this paper aimed to extend current academic knowledge regarding the process of website architecting by offering a integrated comprehensive framework that include all factors affected on a good website architecture. In particular, the research reported in this paper implemented the framework that was typically carried out in book shop architecture, and the techniques and standards that were actually used to support such activities. In this paper, we present a integrated multi-dimensional framework for this type of web site architecture. The framework includes techniques for needs assessment, goal/task analysis, user interface design, and rapid prototyping. Each of these techniques can be used to produce effective solutions across multiple content arenas.

The techniques described in this paper allowed us to focus specifically on what the internet-base book shop owners, customers, and project stakeholders felt was most important. The Web site architecture was based on needs assessment and analysis, on goal and task analysis, and on guidelines for effective user interface design. So, we can use this framework to integrated multi dimensional internet-base book shop architecture. The architecture was refined as it was developed through early user testing in a rapid prototyping process. This made significant evolution of the tool possible while the design was still paper-based and guided important revisions after a functional computer prototype was developed. The result is a Web site that is that is demonstrably easy to use. It is also effective in identifying condition of Iran internet infrastructure. A future research need in this area is the collection of more extensive usage and outcome data, to enable cost/benefit analyses that will further validate this approach.

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