ABSTRACT

The present study intends to design a methodology for examining the influence of modern information and communication technology on business models (BMs). Theoretical framework is mainly selected based on literature as well as consultation with expert focus groups. This methodology is validated by expert judgment and simulated as a real case applying system dynamics. The outcome of the survey includes a change methodology formulated in 5 phases and 37 activities. Not only has this study covered the specification of the theory structure; it was carried out in an organization in order to test its feasibility, as well. The proposed methodology in this research could help business analysts and managers with changing business model while adopting new technologies.

Keywords: Business Model, Change Methodology, Information and Communication Technology, Mobile Technology, System Dynamic

1. INTRODUCTION

In today’s competitive world, the companies move on and survive which select an imitable business model and produce new ones in interaction with their social context including the society, competitors and customers (Tikkanen, et al., 2005). Having a flexible and adaptable business model (BM) and continuous assessment of BM is one of the thriving secrets in business. On the other hand, making advancement and necessary changes of BMs is an inseparable part of today’s business. Many references in the field of strategic management and business development put an emphasis on obtaining sustainable competitive advantage in this ever-changing market. Regarding the changes in technology, market and regulations, it is inevitable to change business rules in order to survive in business world (Refer to DOI: 10.4018/ijide.2013100103

The Case of Mobile Technology in Learning Industry

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Business Model Change Methodology: Applying New Technology in Organization
STOF model (Faber & Bouwman, 2003)). Lai, et al (2006) debate that business model effects explain performance heterogeneity more than even industry effects do and it is important to concentrate on this concept both in business and by academics. Although the business models of firms with comparable positions may appear similar, there are fine-grained differences both in their activities and in their value formation and this differences make some businesses more competitive and prosperous (Sainio, et al., 2011). Here on, many debates and analyses have been accrued to answer this important question: “how do technology and new economy influence traditional business models?” Tapscott (1997) discussed this issue in detail to investigate the factors which can affect the common business models (Shafer, et al., 2005; Kelly, 1998; Peterovic, et al., 2001; Evans, & Wurster, 2000).

Influenced by technology trends, specifically information and communication technologies (ICT); many current organizational business models (BMs) confront questions and companies are faced with the challenge of BM rapid changes (Pateli & Giaglis, 2005). However, creating a radically new BM is a high-risk strategy, as the achieving probability is insignificantly acknowledged (Kalakota & Robinson, 2001). Therefore, it is essential to make more innovations in BMs and challenge the limitations of the current BM (Chesbrough, 2010).

In contrast, newly emerging technologies such as mobile and wireless technology are becoming commonly global these days, due to providing tools for higher productivity and efficiency in organizations (Gebauer & Shaw, 2004; Nah, et al., 2005). Modern mobile technologies have been successfully applied in forerunner organizations. In many cases, mobile applications not only lead to positive aspects such as better performance, improvement in consumption pattern, effectiveness in sales department and modifications in customer service, but also accelerate accessing data and facilitate decision making (Liang & Wei, 2004). The power of mobile technologies is based on an anytime-anywhere connection, which provides several opportunities in process innovation and location based services (Zwass, 2003). As revolutionary changes in business might seem eerie, any time- anywhere access to data affects all types of business processes and activities. Chesbrough (2010) believes that a mediocre technology pursued within a great business model may be more valuable than a high technology exploited via a mediocre BM. Accordingly, considering the daily increasing progress of information and communication technology and its effects on new business structure, and inefficiency of traditional BMs, the current survey seems necessary. This study puts emphasis both on information communication technology changes and appearance of wireless technologies in order to provide a methodology for helping managers and stakeholders to modify their BMs.

2. RESEARCH METHODOLOGY

The research methodology employed in this study is qualitative aiming at extracting BM change methodology; it has been divided into three parts in the following way:

- Literature review
- Experts’ interviews
- Collecting questionnaires

So this study has been accomplished in three phases as indicated in Figure 1.

In order to establish theoretical framework of the study, previous surveys have been studied. This phase covers the following activities:

1. First, previous studies in the field of BM were investigated to select a generic framework based on methodology modifications. Second, based on the literature review and research synthesis, the main phases of the methodology were formed. At this stage, system dynamic antecedent in business study was also checked to ensure its application on system capabilities and purpose. Therefore, the main outputs of this phase are selecting adaptable BM, using the main proposed methodology based on study
In order to develop the methodology, ideas of the experts in this field were applied at two stages. This phase includes interviewing expert focused groups and target society questionnaire collection. Sampling method, sample size and expert selection are dissected in section 4.

3. To take the methodology test and adaptation, system dynamic (SD) approach was applied. Selecting SD is based on the approach ability for creation, modification and manipulation of “Microworld” (Woodside, 2006), and the ability of simulating a range of systems. Furthermore, it examines various policies (Thurbly & Chang, 1995) to assure recreation of observed behaviors in real world (Sterman, 2000). To ensure method feasibility, phases 1 to 3 are implemented on a real case. SD simulation and case study will be described in section 5.

3. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

A considerable amount of studies has been published on business models. So, the BM selected in this paper is defined by focusing on previous studies and investigations.

In 2002, Margareta (2002) defined BM as a description of company’s performance method while Weill and Vitale (2001) believe BM is a description of roles and relationships among consumers, customers, partners and suppliers of the company. In their paper, BM is indicated as a key factor of production, information and financial flow as well as partners’ benefits. Peterovic (2001) and Auer and Follack (2002) express BM as a description of business system logic for value creation. From Turban’s viewpoint this model represents how a company could propose a suitable value that customers propend to pay for products and services (Turban & Wetherbe, 2002). Osterwalder and Pigneur (2002) consider the business model as nothing but the value that company offers to one or several segments of customers and the architecture of the firm and its partners network who make an attempt for creating, marketing and delivering this value and relationship capital. Using this, BM is aimed at generating profitable and sustainable revenue stream. In the more recent literature on business models, the concept is referred to as a design or architecture with the notion of value creation at its core. For instance, Smith et al. (2010, p. 450) define business model as the design by which an organization converts a given set of strategic choices into value, and uses a particular organizational architecture in order to create and capture that value. Similarly, Teece (2010) describes the business model as...
the design or architecture of value creation, delivery and capture mechanisms. Osterwalder, et al. (2005) classifies the authors writing about business models into three different categories, in a hierarchical pattern linked to each other.

- Authors describing the business model concept as an abstract overarching concept, describing real world businesses.
- Authors addressing a number of different abstract types of business models (i.e. a classification scheme), each one describing a set of businesses with common characteristics.
- Authors presenting aspects or concepts of a particular real world business model.

All three categories can vary in their modeling rigidity, ranging from simple definitions of elements listed, to a set of related, defined and conceptualized elements. Regarding the purpose of this study, the emphasis is on generic BMs representing a universal concept or primary level. Then, well designed BMs (Gordijn, et al., 2005) are investigated to select an appropriate one. Based on recent researches, two generic BMs have been developed, displaying components and their relationship as well as clearly representing business logic. Business Model Ontology, accomplished by Osterwalder (2004), and e3-value presented by Gordijn and Akkerman (2001) described business model components and their relationship. These precise statements lead to shared, formal and explicit conceptualization of this concept. The elements conceptualizing the two ontologies are just in some cases similar. These two Meta-models are compared based on important criteria such as the purpose of ontology, origins, supporting technologies, ontology maturity & evaluation and ontological representation. The results showed that both seek the same goals such as design improvement, better understanding, management and analysis of BMs and focus on knowledge acquisition and representation in BM field (Gordijn, et al. 2005). Through component comparison, BMO is revealed to be more comprehensive and covering nearly all common elements of prior models. Another advantage of BMO is its simplicity due to its concept explicitness and being intelligible for everyone. On the other hand, e3-value is superior in different areas such as network constellation related concepts, value exchange related part and tools support and applications. Considering the purpose of logical development in order to preserve, create and promote value and make more profits after business changes, influenced by information and communication changes, tool supports would create significant supremacy. Generally speaking, concept of revenue and value creation is not just e-business model, when BMO is appropriately selected. BMO, developed by Osterwalder in his PhD thesis considers the following areas as foundations of a BM:

- **Product**: what is the business of organization and which products and values are offered to the market?
- **Customer Interface**: Who are target customers and how could be a sustainable relationship appointed?
- **Infrastructure Management**: How does the organization handle its infrastructure and procurement related activities and how does it work as a network?
- **Financial Aspects**: What is the revenue model and business cost structure of the organization?

To be more specific about BMO, the mentioned foundations are divided into interrelated components. These components are extracted from BM literature.

The second important activity in literature review phase is to focus on both analysis and survey of related scientific resources in design and modifications of BM, applying mobile technology in business and moving toward mobile enterprises. Based on the present study, a methodology including five main phases is proposed. In fact, library research, literature analysis and speculation are the main bases of this theoretical framework. The common logic of literature among previous studies in this field is the base of the proposed methodology.
in this paper. Table 1 shows the main phase and related references.

The first and second phases (Table 2 and Table 3) include cognition and awareness, the third phase indicates awareness and changing (Table 4), while phases 4 and 5 (Table 5 and Table 6) focus on implementing the modifications and analyzing its results.

<table>
<thead>
<tr>
<th>Business Model Change Methodology</th>
<th>Related Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1. Identification and documentation of current BM</td>
<td>[2], [23], [37], [26], [17]</td>
</tr>
<tr>
<td>Phase 2. Determining feasible choices and selecting the best one to modify BM based on technology application</td>
<td>[2], [26], [17]</td>
</tr>
<tr>
<td>Phase 3. Investigation and determination of the impact of selected solution on BM components</td>
<td>[2], [37], [26], [5], [17]</td>
</tr>
<tr>
<td>Phase 4. Solution implementation and modification of BM</td>
<td>[1], [2], [24], [26], [3], [17], [40]</td>
</tr>
<tr>
<td>Phase 5. Evaluation and improvement of BM change results in a period of time</td>
<td>[37], [31], [26], [3], [17], [8]</td>
</tr>
</tbody>
</table>

4. METHODOLOGY
DEVELOPMENT AND
VALIDATION

As mentioned before, academic experts’ viewpoints were obtained through interviews to validate and complete initial methodology. The experts were considered as focus groups in this research. Focus groups interview lead to finalizing methodology steps including verifying activities order, approving overall methodology, and designing the final questionnaires. Then, on the second step, gathering data from numerous experts with practical experiences in the field of BM was planned. Statistical sample consisted of individuals in the fields of information technology, industrial engineering, computer engineering and computer science, management and other similar fields. To ask about the experts’ viewpoint, it was necessary to identify the companies they were working for. Companies ranked as ICT consultant and supervisor in Iran were regarded as appropriate centers for finding this target group. An Iranian governmental institute called High Council of Informatics works under the supervision of presidential deputy strategic planning and control aimed at organizing, evaluating and ranking ICT companies based on knowledge and performance indices. Based on the purpose of this research, it was assumed that the target group could be found in companies ranked by High Council of Informatics as levels 1 to 4 of ICT consulting and supervising. As these companies are evaluated on the basis of knowledge and performance indices such as recruiting experts and experiments in various projects; the target group was ensured to be appropriately available in these companies. So questionnaires were distributed in these companies. A sample size of 384 considering 95% of confidence interval was based. It was also assumed that half of the respondents agreed and the other half disagreed or $p=q=0.5$.

Furthermore, binominal tests were applied to investigate the steps proposed in BM modification methodology. Responses to the test fall into two categories:

When respondents consider the step importance as high or very high, it means that the suggested step is of high importance for them (p). But when they indicate its importance as moderate, low or very low, the suggested step is not important to them (q).

To evaluate the importance of each step, a key phrase was applied: “activity No. 1 is important to accomplish the first phase of BM modification methodology”. If the result of binominal test approved, the activity would be accepted in final methodology. In the research process, 403 responses were collected yielding 387 questionnaires for analysis. Results of this
### Table 2. Activities and the outputs of the first phase of proposed methodology

<table>
<thead>
<tr>
<th>No</th>
<th>Activities</th>
<th>Deliverables</th>
<th>P</th>
<th>Q</th>
<th>z</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Identifying value proposition offered to the market</td>
<td>Products/services portfolio</td>
<td>0.76</td>
<td>0.24</td>
<td>12.29</td>
<td>✓</td>
</tr>
<tr>
<td>2.</td>
<td>Market segmentation and determining target market</td>
<td>Target market list</td>
<td>0.74</td>
<td>0.26</td>
<td>10.86</td>
<td>✓</td>
</tr>
<tr>
<td>3.</td>
<td>Determining distribution channel</td>
<td>Distribution channels</td>
<td>0.69</td>
<td>0.31</td>
<td>8.08</td>
<td>✓</td>
</tr>
<tr>
<td>4.</td>
<td>Analyzing customer relationship system</td>
<td>Customer relationship mechanisms</td>
<td>0.61</td>
<td>0.39</td>
<td>4.32</td>
<td>✓</td>
</tr>
<tr>
<td>5.</td>
<td>Identifying value configuration</td>
<td>Value chain</td>
<td>0.75</td>
<td>0.25</td>
<td>11.63</td>
<td>✓</td>
</tr>
<tr>
<td>6.</td>
<td>Determining company capabilities</td>
<td>Set of resources from the firm or its partners</td>
<td>0.60</td>
<td>0.40</td>
<td>4.21</td>
<td>✓</td>
</tr>
<tr>
<td>7.</td>
<td>Deciding strategic partners</td>
<td>Business partners list</td>
<td>0.59</td>
<td>0.41</td>
<td>3.46</td>
<td>✓</td>
</tr>
<tr>
<td>8.</td>
<td>Depicting cost structure</td>
<td>Company costs to create, marketing and delivering value to customers</td>
<td>0.55</td>
<td>0.45</td>
<td>1.99</td>
<td>✓</td>
</tr>
<tr>
<td>9.</td>
<td>Building revenue model and pricing strategy</td>
<td>Revenue flows and pricing mechanisms</td>
<td>0.76</td>
<td>0.24</td>
<td>11.79</td>
<td>✓</td>
</tr>
<tr>
<td>10.</td>
<td>Determining relationship among these 9 elements and BM documentation</td>
<td>Organization BM</td>
<td>0.51</td>
<td>0.49</td>
<td>0.46</td>
<td>×</td>
</tr>
</tbody>
</table>

### Table 3. Activities and the outputs of the second phase of proposed methodology

<table>
<thead>
<tr>
<th>No</th>
<th>Activities</th>
<th>Deliverables</th>
<th>P</th>
<th>Q</th>
<th>Z</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.</td>
<td>Diagnosing and analyzing business needs and opportunities based on new technology</td>
<td>Change priorities based on business needs and opportunities</td>
<td>0.62</td>
<td>0.38</td>
<td>4.98</td>
<td>✓</td>
</tr>
<tr>
<td>12.</td>
<td>Analyzing technology maturity</td>
<td>Technology life cycle and available technology profiles</td>
<td>0.69</td>
<td>0.31</td>
<td>7.95</td>
<td>✓</td>
</tr>
<tr>
<td>13.</td>
<td>Determining possible choices for applying technologies according to the needs and opportunities</td>
<td>List of different technology application choices</td>
<td>0.66</td>
<td>0.34</td>
<td>6.71</td>
<td>✓</td>
</tr>
<tr>
<td>14.</td>
<td>Documentation of various choices</td>
<td>Choice documents</td>
<td>0.52</td>
<td>0.48</td>
<td>0.76</td>
<td>×</td>
</tr>
<tr>
<td>15.</td>
<td>Identifying technical and business risks for each choice</td>
<td>Business and technical risks lists</td>
<td>0.68</td>
<td>0.32</td>
<td>7.70</td>
<td>✓</td>
</tr>
<tr>
<td>16.</td>
<td>Analyzing cost-benefit for each choice</td>
<td>Investment analysis</td>
<td>0.72</td>
<td>0.28</td>
<td>9.55</td>
<td>✓</td>
</tr>
<tr>
<td>17.</td>
<td>Comparing cost and benefit and selecting the best solution considering related risks</td>
<td>Selected choice</td>
<td>0.66</td>
<td>0.34</td>
<td>6.59</td>
<td>✓</td>
</tr>
</tbody>
</table>
statistical analysis are shown in the following tables:

Activity no 10, “Determining relationship among these 9 elements and BM documenting” for identification and documentation of current BM was not verified from experts’ viewpoints.

Activity no 14, “documenting different choices” for determining feasible choices and selecting the best one was not verified from experts’ viewpoints.

All planned activities for implementing the third methodology phase were confirmed by the experts.

All activities designed for accomplishing the fourth and fifth phase were confirmed by the experts.

<table>
<thead>
<tr>
<th>No</th>
<th>Activities</th>
<th>Deliverables</th>
<th>P</th>
<th>Q</th>
<th>z</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.</td>
<td>Evidences of the creation procedure/ modifying the value proposed to the market using new technology</td>
<td>Investigating the effect of selected strategy on the value proposed to the market</td>
<td>0.78</td>
<td>0.22</td>
<td>13.14</td>
<td>√</td>
</tr>
<tr>
<td>19.</td>
<td>Evaluating the probability of having new market using new technology</td>
<td>Investigating the possibility of altering target market through applying selected strategy in the company</td>
<td>0.72</td>
<td>0.28</td>
<td>9.83</td>
<td>√</td>
</tr>
<tr>
<td>20.</td>
<td>Evidences on changing procedure and improving the distribution and customer relationship channels</td>
<td>Investigating the possibility of change in the distribution and customer relationship channels after implementing new strategy</td>
<td>0.71</td>
<td>0.29</td>
<td>9.14</td>
<td>√</td>
</tr>
<tr>
<td>21.</td>
<td>Designing customer relationship system based on the new technology</td>
<td>Studying the feasibility of changing the customer relationship system according to the selected strategy</td>
<td>0.61</td>
<td>0.39</td>
<td>4.65</td>
<td>√</td>
</tr>
<tr>
<td>22.</td>
<td>The processes of updated value chain considering the implementation of selected strategy</td>
<td>Examining the effect of the selected strategy based on the main business processes</td>
<td>0.55</td>
<td>0.45</td>
<td>1.99</td>
<td>√</td>
</tr>
<tr>
<td>23.</td>
<td>List of updated capabilities of the company</td>
<td>Analyzing the feasibility of changing the company potentials</td>
<td>0.70</td>
<td>0.30</td>
<td>8.60</td>
<td>√</td>
</tr>
<tr>
<td>24.</td>
<td>List of new partners and Sponsors</td>
<td>Estimating the feasibility of changing the partners by implementing new strategies in the company</td>
<td>0.55</td>
<td>0.45</td>
<td>2.10</td>
<td>√</td>
</tr>
<tr>
<td>25.</td>
<td>Updated expenses</td>
<td>Examining the probable change in the company expenses</td>
<td>0.56</td>
<td>0.44</td>
<td>2.20</td>
<td>√</td>
</tr>
<tr>
<td>26.</td>
<td>The new and probable revenue trends along with new pricing strategy for every new trend</td>
<td>Feasibility analysis of altering the revenue model</td>
<td>0.68</td>
<td>0.32</td>
<td>7.57</td>
<td>√</td>
</tr>
</tbody>
</table>

5. THE OPERATIONAL VALIDATION OF THE PROPOSED METHODOLOGY

The company used for methodology adjustment through simulating the main methodology phases for changing business model, is Magfa Company (www.magfa.com).

This company is selected due to the availability of the required information for methodology test, familiarity of the managers with mobile technology business and the fact that it is a technology-oriented company. As we studied mobile technology adoption influence in business model that would be necessary for experts to be aware of these concepts. To do
a survey among the experts of this company and adjust the designed dynamic models with the original samples, it was planned to interview with the top manager, deputy managing director, the manager of the electronic learning business, the production and sales and market-

Table 5. Activities and products of the fourth phase of proposed methodology

<table>
<thead>
<tr>
<th>No</th>
<th>Activities</th>
<th>Deliverables</th>
<th>P</th>
<th>Q</th>
<th>z</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>27.</td>
<td>A report on the readiness of company for change</td>
<td>Analyzing the changeability of the company and assessing the readiness for change</td>
<td>0.73</td>
<td>0.27</td>
<td>10.12</td>
<td>✓</td>
</tr>
<tr>
<td>28.</td>
<td>Justification report and change permission from the top manager</td>
<td>Preparing a budget justification report and top-managerial support</td>
<td>0.56</td>
<td>0.44</td>
<td>2.20</td>
<td>✓</td>
</tr>
<tr>
<td>29.</td>
<td>Abstracts of the required projects and the implementation plan for patterns and projects</td>
<td>Defining the patterns and projects needed for change</td>
<td>0.65</td>
<td>0.35</td>
<td>6.12</td>
<td>✓</td>
</tr>
<tr>
<td>30.</td>
<td>Attracting partnership and encouraging the implementation of new business model</td>
<td>Educating and informing the customers and beneficiaries about the values</td>
<td>0.74</td>
<td>0.26</td>
<td>10.71</td>
<td>✓</td>
</tr>
<tr>
<td>31.</td>
<td>Trained staff for implementing the strategy</td>
<td>Training the staff and beneficiaries to use the new technology</td>
<td>0.71</td>
<td>0.29</td>
<td>9.14</td>
<td>✓</td>
</tr>
<tr>
<td>32.</td>
<td>Recruiting new technology</td>
<td>Implementing prioritized projects toward new and desired business model</td>
<td>0.74</td>
<td>0.26</td>
<td>10.71</td>
<td>✓</td>
</tr>
<tr>
<td>33.</td>
<td>Changes in the foundation of the business model</td>
<td>Documenting a new business model</td>
<td>0.54</td>
<td>0.46</td>
<td>1.48</td>
<td>✗</td>
</tr>
</tbody>
</table>

Table 6. Activities and products of the fifth phase of proposed methodology

<table>
<thead>
<tr>
<th>No</th>
<th>Activities</th>
<th>Deliverables</th>
<th>P</th>
<th>Q</th>
<th>z</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>34.</td>
<td>Benefiting from the strategy</td>
<td>Complete settlement of the selected strategy</td>
<td>0.73</td>
<td>0.27</td>
<td>10.12</td>
<td>✓</td>
</tr>
<tr>
<td>35.</td>
<td>Assuring the proper performance of the technologies</td>
<td>Evaluating the performance of the implemented new technology</td>
<td>0.56</td>
<td>0.44</td>
<td>2.20</td>
<td>✓</td>
</tr>
<tr>
<td>36.</td>
<td>Reports assuring the achievement of expected business and its accordance with goals</td>
<td>Regular monitoring to assess business results</td>
<td>0.65</td>
<td>0.35</td>
<td>6.12</td>
<td>✓</td>
</tr>
<tr>
<td>37.</td>
<td>Improving business model</td>
<td>Using prior knowledge for probable improvement of the business model</td>
<td>0.74</td>
<td>0.26</td>
<td>10.71</td>
<td>✓</td>
</tr>
<tr>
<td>38.</td>
<td>Maturity model of technology in the company, introducing services and new strategies</td>
<td>Evaluating the maturity of technology creative uses and assessing further solutions</td>
<td>0.71</td>
<td>0.29</td>
<td>9.14</td>
<td>✓</td>
</tr>
</tbody>
</table>
ing deputies of e-learning business unit to gain information about current state of affairs as well as to predict the changes in the behavior of substantial variables of models due to alternation and balancing of some parameters. The reason for selecting these people differed regarding the organizational position of them in Magfa, efficiency of these people in the selected business, and their capability in responding to the questions about predicting how the conditions would change after implementing the strategies. The most crucial information gathered from these people was general information about the current business model of the company for producing and presenting electronic courses. Therefore, in order to assure that the designed dynamic models effectively demonstrate the desired models, these people were asked about the effect of the substantial variables of business models on each other and their interaction with each other. In addition, as the experts in the business under study, these people were asked how the behavior of these variables would hold true with the reality.

With regard to its background, utilizing the system dynamic approach is believed to be feasible. For example, Burgess (1998) used dynamic systems to investigate the effects of reengineering business; Fowler (2003) used it to manage the complex and dynamic process of strategy formulation, evaluation and implementation; Qureshi (2007) tried to evaluate the company value; Bleda and Shackley (2008) aimed at analyzing the environmental change and its influence on business companies; Personen (2008) tried to improve the production cycle and Nielsen & Nielsen (2008) evaluated the applicability of dynamic nature of the balanced score card model applying system dynamics approach.

Actually system dynamics approach has been applied in current study to simulate main methodology phase’s consequences in a real business. The application procedure of this approach and data analysis procedure is explained as follows: (cited in Sterman, 2000).

1. **Determining the Boundaries of the System**: Since the main concern of this study is to achieve a suitable method of changing business model, the system under study is the selected business model along with its components and relations, which was demonstrated in Figure 2.

2. **Organizing the Dynamic System and Designing Causal Structures**: Since the method and the relationship of business model components was carefully examined in reviewing the related literature, in this phase, the relationship between business model elements and stock and flow graphs are modeled. Also, the designed dynamic hypotheses which are originally the basis of the main phases are evaluated using this method. To do so, in each hypothesis one out of five phases of designed methodology is emphasized. In each step, we assumed implementing the phase is essential in business model change process.

3. **Simulating Business Model**: To express the mathematical and graphical relationship between the components of this business model, Venism Software is used.

4. **Testing the Model**: To assure the efficiency of the system (business model) simulation, boundary tests (examining the behavior of business model in boundary conditions and comparing it with reality) were administered and a survey was conducted among the selected business experts on whether there is a match between the model and the reality.

5. **Evaluating the Effect of Bringing Technology into Business Model Using Methodology**: Analyzing the results of modeling in the condition of a real business and asking the experts to adjust the model behavior with reality. In this phase, the application of new technology and its results were evaluated using various scenarios. With regard to the hypothesis for each phase of the methodology and creating a model accordingly, the scenarios were implemented and the hypotheses were tested to find out whether improper

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or unexpected results would occur if the proposed phase were skipped.

Through the above phases, a simulation of the main methodology phases was done and its practicality was evaluated. Using this approach and simulating various scenarios and studying the results not only sheds light on the importance of carrying out every phase of the methodology, but also brings about an important change in the crucial methodology activities.

5.1. Operational Validation of the First Phase of Methodology

In order to fully understand the complexities of business environment and making decisions on using technology and to emphasize the importance of careful examination for bringing new technology into the companies, the next dynamic model was presented and performed in different conditions, based on the main concepts of BMO and according to the genuine business environment. To test the hypothesis “To adopt the new information and communication technology into business, gathering information about the business model building blocks is important” the model presented in Figure 3 and the related scenarios were designed.

According to BMO structure and components, the above model includes some important components which are explained as follows:

- The customers who switch between this and the rival company. Actually, this component includes the potential customers who can be for either company.
- The company, its production capability, and value presentation to the market which is based on the company’s intended amount of supply, its present capability in supplying, and the distance between these two. This also shows the price changes based on the change in supply and demand.
- The value proposed to the market which is based on the two factors of quality and price.
- The company suppliers who provide inputs for company’s production and who bargain according to the amount of demand for inputs.

It should be noted that this model was first built without considering the competitors and to be evaluated in realistic conditions, a survey was conducted among business experts. To be complete, as what experts believed, this model needs to demonstrate the competitors’ reactions and interactions. However, in one step of the evaluation of model behavior could not been complete without considering competitor reactions. Therefore, in spite of the fact that the Business Model Ontology does not include the competitors’ behavior, to adjust the dynamic model to the real world conditions, this part was added and the expert viewpoints were again gathered.

To evaluate the hypothesis related to this model some scenarios were designed. The results showed that recruiting new technology can lead to unexpected results if fundamental...
concepts about customers, infrastructures and competitors are not realized. In one scenario it was assumed that the company could better attend to its customer’s desires and expectations by using cell-phone technology, and through enhancing the quality of services, the customer’s perceptions about value could be modified. The company is expected to broaden its market after performing this strategy. In such conditions, the competing company would make a similar value by decreasing the cost of its products and services. The results of practicing this model to compare the key parameters of two rival companies are as stated below (in all figures, red shows the conditions previous to model implementation, and blue shows the condition after it was performed; company 1 is the company under evaluation, and company 2 is the rival company):

As a result of quality shock in the first company, it had a rise in the number of customers. However, due to the rival’s reaction it fluctuates about the same number as the rival’s. The company action and its rival’s reaction cause a sudden but temporary increase in the number of customers but then this number becomes stable with some fluctuations. The effect of performing the quality enhancement strategy through applying new technology on the number of customers of the company and its rival is shown in Figure 4.

Not having reached the predicted profit due to the rival’s reaction, the first company may enhance its technology as well as its quality. Meanwhile, all the potential customers are now turned into actual ones and have joined either of these companies (Figure 5). Therefore, failing to learn about the target customers and...
its number can bring about wrong decisions in the company in investing more on technology.

The company anticipates a radical rise in the profit as a result of using the technology and the value increase; however, this does not happen since the rival company reacts by decreasing its prices. Figure 6 and Figure 7 shows that after a significant rise in the unit profit and the total profit due to the rival’s reaction, it gets close to the rate it had before using the technology. In such condition, the company may aim at increasing its profit margin and therefore make a greater investigation in technology utilization and quality enhancement. This would not be a correct decision and not only does not increase the profit, but also because of a lack of potential customer in the market (Figure 5), increases the expenses required for technology utilization in the company.

The second scenario is designed assuming an enhancement in the quality of both the company and the rival. As it is seen in Figure 8, after implementing the quality enhancement strategy and the occurrence of a cost increase in the company and the rival, for good quality, the customers are attracted to the company and its rival until all potential customers turn into actual ones. Then, due to an increase in average

Figure 4. Comparison between the numbers of customers in two rival companies after quality enhancement in company 1

Figure 5. Potential customers in the market affected by quality enhancement through using technology in the company 1
bid price in the company and the rival, they are attracted to other alternative choices.

In spite of what the company expected about a higher value difference calculated by reducing the company’s bid price from the rival’s bid price, the above figure shows a first shock, then an improvement in this variable and finally fluctuations after a period of time, the above variable fluctuates around zero (Figure 9).

Therefore, the average bid price in the company is the same as the rival’s.

Therefore, the company arrives at the same result if it acquires technology only for attracting more customers and more value but ignores the competitors’ reaction in applying a similar model. Performing this strategy puts a heavier emphasis on the importance of gaining better knowledge about the components of business model before investing on new technology.
The third scenario: Decreasing the company production cost. In this scenario it is assumed that the company can reduce its service cost through technology acquisition. In this situation, the company can decrease the cost of production or services. Assuming that the cost of the products does not change in the market, a rise in the company’s profit margin or the profit of every unit and ultimately the whole profit is expected. As the company is not familiar enough with the suppliers’ reaction, the profit margin from the reduction of the costs is taken by the supplier. The behavior of this scenario is as follows (In all the figures red indicates the situation before the scenario performance and blue stands for the situation after its performance):

After technology acquisition, the company can reduce the costs and lower the bid price of the services or products. As a result of cost reduction, the rate of demand for input is enhanced. This occurs through a mediator variable called goal supply. When there is more demand for input, the supplier increases its cost. In such condition, although the ending inventory or service expenses are lowered, the final cost does not change much and a considerable amount of the value and profit is taken by the supplier. Figure 10 shows the changing behavior of the input costs caused by the strategy of decreasing the production value through technology acquisition.

Regarding the increase in input costs, the cost of each unit gets a rise after a short period of time and each unit’s profit is lowered according to the behavior of this variable in Figure 11. In fact, having a good bargaining power, the suppliers receive the profit of technology acquisition by implementing this strategy. As the suppliers increase the costs, they get the profit from technology acquisition.

Therefore, as it is seen in Figure 11, the unit cost in one phase is increased as a result of a decrease in the costs and this profit increases with a bargaining power rise for the cost of input and decreases by a rise in the costs of input. Contrary to the company’s expectation about a rise in the profit margin and the unit profit, by proper implementation of technology and decreasing the cost of work using technology, the profit from technology is transferred to the supplier.

According to Figure 11 and in spite of having a decrease in unit cost after a time period, when the customers are provided with a higher value, and therefore, more customers are attracted to the company, the company witnesses a rise in its average total profit.
The important fact that is realized from modeling of Figure 3 and performing the above scenarios is the significant role of the first methodology phase (i.e., getting familiar with the current state of business), the importance of examining business models and familiarity with the competitors. Hence, “familiarity with the business model of the competitors” was added to the recommended activities for performing the first methodology phase.

### 5.2. Validating the Second and the Third Methodology Phases

In order to test the hypothesis “identification and analysis of various choices and examining the effects of these strategies on the business model...”

**Figure 10. Rising of the input costs by the supplier after technology acquisition in the company 1**

![Graph of input costs rising over time](image1)

**Figure 11. The profit of every unit in case of suppliers’ high bargaining power after technology acquisition**

![Graph of profit over time](image2)
in the process of new technology acquisition is important” a model based on BMO is simulated using software. To test this hypothesis, it is assumed that the company has a complete understanding of the components of the business model and indeed the first phase is performed. Therefore, the company’s inefficiency in identifying and analyzing different choices and examining the effect of these strategies would lead to unexpected results. This model is demonstrated in Figure 12.

In fact, this model is designed in order to show the important role of evaluation and selection of correct strategy. The results of some scenarios performed according to this model indicate that even by having a good knowledge about different aspects of the business model, it is important to evaluate the probable results of different strategies and select a strategy that shows to be more effective. In one scenario, it is assumed that having performed the first phase and being aware that the suppliers have a high bargaining power, the company does not use technology to decrease the production cost. Rather, it uses technology to enhance the quality of products and services. In such conditions and as it is seen in Figure 13, although the profit boosts in the first phase due to the quality shock, the total profit shows a decrease after a while. The main reason is the attraction of all potential customers to the company. After a while, since there is no other potential customer in the market, even with more effort to improve the value perceived by the customer, there would be no possibility of profit increase. Also, as a result of an increase in the cost of attracting more customers, the total profit decreases. The blue graph shows the state after the performance of the scenario and the red graph shows the condition before this performance.

As it is seen in Figure 14 about the price and unit cost behavior resulting from this

Figure 12. Stock & flow diagram based on BMO
Figure 13. Total benefit during technology development for quality enhancement and lack of investment on quality

Figure 14. The price and unit cost during technology development for quality enhancement and lack of investment on quality
strategy, in order to provide a better quality, the company raises the price of its products and services; however, after a decrease in demand due to a decrease in the number of customers, it has to lower the prices. Meanwhile, providing high quality products makes the company pay a high unit price. This dynamic nature of the system lowers the total profit to the extent that the company makes a loss (Figure 13).

As it is seen in the above analyses, in spite of awareness about the current state and the suppliers’ high bargaining power, without doing a strategy analysis and understanding the effects of the selected strategy (investment in quality enhancement) on other components, the company undergoes a loss in a period of time. Hence, according to the simulation results, the importance of the second and third phases of the model is made obvious. Also, it is agreed that analyzing possible strategies and evaluating or perceiving the effects of the selected strategy on other business model components is of high importance. In this simulated sample, although the company is aware of the current situation and in spite of the fact that it selects a strategy to enhance the quality in order not to let the supplier absorb the profit, quality acquisition led to adverse results. The reason for this adverse result would be the company’s failure to analyze the strategy and evaluate its effect on the customer, prices and quality.

5.3. Operational Validation of the Fourth and Fifth Phase of Methodology

To test the hypothesis “applying the selected strategy and putting the new technology into operation in the process of business model change affected by changing ICT is of crucial importance”, a dynamic model is created which shows that applying the selected strategy would face some problems, even though the company has gained enough knowledge about the current state of affairs, the evaluation and analysis of possible choices and the effect of selected strategy on the components of the tested model. This problem is closely related to what the business authorities and decision-makers do and is affected by it. For this reason, a dynamic model is designed to show that getting advantage from investments and achieving positive results depends on the investors’ positive attitudes. Besides, in order to reach desirable results from the investments, the company needs to provide the required expenses for operational activities (such as the costs of teaching the staff and the beneficiaries to use the new technology and to maintain the implemented strategy). The designed model to test this hypothesis is shown in Figure 15.

The investment will reach its intended goals and higher benefits if the investor is optimistic about the investment for technology development and perceives a longer period of time to reach the desirable results, and if they pay the necessary expenses for operation and other costs. The following graphs show the difference between the results of these two viewpoints about the operational phase of technology (the red graphs show the optimistic stance and the blue graph demonstrates the pessimistic stance toward investing on technology).

As it is illustrated in Figure 16, in a pessimistic condition or when the company considers a very short period of time before achieving desirable results, the prepared infrastructures are completely depreciated and the company investments on previous phases is totally spoiled. On the contrary, when the time before reaching desirable results is assumed as reasonable and the company pays for the current expenses in order to get the most benefit of its investment, the level of prepared infrastructures (considering 3 years depreciation of the technology) are higher than before and the company is able to make a practical use of what it had done in the previous phases.

One example of current expenses is the expense required for training the staff in making use of the acquired technology. Figure 17 shows that in the pessimistic scenario the current expenses are not paid for, although in the optimistic situation the expenses are specified to technology operation. Specifying the expenses and setting out to use new infrastructure in the
company develops the infrastructures under operation (Figure 18).

As it is demonstrated in Figure 18, the perceived profit from technology results in optimism toward investment and consequently toward the company’s behavior in paying for the expenses shown in the red graph in Figure 17. Regarding the strong decision of the company regarding the complete implementation of new technology and standing the expected results from technology, the enhancement of prepared infrastructures causes an enhancement in the quality of the company products and shows its ultimate effect on boosting the net income in every unit. Performing the optimistic and pessimistic scenarios about implementing,

Figure 15. The stock and flow graph to test the hypothesis about the importance of the fourth methodology phase

Figure 16. The difference between operationalized infrastructures and the infrastructures being developed in the optimistic and pessimistic views toward technology implementation
performing and applying the selected technology indicated that even after successful performance of the previous steps, having a pessimistic approach toward implementing new technology can lead to failure in performance and as a result the prepared technology and the infrastructures that are being developed do not turn into operationalized infrastructures. This can affect the pessimistic approach of the decision-makers; and not having experienced a positive result from using the technology, they would resist against utilizing technology. On the other hand, having patience in applying and implementing new technology will lead to positive results, better performance and more positive attitude toward technology. Enhancing such attitude toward more investment in technology acquisition would bring about more benefit and more positive results.

The fifth phase of the methodology or, in other words, evaluation and improvement of the results of changing the business model over a time course, according to the literature, includes three main tasks. To evaluate or control every system, first you have to gather detailed information about the current state of affairs. Then you need to evaluate and analyze the information you have gathered and ultimately,
there will be a need for modification and change. Therefore, the fifth phase is comprised of a set of activities related to previous phases. In other words, first a set of detailed information must be gathered (the same as the first phase), then the information needs to be analyzed and evaluated and a strategy should be determined (as in the second and third phases) and finally the defined modifications should be carried out (as in the fourth phase). Hence, having realized the importance of four previous phases one can reach an understanding about the significance of the last one.

It should be noted that in addition to simulating the different phases of methodology performance, the first three phases of the recommended method was carried out in Magfa Company to make sure that the phases and activities are practical; it was assumed that cell-phone technology is used in distance learning services and it is feasible to implement this methodology. Magfa offers a chance to achieve a new online teaching method by providing an electronic learning management system. In fact, offering electronics courses to schools and providing them with technical support is the basic mission of e-learning unit. The products and services of this unit are as follows:

1. Providing training centers with supporting services in special, practical and advance courses in digital format.
2. Preparing modular, practical and advanced courses for universities on Internet.
3. Providing a learning management system (LMS) to offer courses on Internet.
4. Offering technical support, during the courses which includes daily seminars and training for the teachers, trainers and learners in order to use the electronic learning management system.

After implementing the first phase of the methodology, the current business model of Magfa, which is based on preparation and offering of electronics courses, was identified. Also, the main products and general capabilities regarding designing and preparation of electronic courses as well as regular updating of these courses have been investigated. An examination was made of the production method, offering and selling the services, the method of dealing with customers and presenting the products through training centers and universities. Ultimately, the revenue models and the main expenses were studied. In the second phase, according to the fact that the increasing development of wireless technologies is diminishing all the limitations of time and distance in the presentation and transferring of information, there would be an opportunity of applying mobile technology for educating people at any time and place. Since the revenue model in Electronics course looks at absorbing more and more trainees and more use of Electronics courses, and regarding the fact that in today’s business world many people have to commute to do their daily work, by removing the distance limitation for using the courses, more operators can make use of Magfa services and consequently the company’s revenue model would take more variety and the revenues would rise up. After doing necessary analyses and examinations among different alternatives for applying wireless technology to this business, the main strategy selected for changing the business model was to make a chance for wireless communication. In the third phase, all the components of the business model were revised according to the use of this technology. The main effect of the application of this technology on distribution channels and communication with customers was shown to be the combination of the company’s capabilities, preceding other companies in the competition, and the amount of value taken by the customer.

With regard to the survey results among the experts, it was observed that activity 10 from the first phase, activity 14 from the second, and activity 33 from the third which relate to the documenting the results of activities in each phase did not have any significance and therefore were discarded from the list of recommended methodology activities. In addition, the dynamic examination and implementation of the first 3 phases makes some changes in the recommended methodology as follows:
According to the examination of the dynamic model in phase 1, the rival’s business models need to be analyzed and a comprehensive understanding of the rival’s status should be achieved. As it was stated previously in section 1-5, analyzing and changing the business model without considering the rival’s current situation would lead to unexpected results. Therefore, according to the designed scenarios, to evaluate the dynamic model of Figure 3, it was shown that becoming aware of the rival’s business model and anticipating the probable reactions of the competitors have an important role in changing the business model. These activities were added to the activity list of the first methodology phase. The results of the study in the sections 2-5 shows that in addition to considering the influence of the selected strategy and technology acquisition on every component of the business model, in the second phase, the effect of rival’s reaction needs to be analyzed to determine what changes are made in the customers, sales, revenue and profit as a result of the rival’s probable reactions.

6. DISCUSSION

The dramatic increase in the number of publications referring to the “business model” since the late 1990s and early 2000s illustrates the rise in the interest in the concept (Zott et al., 2011). The relevance of the business model, however, is not only limited to the academic debate. Recently, also practitioners have shown interest in the concept and have discovered the business model as relevant locus of innovation that goes beyond traditional product and process innovations. Considering the increasingly importance of this concept, we tried to prepare a well designed methodology for BM change. The results of this study help entrepreneurs and manager to apply new information and communication technology such as mobile phones considering essential changes in business model. The users of the recommended methodology in this study include the companies pioneering the acquisition of new technologies, small and medium companies aiming at using technology development to present special services to the customers and the companies which are active in the area of internet technology and wish to use cell-phone technology. The simulation which was done using the methodology of dynamic systems show that in spite of the importance and clarity of the recommended phases, there are problems in the way of performing it.

The most important issues which need to be taken into consideration in order to arrive at desirable results are considering the present status of the components of the business model, the present status of the rivals in the first methodology phase, the prediction and evaluation of the results of applying the selected strategy and technology implementation in the second and third phases, as well as pondering about how to get positive results from applying the technology in the fourth phase. Hence, when changing their business model or beginning to apply a new technology, the beneficiaries are advised to take a careful account of the recommended approach and methodology.

On the other hand, contrary to the previous studies related to business model in which the rival is not considered as a determining factor to be studied and analyzed, the results of this study illustrated that failing to consider the rival and its reactions to technology acquisition leads to results contrary to what happens in real business situations. As it was stated in the section related to the simulation of dynamic models, performing the model in one phase without considering the rival and its probable reactions led to results about the revenue and profit which was not confirmed by the experts. So, in identification and analysis of business model, especially in the stage of deciding for change, it is required to take the competitors into account. The results of this study can help the future researches in this area. Also, the applied approach and the profit made from the methodology of dynamic systems to model and define the variables, the relationship among them and the related factors in a company can be a model for other studies about business. For example, the model designed for the general business model in figure 3 can be used in the studies
related to the supply chain and a company. In fact, applying the approach of dynamic systems in this study is an innovation in methodology.

Considering the nature of this study, the wide scope of the area under study, and the fact that the main factors involved in the topic of business model are qualitative, this study faced a number of limitations. These limitations included issues such as ignoring the environmental factors and future trends in areas like rules, regulations and sudden and intense changes in the market in designing the recommended methodology to change the business model. Moreover, preparation of the assumed methodology which uses the anthology of business model (BMO) to design the business model is another limitation of this study.

Future studies in changing a business model could be conducted in following areas:

1. Feasibility study of the implementation of methodology of change and updating the business model according to the company’s limitations in technology development, limitations of investment, limitations of study, research and gathering of extraggregation and intraorganization information and evaluation of the business model due to complete implementation of the recommended methodology in this study.

2. Selecting a business model, evaluating its rate of profit, methodology of change and updating the model with more emphasis on supporting the model using computer software, writing the model using more electronic-based approaches, and developing the software based on the model for cooperating companies regarding the increasing growth of these companies.

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