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A dynamic model for evaluating the effect of technology on the development of the industrial clusters using a system dynamics approach

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Abstract

The present study is problem-oriented applied research seeking to figure out the role and effect of technology models in and on the creation and development of the knowledge-based industrial clusters in Sistan and Baluchestan Province using the system dynamics approach and Vensim Simulation Method. The required information for the research has been collected through library research and field studies based on open interviews with 12 experts who have been selected via judgmental and purposive sampling methods. The research's causal diagram has been drawn following the identification of the risk indices and dimensions based on experts' notions through the use of a fuzzy analytic hierarchy process. In the end, corresponding to the system's dynamics modelling, the research's dynamic model has been designed using Vensim Software. In this regard, two objectives are sought considering the region's infrastructures and potential: the first is the improvement of the regional development through setting the required grounds and acquiring technologies effective in the development and introduction of the new industries; the second goal is an enhancement of the industries' competitive potency in terms of the industrial clusters' growth and development within the framework of the macro-level economic policies. The article can be utilized in various industrial arenas and it can also express a perspective about the industrial clusters of science and technology usable by the private sector within a development process capable of accelerating economic growth. That is because technology development is among the inevitable stages of modern technologies' advancement and use, and, in fact, research organizations should find the proper grounds for their research findings and provide the investors with their research accomplishments because it can in this way lead to the formation of novel industries and, on the other hand, heightening of the efforts parallel to the presentation of a vivid image of the potential and actual competencies to the industrial clusters which can subsequently take part in the creation of new job, entrepreneurship and innovation opportunities.

Keywords: cluster, knowledge-based, technology, development, systems dynamic method, competitiveness
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1 Introduction

During the past decades, industrial community has been playing an essential role in the development of the cities and regions ending in the formation of a new industrial organizational premise for the economic development [22].

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A prominent specimen of this activity is the centralization of the businesses in certain geographical loci that are mostly termed clusters [19]. It has been claimed that the cluster companies can gain profits as a result of geographical closeness and constant interaction by the subsidiaries [28, 29]. Clusters are recognized as the primary institutions of economic growth and innovation worldwide [17]. However, the investigation of the literature about the industrial clusters during the recent decades is reflective of the idea that many studies have investigated the industrial clusters in the advanced countries [8] and [2] wherein the industries are imperatively obliged to create a cumulative effect after reaching a certain level or stage due to constant industrialization [12]. After the cumulative industrial effect appears, industrial development is stimulated, and optimization and enhancement are carried our following which the corresponding industrial chain is absorbed for achieving scalability and efficiency [9]. In the end, the industrial clusters appear as a phenomenon [2]. The industrial clusters should seek for benefits instead of industrial competition in clusters of industrial economy for it can exert a good deal of effect on the economic development of the clusters and the peripheral regions. Thus, all of the countries around the globe are a lot worried about the development of the industrial clusters and tend to do more research in this regard [13].

Contrastingly, there is still seen the absence of a comprehensive research having systematically dealt with the dynamicity and nature of the clusters' operation in developing economies. In fact, the discrepancies about the institutional conditions between the two economies are indicative of the idea that the image of these clusters' mechanism of action in the developing environment is to a large extent incomplete [11, 18]. Therefore, researchers should be doing more studies about the capability of transferring the current clusters' theories to the newly emerging markets and developing countries [22]. This per se emphasizes on the role of the localization and background factors in the performance of the inciting clusters. Thus, concentration on this area can contribute to the recognition of a region's social, political and economic conditions [27] and it can subsequently facilitate the industrial development's advancement based on the clusters in the developing countries [7].

During the past three decades, economic and industrial development via the industrial clusters has been one of the dominant, effective and common models of economic development worldwide. Extensive paying of attention to the regional economies, particularly regional clusters, is per se an example of the extent to which this subject is significant [24]. Porter [20] put an emphasis on the importance of this subject in the development of local economy by offering the theory of industrial clusters and elaborating on the socioeconomic structure of the companies with internal and concentrated communications within a geographical district as well as with common manufacturing grounds, common opportunities along with the role of the actors of the supply and demand sides and cooperation networks. Doing so, he drew the attention of the scientific community, economic policy-makers and related organizations to the promotion of the cluster-based development; he realizes the success of the small- and medium-size business entities as resulting from their way of organizing and managing the clusters' contents and knows the absence of competent clusters and cluster-centered economic underdevelopment in these countries as the most substantial reason for their weak competitiveness [6]. Thus, extensive paying attention to the regional economies featuring the use of the most state-of-the-art technologies is expressive of an extreme emphasis on the too much importance of the subject [1, 3, 16, 21, 24]. Thus, the primary question of this research is what could be the model and the role of technology for and in the development of the industrial clusters through the use of the system dynamics approach in line with the development of the small- and medium-size industries. In Sistan and Baluchestan Province? The study also seeks accomplishing the following objectives:

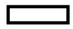
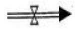
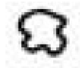
1. Identification and determination of the technology model's indices and sub-indices
2. Determination of cause-and-effect relationships between the technology model's indices and sub-indices
3. Determining the level of the technology model's indices and sub-indices
4. Modeling the dynamics of the model's indices and sub-indices

2 Dynamic System

This system plays a very important role in the analysis of the social systems and the modeling of the system's dynamics was developed by J. Forester, a professor in MIT University, during 1950s [5]. The title function is a method for investigating the systems' dynamic behaviors with an emphasis on the interrelationships of the system's constituents [5]. System dynamics approach gives a better perception of a given system's behavior thereby to be able to codify novel structures and policies for the improvement of the system's behavior further [25]. The prerequisite for modeling the system's dynamics is a systematic thinking that includes a set of chain activities beginning from conceptual activities and ending in computational and technical activities [15].

In the first step of modeling the system's dynamics and in order to better comprehend the structure of the systems, it is necessary for a modeling language to be existing. This language is called causal diagrams in the system dynamics approach. These diagrams constitute one of the most important means for the delineation of the system's feedback structure. They incorporate variables the effect of each of which on the other is showcased by some arrows. The sign $+ \longleftarrow$ designates the positive polarity and/or the co-linearity of the variables and the sign $- \longrightarrow$ denotes the negative polarity of the variables [23]. The causal relations form causal loops in reciprocating courses. A causal loop is considered as positive if the increase or decrease of a variable results in the re-increase or re-decrease thereof after the loop is passed otherwise it is called a negative loop [10]. The following table exhibits the signs and symbols used in such a kind of modeling.

Table 1: symbols used in this modeling

Name	**Symbol**
Stock	
Flow	
Spring/well	
Connectors	
Parameter	

Based on the table, inventories are expressive of accumulation and they are denoted by rectangular shapes. The inflows and outflows of an stock variable are displayed by an arrow [26]. The stock variables can only change by the flow variables. To draw the flow-stock model, Vensim Software is used. The software has been produced by Ventana System Company and it is a sort of modeling tool capable of visualizing, processing, simulating, analyzing and optimizing the dynamic systems' models; it is able to present a simple and flexible sort of simulation for the models with a lot of loops and flow and stock variables [15]. In this software and after the definition of the relationships and following the model's construction, the system's behavior can be simulated in the course of time.

System dynamics have been formed based on the theory of information-feedback and certain symbols are applied for mapping the business systems within the format of diagrams and equations; programming language is applied for computer simulations. The system dynamics technique assumes that the components are correlated within a complex pattern and that the world has been constructed of the rates, levels and feedback loops with information flow being more important than the physical flow and with non-linearity and delay being amongst the significant parts of every system [9]. The system dynamics approach aims at investigating the various potential policies based on which a system works. Amongst these policies, the policy providing the best results can be selected to be run in a modeled system [8].

3 Methodology

The present study is an applied research in terms of the objectives; it is a quantitative research in terms of the variables and it is classified as a descriptive-analytical research in terms of the nature and the method. The system conceptualization includes the demarcation of the model in respect to the preset goals [26]. Following library research and preliminary identification of the industrial clusters' dimensions and indices, field studies have been carried out to extract and moderate and revise the final variables. To collect the data, open interview has been the means used herein. The study population in this stage included a group of experts and specialists with one of the following two qualifications: 1) having at least MA degree related to the area of the industrial clusters and 2) having worked at least ten years in areas related to the industrial clusters. From amongst the qualified individuals, 12 persons were selected using judgmental-purposive sampling and subjected to open interviews. The following table shows the cognitive status of the study sample in this stage.

In the first step of AHP, the study uses the fuzzy datasets as its foundation of research. Then, it designs a model using system dynamics approach and subsequently elaborates the results of the business clusters' performance dimensions. The AHP entails pairwise comparisons and a decision-maker has to begin with delineation of his or her decisions' hierarchy; the hierarchy includes the various factors and choices that should be taken into account when

Table 2: demographic characteristics of the study sample in the conceptualization stage

Descriptive specifications		Frequency	Distribution percentage
Education	MA	7	58.4
	PhD	5	41.6
Work history	10-15 years	10	83.4
	Above 15 years	2	16.6

making a decision. Next, pairwise comparisons are made to determine and evaluate the factors. In this method, the options with the highest weights or values are selected as the best options. The numbers used in this method are the fuzzy triangular numbers. The fuzzy AHP's concepts and definitions are explicated based on the developmental analysis method. Consider the two triangular numbers, $M_1 = (l_1, m_1, u_1)$ and $M_2 = (l_2, m_2, u_2)$, shown in figure 1:

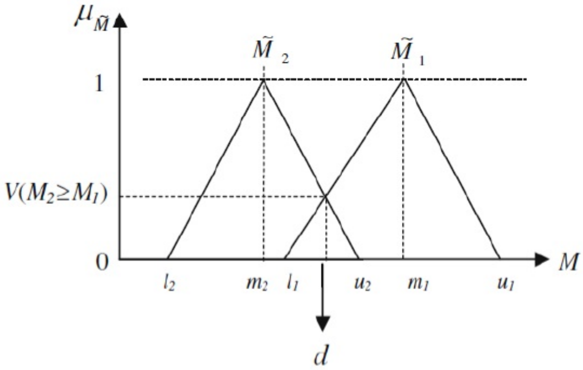


Figure 1: diagram of two triangular numbers of $M_1 = (l_1, m_1, u_1)$ and $M_2 = (l_2, m_2, u_2)$

Their mathematical operators are defined as shown below:

$$M_1 + M_2 = (l_1 + l_2, m_1 + m_2, u_1 + u_2) \tag{3.1}$$

$$M_1 \times M_2 = (l_1 \times l_2, m_1 \times m_2, u_1 \times u_2) \tag{3.2}$$

$$M_1^{-1} = \left(\frac{1}{u_1}, \frac{1}{m_1}, \frac{1}{l_1}\right) \tag{3.3}$$

It has to be noted that the sum of the two fuzzy triangular numbers' multiplication or the inverse of a fuzzy triangular number cannot be any longer a fuzzy triangular number. These relations only express an approximation of two fuzzy triangular numbers' real multiplication or the inverse of a fuzzy triangular number. In the developmental analysis method, S_k, which is itself a triangular number, is calculated as shown below for each line of the pairwise comparisons matrix:

$$S_k = \sum_{j=1}^{n} M_{kj} \times \left[\sum_{i=1}^{m}\sum_{j=1}^{n} M_{ij}\right]^{-1} \tag{3.4}$$

wherein,

$$\sum_{j=1}^{n} M_{kj} = \left(\frac{1}{\sum_{i=1}^{n} u_i}, \frac{1}{\sum_{i=1}^{n} m_i}, \frac{1}{\sum_{i=1}^{n} l_i}\right) \tag{3.5}$$

where, k denotes line number and i and j respectively indicate the options and indices. In the developmental analysis method, the S_ks are seminally calculated, and their magnitudes should be secondly obtained in respect to one another. In general, if M_1 and M_2 be two fuzzy triangular numbers, M_1's magnitude denoted as $V(M_1 \geq M_2)$, is defined with respect to M's magnitude as below:

$$V(M_1 \geq M_2) = \begin{cases} 1; & m_1 \geq m_2 \\ \frac{u_1 - l_2}{(u_1 - l_2) + (m_2 - m_1)}; & others \end{cases} \tag{3.6}$$

The magnitude of a fuzzy triangular number is obtained as shown below based on the k other fuzzy triangular numbers:

$$V(M_1 \geq M_2, ..., M_k) = \min[V(M_1 \geq M_2), ..., V(M_1 \geq M_k)]. \tag{3.7}$$

In the developmental analysis method, the following procedure is taken for calculating the weight of the indices in a pairwise comparison matrix:

$$d(A_i) = \min\{(S_i \geq S_k)\}, \quad k = 1, 2, ..., n, \; k \neq i. \tag{3.8}$$

Therefore, the indices' weights vector takes the following form, which is the very vector of the non-normed coefficients in fuzzy AHP:

$$w = (d(A_1), d(A_2), ..., d(A_n))^T \tag{3.9}$$

Modelling is a rotating and reciprocating process meaning that it influences the individuals' actions in the outside world, with the externally exhibited action having a mutual effect on the model and its correction. Therefore, the model should be revised every now and then. In proportion to the model's upgrading and its higher adaptation to reality, our understanding of the complicated peripheral world would be made more exact. Sometimes, model construction demonstrates that our image of reality has been flawed. In fact, the primary goal of modelling in the system dynamics approach is the projection of the mental presumptions and revealing of the mental models. It is in this process that the individuals figure out the fundamental differences between one another in their analyses of various problems. In other words, the system dynamics approach discloses the individuals' mental models and makes them accordingly criticizable. The modelling process takes place in various stages that will be dealt with in the forthcoming parts.

1. **Statement of the Problem:** Before anything, it has to be remembered that a problem and not a system should be modelled. Put differently; there should be initially a problem to be subsequently modelled. Unfortunately, many of the temptations urge the use of the system dynamics approach for modelling the systems that do not seem to have a problem. The second point to be noted is that the precondition for a model's success in optimization is the extent to which it enables simplification. In the same way that, to discern the dimensions of land, we use a small map in which the details are not mentioned; the unnecessary details are not also stated in the models. Otherwise, the model would be rendered a lot perplexing, and this not only fails in assisting our perception of the reality, but the comprehension of the model itself would appear troublesome. The main variables gain meanings in proportion to the problem which is going to be examined. The diagrams indicating the procedures existing amongst the primary variables, tables and reference diagrams (or reference modes as diagrams exhibiting the primary variables' variations in the course of time) are common tools applied to serve the same purpose [14].
2. **Organizing a Dynamic Hypothesis:** as understood from the name "system dynamics approach", the technique enables the modelling of the dynamic phenomena. In order to elucidate them, a dynamic hypothesis should be posited. The dynamic hypothesis is an elaboration offered by informed and specialized persons about the causes of a problem. Various individuals have different assumptions about the illumination of variegated phenomena. In this section, the model's duty is to gain information about such elaborations and not trying to criticize them [14]. Delimitation of the model and its constituent variables is one of the most important steps of this stage and it has to be taken with due care. In case that the model's boundary are defined very large, it should consequently embrace a lot of variables that might be envisioned unnecessary and just cause the model to become more complicated. Separation based on the variables' exogenous-endogenous nature should be brought about when selecting them and this presumption should be clearly and explicitly announced in the beginning because some models have been found failed as a result of the erroneousness of this presumption. Dynamic theorization refers to the discovery of the causal structures explaining the reason why a problem has come about [30].
3. **Model Simulation:** after the variables were defined and their interrelationships were determined, their cause-and-effect diagram is drawn (the diagram shows how the system's components interact); and, afterwards, the variables are more precisely investigated so that their kinds (stock or level) can be determined. Then, the flow diagram is drawn in respect to the type of the variables. Next, the turn comes for formulating these relationships. Afterwards, the prepared model is given to a computer for writing the formulas that can elucidate the quality of the variables' interaction thereby to get the simulation model ready for running. After the initial designing, the model should be validated [10]. Numerous tests have been proposed for the validation of dynamic models and they are usually divided into two sets of the structural and behavioural tests [4]. The test used in this research paper is of the boundary conditions type considering the study objective that is modelling the effect of

technology on the development of the industrial clusters. The test indicates whether the system showcases an expected behaviour or not.

4. **Model Validation:** then, it has to be seen whether the designed model exhibits a behavior similar to its past and existing ones or not? If the model cannot simulate a type of behavior similar to the past performance of the intended variables, its prediction results would be definitely misleading. Implicitly, it means that the model should be redesigned. Moreover, the model's efficiency is challenged by investigating the special states (for example, no sales should be existing when the production is zero and the inventory is also zero. Does the model show the same thing?) [30].
   In case of the model's success, it can be used for simulating the effects of various policy-making and implementing of various scenarios and examination of the outcomes. Furthermore, the sensitivity of the variables' behaviors to the existence or nonexistence as well as increase or decrease and abrupt change in the behaviour of some of the variables can be explored. For instance, how the primary variables of the model are influenced by the elimination of the investments or sudden increase in the investments or so forth?
5. **Implementation of the Scenarios:** this stage incorporates all of the interventions that should be made parallel to the execution of the strategy adopted from the real world in the previous stage [30].

4 Findings

4.1 Role of Technology in Cluster Development

In order to prevent the immethodical complexity of the model, the most important factors are inserted based on the priority of their effects on the codification of a dynamic model of industrial clusters with an emphasis on the sustainability indices of the business clusters. Thus, the model would very well depict the statuses of the system and the interaction of its key elements. Following enquiring ideas from the experts about the method of the variables' interrelationships, numerical functions were applied to form an equation based on the experts' perspective. The equations pertinent to the unit performance of the technological development are as explained below:

Table 3: equations pertaining to the unit performance of the technological development

Number	Formula	Explanations
1	Technology development project= INTEG (tech development definition-tech Development fulfillment,2) Units: project	The number of the technology development projects is a stock obtained from the difference between the percentage of the finished projects and the percentage of the defined projects.
2	Production capacity= INTEG (+capacity Increase-capacity depreciation, 10000) Units:ton	Production capacity is a stock obtained from the difference between the rate of capacity enhancement and the rate of depreciation.
3	Tech development fulfillment= tech rate Units: project/ week	Rate/number of the defined technology development projects

Development of the small- and medium-size industries is conducted parallel to the production capacity augmentation based on novel technologies in case the budget al.location to the technology development projects is guaranteed. Since the capacity for the application of modern technology is reflective of maximum production capacity, its increase and decrease have been taken into consideration herein.

Increase in the capacity is a function of minimum production volume and production capacity rate with the latter being determined based on the rate of the technology development projects' fulfilment. The reduction or depreciation of the production capacity, as well, depends on the amount of production which is decreased with the increase in the production rate (SP1).

Figure 3 shows that the growth in the technology development projects is ascending in the beginning in match with the reference behaviour and it would become descending after a relatively constant trend.

4.2 Policy of Technology Development Projects' Increase

The policy of increasing the number of technology development projects has been studied. The increase in the number of the technology development projects through the elevation of the production capacity brings about enhancement in the flexibility in addition to the increase in the number of R&D projects for a company. Innovation adds

4	Tech development fulfillment=ZIDZ (Technology development project tech fulfill during) Units: project/ week	The rate/number of the completed technology development projects is obtained by dividing the number of the technology development projects by the project completion period.
5	Capacity increase= min production Volume* production Capacity rate Units: ton/ week	The capacity enhancement rate is the product of multiplying the minimum production volume by the production capacity rate
6	Capacity depreciation =S P1*u1/ production Capacity Units: ton/ week	The depreciation rate is the product of multiplying the production rate in the minimum tonnage by the production capacity
7	U1=40 Units: ton	Minimum tonnage is applied for unit conversion
8	production Capacity rate=f8(tech development fulfillment) Units: Dmnl	The production capacity/rate is a function of the rate/number of the completed technology development projects.
9	F8((0,0)-(10,20),(0,0),(0.2,1),(0.4,1.5),(1,2.5),(2,4),(4,9),(5,12)) Units: Dmnl	The table-valued function includes the relationships between the rate/number of the completed technology development projects and the production capacity/rate.
10	Tech rate= IF THEN ELSE(SMOOTH(tech development Fulfillment, time to adjust Tech)+ depreciation effect<f5(technology Development C), depreciation effect+ SMOOTH(tech development Fulfillment, time to adjust tech), f5(technology Development C)) Units: project/ week	Technology development rate: if the rate/number of the completed technology development projects plus the lower depreciation effect be the number of the projects to which budgets have been allocated, the technology development rate would be the number of the completed technology development projects plus the depreciation otherwise it is the number of projects to which enough budget has been allocated.
11	F5 ([(0,0)-(3.40282e+038,5)], (0,0), (1e+009,2), (1e+013,2.5), (1e+017,3), (1e+020,3.5), (1e+023,3.8), (1e+026,4.3), (9e+037,5)) Units: Dmnl	Table-valued function includes the relationships between the budget and the number of the technology development projects.
12	Technology Development C=0.999*Asset Units: rial/week	Technology development budget
13	Depreciation effect=f22(capacity Depreciation) Units: project/ week	Depreciation is a function of the capacity depreciation rate.
14	F22 ([(0,0)-(40,10)], (0,0), (5,0), (10,0.3), (20,0.5), (30,0.75), (35,1), (40,1.2)) Units: Dmnl	Table-valued function includes the relationship between the rate of the capacity depreciation and the effect of depreciation.
15	Max volume Devalopment=f13(production Capacity) Units: Dmnl	The maximum development capacity is a function of production capacity.
16	F13 ([(0,0)-(40000,5)], (0,0), (7000,1), (7860,1.5), (9000,2), (10000,3), (15000,3.5), (20000,4), (30000,4.5), 40000,5)) Units: Dmnl	Table-valued function includes the relationship between the production capacity and maximum development capacity.
17	Min volume Devalopment=f12 (min Production volume) Units: Dmnl	Minimum development capacity is a function of minimum production capacity.
18	F12 ([(0,0)-(10000,5)], (0,5), (2,4.8), (12.9969,4.4) (23,4.2), (34,4.1), (43,4), (55,3.5), (70,3), (100,2), (1000,1), (10000,0)) Units: Dmnl	The table-valued function includes the relationship between the minimum production capacity and minimum development capacity.
19	Min Production volume=40 Units: ton/ week	Minimum production capacity
20	Tech fulfill during=144 Units: week	Technology development project's completion period

21	Time to adjust tech=48 Units: ton/ week	Adjusted period of a new technology development project

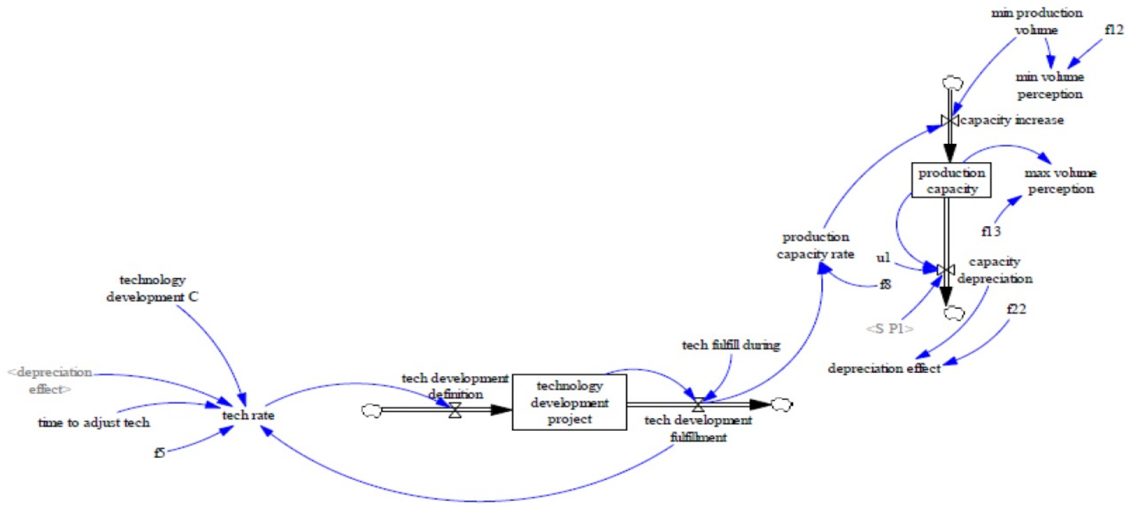


Figure 2: unit performance of technology development

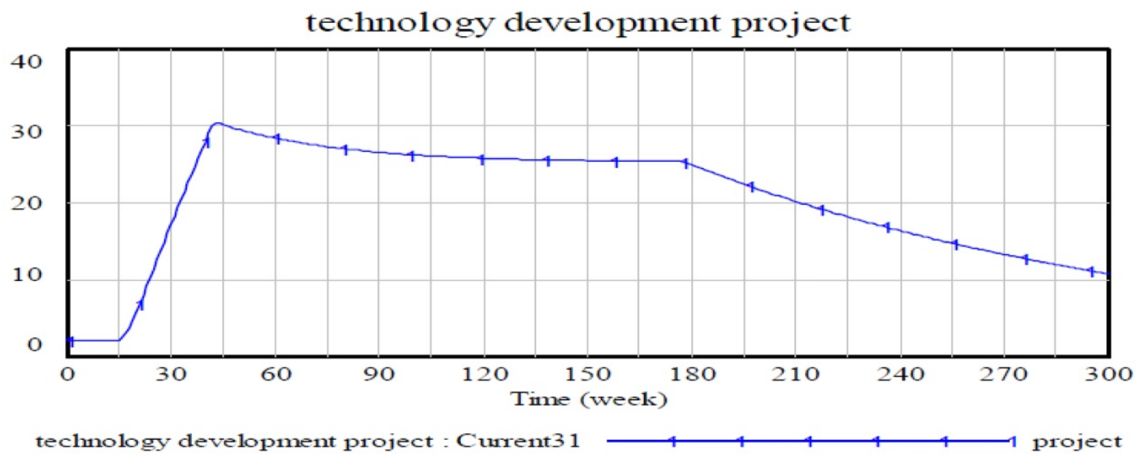


Figure 3: stock behaviour of the technology development projects

to the development, and it is with the improvement in the quality of the projects that the development can also be somewhat advanced. In addition, it is with the increase in the production capacity that the development is advanced more with it, gradually enabling to render development more persistent.

It is worth mentioning that the present study has used boundary and excessive amounts for testing the policies so as to clarify the effect of the factors giving rise to the enhancement of production leverages on the development of quality and innovation based on the industrial clusters' persistency indices. Additionally, the study also expresses the spans of time during which the changes in the production leverages and the exertion of the policies have influenced the production persistence. It is worth mentioning that the enhancement of persistence is a good indicator of the development-oriented strategy, and the decline in persistence means that the adopted strategy does not serve development. In the meanwhile, a combination of the production leverages' modification can be used for the exertion of policies.

Scenario One:

In this scenario, in order to codify the dynamic model of the industrial cluster's development with an emphasis on the development of industrial business clusters, it is suggested that the managers should focus in the short run on the reduction of the work situations' differences and their own conflicts. To do so, the managers should make plans for

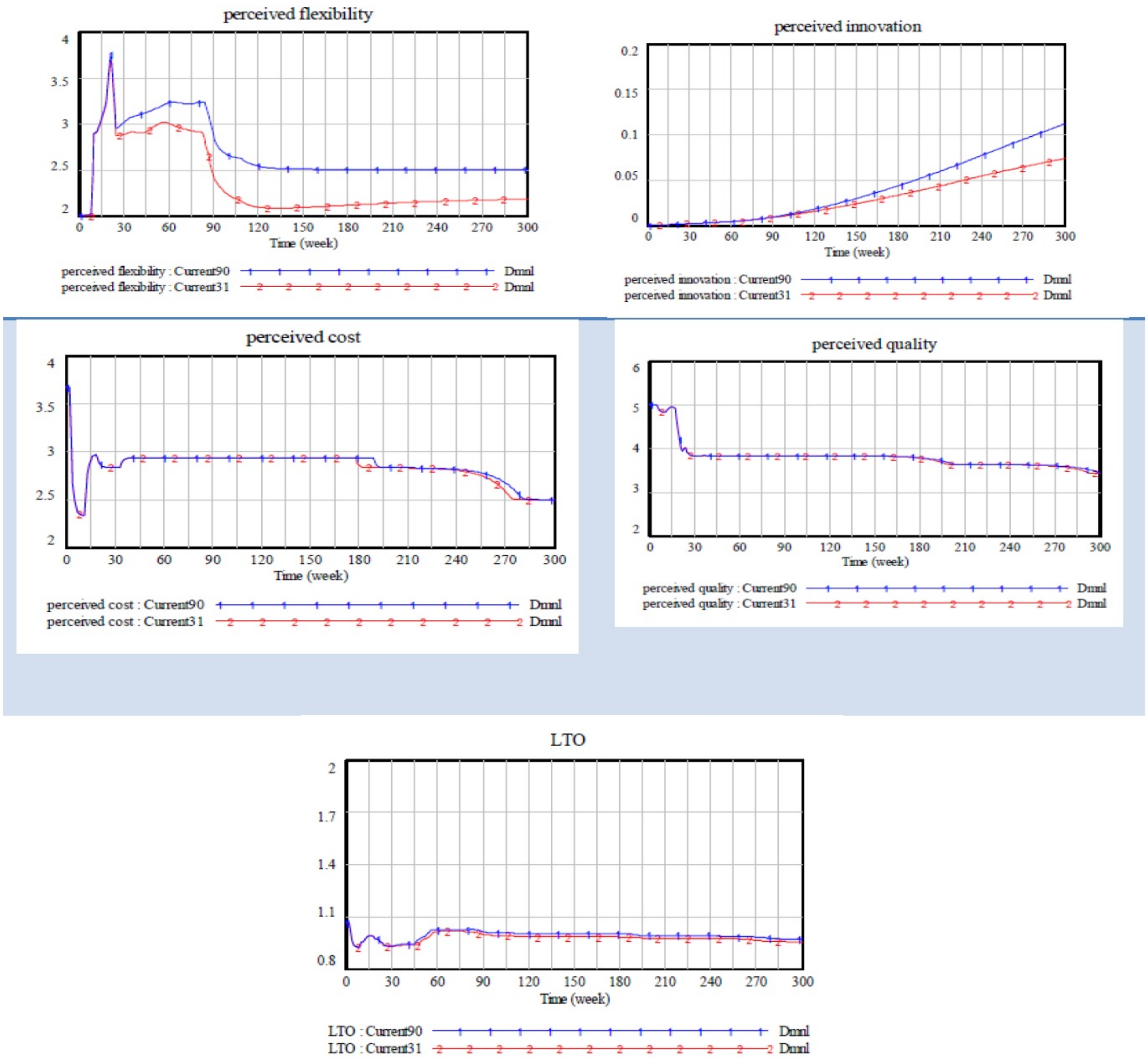


Figure 4: policy of increasing the number of technology development projects

reducing the differences in the work levels to a 0.2 value and set conflicts resolution rate at 0.4. the behavior of the model's key variables following the first scenario's simulation can be observed in figure 5.

Scenario Two:

It is suggested in the second scenario that, besides the implementation of the first scenario, the business clusters should be seeking to resolve the non-functional contradictions of the system in the long run and bring them to a minimum possible amount. Therefore, the level of the non-functional conflict should be decreased to 0.1, and, then the changes of the key variables' behaviours should be subsequently tracked. The behaviours of the model's key variables following the second scenario's simulation can be seen in figure 6.

Since there is a dynamic relationship between the indicators influencing the codification of a dynamic model for the industrial clusters' development with an emphasis on the industrial clusters' development indices, it can be stated that the codified model also enjoys a structure for the dynamic strategy development, as well. Accordingly, the companies should not just concentrate on one factor when forming business clusters. Rather they should adopt a full-scale approach. The model proposed in this research can considerably assist the accomplishment of this important objective and help the companies succeed.

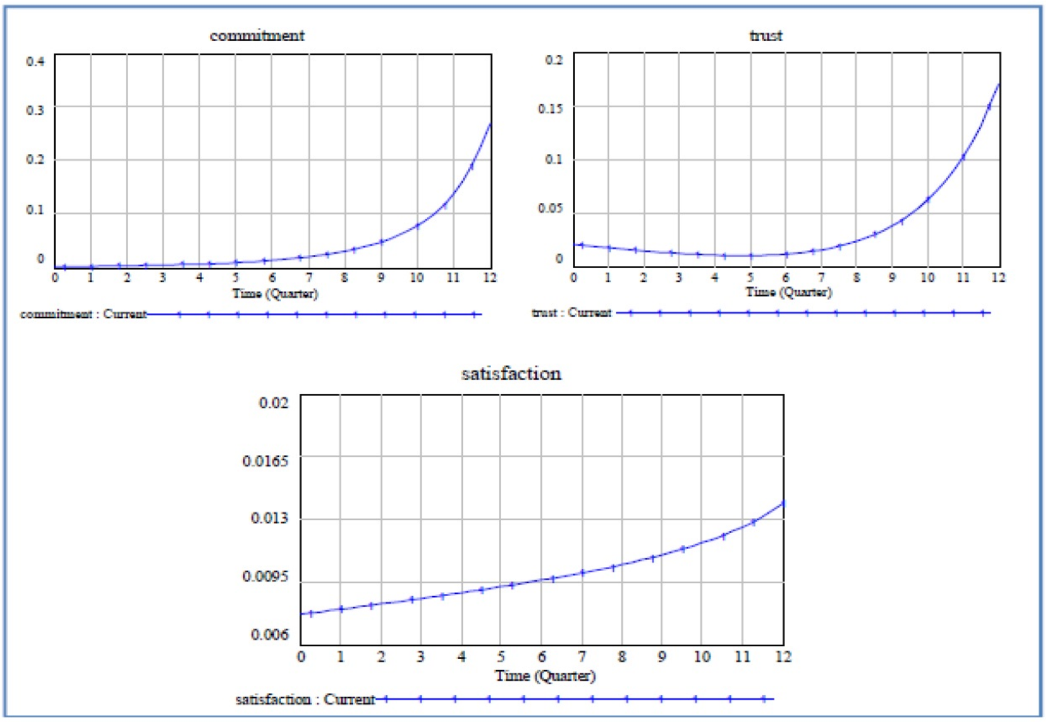


Figure 5: results of the first scenario's implementation

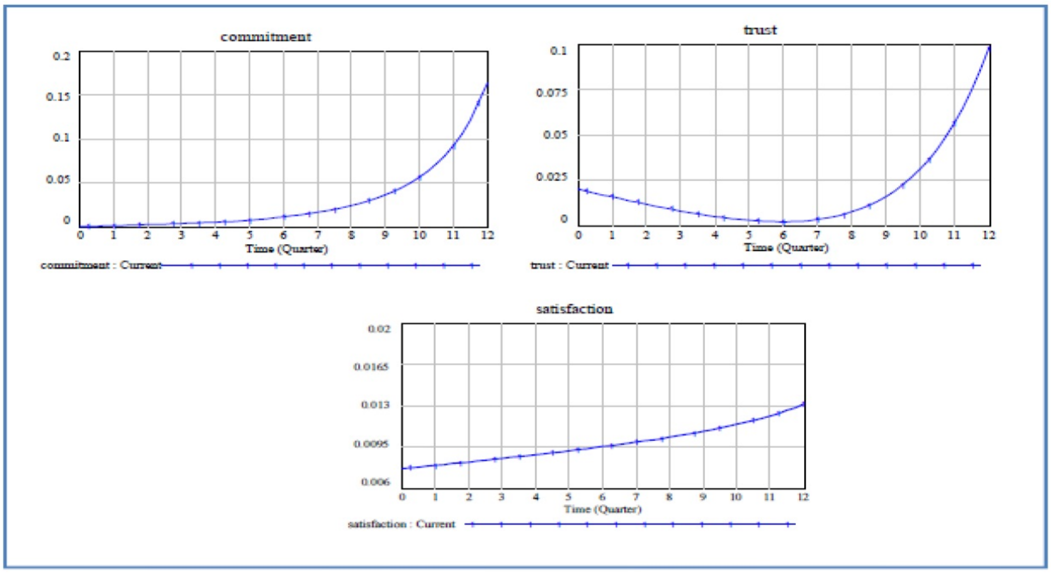


Figure 6: results of the second scenario's implementation

5 Discussions and Conclusion

The results obtained from the scenarios' analysis are indicative of the idea that paying attention to the long-term output is of great importance within the structure of collaborations between the suppliers and the business partners. In shaping the key factors of codifying a dynamic model for economic development with an emphasis on the business clusters development indices, it is necessary to concentrate on the idea that the long-term output should be examined within all the short periods. It can be also asserted that, based on the notions of the experts, the most important accomplishment of the present research is the transferring of the dynamicity concept to the economic development of the industrial clusters and their structure of the variables' dynamic interrelationships. Indeed, the present research has been conducted in the hope of bringing about changes in the perspectives of the growth managers and proctors as well as development in this important, complex and dynamic phenomenon. Moreover, the present study's results can be outlined as beneath:

1. After the cause-and-effect model proposed herein was investigated, it was made clear that factors like technology and commitment, mutual trust and satisfaction of cooperation play an essential role in enhancing the development of the industrial clusters in less privileged provinces.
2. Based on the results of the scenarios' analyses, the active companies of the province can make efforts in line with the economic development of the province's cities and development of the industrial clusters via short-term planning for reducing the non-functional conflicts, rendering the companies' statuses transparent, creation of a common sense between them and reduction of the existing conflicts.
3. Considering the examined scenarios, in line with mitigating the effect of such a factor as the differences in the marketing activities' grounds within the structure of the industrial business clusters and based on the experts' ideas, the companies should choose partners and suppliers who share their expertise in sales market and supply of raw material and quality enhancement. They can also improve the information transferring and apportionment to make things more transparent and get involved in more interactions so as to reduce the economic and bioenvironmental damages.
4. The industrial clusters' managers should concentrate on relational marketing concepts that influence the mutual trust for it has an effect on their commitment that per se influences persistence of industrial development.
5. To enhance the industrial clusters' persistency, industrial clusters' managers can make plans for solidifying their relationships and communications for the marketplace's satisfaction is closely intertwined with the persistence of the industrial development.
6. From the perspective of the managers, technology, innovation, quality enhancement and flexibility elevation are in this competitive world the prerequisites of the developed companies' survival. However, it has to be stated that the Iranian companies have not perceived challenges like competition in free markets and they should be accordingly making expedient plans in line with the sublimation in the competitive markets.

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