



Proceedings of the First National Conference of the Iranian System Dynamics Society

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The First National Conference of the Iranian System Dynamics Society

December 21, 2017

Sharif University of Technology, Tehran, Iran

Conference Chairs

Ali Naghi Mashayekhi

Scientific Committee Chairs

Mohammad Reza Hamidizadeh

Organizing Chairs

Ali Haji Gholam Saryazdi

Conference Threads

System Dynamics Methodology

System Dynamics Application

Important Date

Full paper submission

November 21, 2017

Notification of Acceptance

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Submission website

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The Iranian System Dynamics Society Office

Graduate School of Management and Economics

Sharif University of Technology, Teymori Blvd., Habibolahi Ave., Azadi St., Tehran, Iran



Introduction

The first national conference of the Iranian system dynamics society was held at the Sharif University of Technology in 2017. The chairpersons of the conferences were as follows:



**President of the conference:
Ali Naghi Mashayekhi**



**Science committee chair:
Mohammad Reza Hamidizadeh**



**Organizing Chair:
Ali Haji GholamSaryazdi**

Held panels and article's abstracts

Panel members: Dr. AliNaghi Mashayekhi, Dr Ali RajabZadeh Ghatari

- ❖ **Article : A dynamic model to determine the way of oil revenue allocation in order to develop new energies in the country**
- ❖ **Article: Development and Analysis of a System Dynamics Model for investigating therelationship Between Oil Price and the Inflation Rate in I.R Iran.**
- ❖ **Article: Policy Making in Cement Industry for Mitigation of Energy Consumption and CO2Emission Using System Dynamics Approach**
- ❖ **Article: Presenting a model of forecasting the container terminal's function in ports with system dynamics approach**
- ❖ **Article: Simulation of Iran's crude oil production based on Hubert's theory**



A dynamic model to determine the way of oil revenue allocation in order to develop new energies in the country

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Abstract

Since the resources of fossil fuels are exhaustible and these energies are to a great extent pollutant of environment, it is required for sustainable development to decrease the share of these fuels in country energy basket and to substitute them with renewable energy consumption.

The relative value of renewable power purchase cost by government to its finished price is an important variable brings about the cooperation of private sector in development and production of these kinds of energies in present study, the structure and ways of oil income allocation to the development production of renewable energy using dynamic system tools are investigated. after model simulation, present study validates suggested model using 3 methods of structural behavior reconstruction, after confirmation of model validity using 6 different scenarios, the result of model simulation has been analyzed . finally, 2scenarios have been considered. In first scenario, the results indicated that the allocation of 5 percent of oil income to FIT price increase will result in the increase of production capacity of private sector by 164 percent the result of second scenario showed that the increase in FIT price from 0.18 to 0.1 , 0.18 and 0.3 from 1395 to 1404 will result in changing renewable power production capacity to 3.0, 3.6 and 4.5 respectively.

Keywords: system dynamic, fossil fuels, renewable energy, wind power.

Development and Analysis of a System Dynamics Model for investigating the relationship Between Oil Price and the Inflation Rate in I.R Iran.

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Abstract

Obviously, there is no need to talk about the significant importance of oil price over the whole body of Iranian economy. All of the economic variables will strongly react to the changes in the oil price. On the other hand, one of the most important and most prevailing topics of Iran today's society is the inflation rate. In this work, we tried to develop a system dynamics model in order to analyze the effects of changes in the oil price on some of the economic variables of Islamic Republic of Iran; especially inflation rate. After developing the model, we have used the historical data to validate the results of our model. Furthermore, we developed some practical scenarios for controlling the effects of changes in the oil price. We suggest scenarios such as: distribution of saving bonds, shocks to oil price and non-oil export. As an important result, we show that, unlike the oil export, the non-oil export has a significant role in declining and controlling the inflation rate in the I.R. IRAN economy.

Keywords: Historical data, System dynamics, Oil price, Inflation rate, Oil export, Non-oil export.

Policy Making in Cement Industry for Mitigation of Energy Consumption and CO₂Emission Using System Dynamics Approach

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Abstract

Today, energy access is one of the most challenging issues in the world. Due to limitation of energy resources and the rapid rise of energy carriers' tariffs in Iran, identifying the methods and the strategies for energy management in energy intensive industries such as cement is imperative. In this regard, this paper evaluates the opportunities for reducing energy consumption and CO₂emission in the cement industr. A system dynamics model is developed under three energy efficient technologies (clinker substitution, alternative fuels and waste heat recovery) over a period of 20 years. The simulation results indicate that utilizing clinker substitution in producing cement, could potentially lead to reductions of 15% and 13%, respectively in energy consumption and CO₂emission. Hence, it can be considered as one of the most influential policies in energy management to achieve sustainable cement production.

Keywords: cement industry, energy efficiency technologies, system dynamics,sustainable development

Presenting a model of forecasting the container terminal's function in ports with system dynamics approach

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Abstract

Due to the nature of the causal maritime transport sector and interaction of variables in this section as well as the complexities, System dynamics (SD) approach is used to measure and forecast port performance. This paper concerns the performance in terms of the number of container loading and unloading of container terminal, ship turnaround time in port and berth occupied percentage. Historical data of Shahid Rajae from 1384 to 1394 is used to valid proposed model. The results of simulation show that by increasing one more gantry crane, the container throughput increase 12/5% and the average service time decrease about 30%. By investing and developing one berth more, the throughput increase 4% and average service time decrease about 37%. Whereas by increasing one more gantry crane and berth, the throughput increase 37% and average service time decrease about 45%. The proposed model can help port managers to see the effects of their decisions on future port performance and design policies that lead to desired consequences.

Key Words: System Dynamics, Performance, Container Terminal, Forecast, Shahid Rajae Port

Simulation of Iran's crude oil production based on Hubert's theory

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abstract

Crude oil is an exhaustible source of energy. According to Hubbert's theory, oil production tends to follow a bell-shaped pattern and after a peak in oil production, it is running the downward path. In this study, oil production was simulated in the horizon between 2006 and 1435 by using system dynamics and Hubbert's peak theory. According to the results of the simulation, provided with happening required investment and non-accelerating extraction by neighbor countries from pool resource, the peak of the country's crude oil production would be in the year of 1411 with a peak production of 1970 million barrels per year. Due to the ever-increasing trend of domestic energy consumption, this suggests that limited time remained to transform oil export revenues into competitive industrial infrastructure. Of course, upgrading the oil field recovery rate from 27 to 35 can move the peak to year 1425 by the peak production of 1425 million barrel per year. Estimating the huge revenues generated by this upgrading can be a good incentive for policy makers' efforts for attracting investment with this regard.

Keywords: Peak Oil Production, System Dynamics, Oil recovery factor, Decision Support System.

Panel members: Dr. Mohammad Saleh Owlia, Dr. Nasim Nahavandi

- ❖ **Article Dynamic Analysis of Knowledge Management in Imam Ali's Sire**
- ❖ **Article Aging chain simulation of faculty members' promotion using system dynamics**
- ❖ **Article Stimulation of the Fluctuations in Customer Orders of an Air Conditioner Assembly Manufacturer: A System Dynamics Approach**
- ❖ **Article Providing a Dynamic Model to Examine the Influence of Innovation Dimensions on New Product Development**
- ❖ **Article A Systematic Review of System Dynamics Literature in Iran**



Dynamic Analysis of Knowledge Management in Imam Ali's Sire

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Abstract

Considering the importance of knowledge management (KM) in organizations; in this article we have tried to find out Attitudes and important points about Knowledge management in Imam Ali's Sire and provide some strategies to improve KM in organizations and facilitate the implementation of it.

In this article, based on the knowledge management cycle, we investigated in Nahj al-Balaghah & Qorar al-Hekam and Dorar al-Kalem, then the reinforcing and balancing Dynamism identified and has been modeled based on System Dynamics approach. In the following, we tested the model then formulated and simulated it.

At the end, based on simulated results, we suggested some strategies: identify Knowledge Separation Indicators, KM strategy based on need of individual, moving towards creating an learning organization through the learning of each individual, Identifying barriers to knowledge sharing and its growth engines, Developing an appropriate human resource training strategy.

Keywords: Imam Ali's Sire, Nahj al-Balaghah, Qorar al-Hekam and Dorar al-Kalem, Knowledge Management, System Dynamics Approach.

Aging chain simulation of faculty members' promotion using system dynamics (Case Study: Ferdowsi University of Mashhad)

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Abstract

Undoubtedly considering human resource planning in organizations can contribute to their sustainability and competitiveness. However, aging chains and various factors are beneficial in this planning. On the other hand, one of the most important sectors of science and technology in each country is universities of those countries and naturally, efficiency of university's structure has a direct and close relationship with realization of the goals of science and technology system in each country. In universities, giving direction to academic activities of university is based on the process that university professors follow. One of the important issues with great impact on this process is planning for recruitment and promotion of faculty members. However, various and complex factors affect this process, while a large part of these factors are intangible and unknown. One of the tools for understanding dynamic environments is system dynamics. In this article, we attempt using system dynamics to model the status of faculty members of Ferdowsi University of Mashhad. Considering the current state of faculty members of Ferdowsi University of Mashhad, the dynamic hypotheses of research were developed and a conceptual model was presented. In order to find the causal relationships and the loops governing on model, we used comments provided by experts. Using existing data set of university, the final phase of analysis i.e. validation model and future behavior of the system simulated and validated by applying the Vensim software. Identified behaviors with current policies, indicate leap and decline behavior for academic degree of (lecturer/instructor to associate professor) and S-shape behavior for the level of full professorship.

Keywords: Human resource planning; Promotion System; System Dynamics; Faculty member.

Stimulation of the Fluctuations in Customer Orders of an Air Conditioner Assembly Manufacturer: A System Dynamics Approach

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Abstract

Inefficient management of the orders leads to problems such as delay in timely delivery of goods, loss of the key customers, and finally reduction of the revenues and profits of the companies. Hence, proper management of the customer orders plays a key role in success of the companies. This study stimulates the systemic patterns of customer orders of an air conditioner assembly manufacturer using system dynamics approach. Analysis and stimulation were performed using Vensim DSS software. The obtained results show that production costs and marketing budgets have a great impact on fluctuations of the key variables such as customer orders and sales personnel. Finally, the value change scenario suggests that income elasticity of air conditioners is approximately less than one. In other words, by increasing the incomes, no significant changes have been created in the amount of the company's purchases over time. In addition, in the structural change scenario, it was found that in case of exceeding the rate of receipt of orders on their delivery rates, reducing marketing budgets, and in the event of exceeding the rate of delivery of orders from their rate of receipt, promotional activities in order to increasing the sales effectiveness, have a significant role in reducing and balancing the fluctuations in customer orders. Finally, this model can be used by the policy makers and planners in the assembly industry in general and in air conditioning and refrigeration systems in particular.

Key Words: Simulation, System Dynamics, Fluctuations in Orders, Air Conditioners.

Providing a Dynamic Model to Examine the Influence of Innovation Dimensions on New Product Development

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Abstract

Successful new product development projects are one of the most controversial issues in business studies. Identifying the drivers for improving the efficiency of new product development process in an organization is always as important as to maintain this efficiency. In this paper a systematic approach has been conducted to review the literature and exploit the dimensions of innovation in new product development as the importance of innovation in new product development is apparent. It is also important to define and also refine the exploited dimensions' indicators so as to provide a set of variables which can be used for dynamic modeling. Content Validity Index (CVI) has been used to address this and after that a dynamic model of innovation dimensions in new product development has been conducted. The final dynamic model consider both the growth manner of the system and the barriers to growth but of course in this paper researchers emphasized only on conducting the casual loops of innovation dimensions in new product development and apparently using verifying methods to confirm the model and following that simulate it to examine policies is on going for further papers from authors.

Keywords: System Dynamics, New Product Development, Innovation, Innovation Dimensions

A Systematic Review of System Dynamics Literature in Iran

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Abstract

The system dynamics approach is a method for modeling complex dynamic problems in various fields that has grown dramatically since its development in the 1950s. One of the areas of growth of this approach is its expansion in various countries and reputable universities of the world as an academic discipline. Meanwhile, Iran is among the leading countries in the number of students, professors and researchers in this approach, as well as the system dynamics courses. Therefore, many studies have been carried out by Iranians in this approach which requires their integrated review to determine the trend of research by identifying the focal points of interest to Iranian researchers and existing research vacuum and suggestions for future research. As a result, this paper aims to study comprehensive literature related to Iranian research in the system dynamics approach. In this paper, by systematically reviewing the 166 published Iranian articles by the year 2017 in the field of system dynamics approach, a summary of the researches has been done.

Keywords: System Dynamics Approach, Systematic Review of the Literature, Iran.

Panel Members: Dr. Ali Rajab Zadeh Ghatari, Dr. Mohammad Saleh Owlia

- ❖ **Article: Profitability Paradox of Iran's Commercial Banks: A System Dynamics Model**
- ❖ **Article: Identification and modeling of effective mechanisms of financial empowerment of people in health care and its effect on reducing health system costs with system dynamics (sd) approach**
- ❖ **Article: The Impact of Provisionings Policies on Non-Performing Loans' Changes: The System Dynamics Approach**
- ❖ **Article: Designing a Simulation Model for Project Portfolio Management in software developing companies**
- ❖ **Article: Evaluation of Different Strategies for Maintenance of Medical Equipment with the Dynamic Systems Simulation Approach**



Profitability Paradox of Iran's Commercial Banks: A System Dynamics Model

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Abstract

Iran's banking system, regarded as one of the important sources of funding, has a critical role in Iran's economy. Commercial banks in Iran depend on their business model can not generating sustainable profitability for stakeholders. For many years, banks have been earning profit by appealing deposits and providing facilities to their customers, but performance indicators show that this mechanism has not been able to lead to expected profitability for stakeholders. The major challenge is the design of a business model with a linear approach to profitability. Implementing such a model increases risk-weighted assets, decreases the capital adequacy ratio for the banks, and reduces the stock value of the stakeholders which this is unexpected result and against the primary purpose of designing a business model (profitability). This is known as banking paradox. To find out the causal structure of this problem, and to provide an effective solution into managing it, the system dynamics methodology has been used in which by developing a mathematical model, one can generate and simulate the results of the implementing different scenarios. The results of this study show that changes in a set of parameters affecting the national banking structure, e.g. deposit interest rate, facilities and loans interest rate, and reserve ratio, would not result in riddance from profitability paradox. The appropriate strategy for achieving profitability and a sustainable value for the stakeholders is to change banking business model from loans and facilities-based structure to service-based structure, and to earn profit from fees gathered for providing services to customers of the bank.

Keywords: Business Model, Profitability, Intrest-Incom, Non-Interest Income, Capital Adequacy Ratio, Banking Paradox

Identification and modeling of effective mechanisms of financial empowerment of people in health care and its effect on reducing health system costs with system dynamics (sd) approach

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Abstract

The participation of people in their health affairs needs to empower them to improve the health system, which has always been one of the most important issues in developed and developing countries. Since the empowerment of people takes place through different strategies and mechanisms, the identification of the most effective empowerment mechanisms is of high importance. One of the important strategies is the financial empowerment of individuals, which is faced with limited execution capability due to limited budget allocations.

In the health system, policy-making and decision-making related to empowerment for achieving desired outcomes are implemented with a long-term vision. Because most of the health system issues and problems are often based on existing delays and system feedback, which results in huge costs in health systems. In this paper, using the system dynamics approach, financial empowerment mechanisms of individuals in the field of health and their impact on reducing health system costs are identified. Therefore, after literature review, a semi-structured interview with the experts was conducted, and influential variables on the reduction of health system costs with increasing financial ability and access to health services in the health field were identified. Then, the feedback loops, Casual loop diagrams were designed by Vensim software, and an integrated model for illustrating the mechanisms and their effects was presented. Such a model can provide a better understanding of the interrelationships of variables, for policy making.

Keywords:empowerment, system dynamics (sd) approach, Casual loop diagram,

The Impact of Provisionings Policies on Non-Performing Loans' Changes: The System Dynamics Approach

Ali Hosseinpour and Mohammad Ebrahim Aghababaei

Abstract

The central bank has regulated regulations, including asset classification guidelines and how to loan loss provisioning with the aim of overseeing banks and credit institutions. In the process of provisionings, the central bank seeks to improve the quality of facilities and reduce the amount of non-performing loans' accumulation by reducing the revenues of the bank or credit institution through imposing fine on balance of each of the categories of non-performing loans. In this study, the effectiveness of this policy has been investigated using the system dynamics method. The results of the research indicate that the application of the above policy would at least lead to a 17% reduction in the amount of non-performing loans' accumulation. Research suggests that, if the coverage factor of pledge is increased during the provision of facilities by bank, the effectiveness of the policy in the fight against the accumulation of non-performing loans will be eliminated. This phenomenon suggests that the central bank needs to focus more on preventive regulatory approaches than on a priori methods in monitoring the functioning of credit institutions in providing facilities.

Keywords: Monetary Policy, System Dynamics, Non-performing loans

Designing a Simulation Model for Project Portfolio Management in software developing companies

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Abstract

The role of software and software systems in organizations and complex managing systems in recent years has increased significantly, and software is a key factor in the success of organizations and companies. Hence, the demand for software development in the past two decades has led to companies paying more attention to software development methods and management patterns. The managing multiple projects simultaneously in a software development company because of the intangible nature of these projects, processes, including product development processes, delivering products to customers and cash flow, is complicated. The development of software systems with various issues such as cost overruns, delays in delivery of projects, reliability and user dissatisfaction is facing down. These problems, despite the remarkable progress in the field of software engineering to overcome the difficulties of software production, are still in force. In this study, a model to simulate the dynamics of the system is investigated. This model consists of four subsystems, human resources, production, finance and sale, which can be used in decision-making and analyzing software portfolio management. For simulation of this model, Vensim PLE is used. At the end, this model was used to analyze the different software management policies.

Keywords: Project Portfolio Management; Simulation; System Dynamics; Software Projects

Evaluation of Different Strategies for Maintenance of Medical Equipment with the Dynamic Systems Simulation Approach

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Abstract

Proper maintenance strategies reduce overall operating cost of medical equipment and lead to an increase in the availability of equipment. In fact, this study seeks to optimal strategy to increase access to medical facilities, reduce the cost of maintenance and increase its overall net worth of equipment maintenance system. This study wants to design a system dynamic simulation model to evaluate the contribution of preventive and corrective maintenance actions and strategies to improve the overall performance of medical equipment. In this regard, the key variables of the medical equipment maintenance and repair system identified, causal relationships formulated in the form of rings and then by designing the original model in the form of stock and flow charts with the Vensim software simulation is completed. Simulation results show that Increasing preventive maintenance actions by reducing the need for corrective action, leading to an increase in the availability of equipment and reduce the cost of maintenance. Ratio of Change of resources and the allocation to each of corrective and preventive maintenance measures through the simulation and according to the primary and secondary variables of case study (Razavi Hospital) is obtained. Simulation model for other hospitals consider to their internal conditions can be implemented.

Keywords: maintenance and repair system, maintenance and repair strategies, Dynamics systems, Causal loop diagram, Stock and flow diagram

Panel Members: Dr. masoud Rabie, Dr. Nasim Nahavandi

- ❖ **Article: A Dynamic Model of Traffic Accidents leads to Injury and Death Caused by Human Factors**
- ❖ **Article: Dynamics of Airline industry Earnings due to airfleet expansion**
- ❖ **Article: Forecasting Amount of Shiraz Air Pollution Based on CO and Particulate by Using System Dynamics Method**
- ❖ **Article: Export Strategy for Oil and Natural Gas: Aggressive or Conservatorial?**
- ❖ **Article: A dynamic model to improve customer absorption in NPD**



A Dynamic Model of Traffic Accidents leads to Injury and Death Caused by Human Factors

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Abstract:

Iran is in the third placed of death caused by traffic accidents in the world and human factors is one of the most important effective factors on it. This paper aims to present a dynamic model of traffic accidents leads to injury and death caused by human factors. To study human factors, the data collected by literature review and open interview by 14 experts chosen as researchers' judgment. Dynamic model is plotted by VENSIM based on system dynamics approach after determining causal relations between human factors and traffic accidents. To validate the model by system behavior reproduction test, the data collected from traffic police from 2015 to 2016. Coefficient of determination between real data and simulated data determined 0.998. The model was simulated from 2016 to 2026 to analyze current and future policies. As a result, accidents because of disabled people have the greatest increase by keeping on current policies. Fatigue and drowsiness and being old are at the next levels. The greatest reduction in accidents related to unnecessary rush because of controlling the ways by camera and heavy fines.

Keywords: Traffic Accidents, Human Factors, System Dynamics, VENSIM

Dynamics of Airline industry Earnings due to airfleet expansion

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Abstract

Marketing airline products and services has always been highly complex and requires that rigorous strategic planning is put in place for achieving maximum growth and profitability. However, it's obvious that finding solution to problems in this field that involve people and huge investment by experimenting will be vary dangerous. So, modelling and simulation studies have become a powerful tool to proffering solutions to such problems. This paper deals with how to develop a dynamic model to forecast the profit of an under development airline so the model could be used as a descision support tool for fleet expansion in airlines. Moreover, it's desired to evaluate the effect of chang in demand rate on airline profit in this condition. The under development airline is an special case in the way that it has limited opportunities to order airplane for the development of its fleet. System Dynamics framework has shown strong potential as a decision support tool in this instance because of its capability of representing physical and information flows, based on information feedback control that are continuously converted into decisions and actions. We have developed a SD model that forecast airline profit trend based on its current demand trend. It shows that if there will be no chang in demand trend, the profit margin due to fleet expansion will be way lower than desired because of lack in demand. Additionaly, with testing different rate behavior for demand the effect of increas in demand on profit has been indicated and the airline is suggested to evaluate policies in order to reach the optimal demand rate based on its desired profit.

Keywords: System Dynamics, fleet management, airline development, profit forecastings, modelling

Forecasting Amount of Shiraz Air Pollution Based on CO and Particulate by Using System Dynamics Method

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Abstract

Widely Environmental and health effects of air pollutants are considered via many studies over the worlds. In this study with respect to the time and feedback behavior of key variables in air pollution and also by using SD, the amount of air pollution that is caused by CO, Particulate air in Shiraz and Environmental effects for the time horizon 1392 till 1396 are simulated. This work is based on the data that is gathered from farvardin 91 till dey 92 and are analysed via VENSIM DSS software. Based on research findings , A large share of personal vehicles play a main role in air pollution in shiraz and allocate a large share to themselves. The amount of air pollution increases from about 40.08 b in 1391 to 5.213 b in 1396. This indicates that the amount of pollution that is caused by CO and Particulate increases 23 percent and shows that policy makers should pay more attention to this area.

Keywords: forecasting, shiraz air pollution, CO, particulate, system dynamics method.

Export Strategy for Oil and Natural Gas: Aggressive or Conservatorial?

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Abstract

Development on the basis of extraction and export of non-renewable natural resources is a dynamically complex problem. Empirical evidence suggests that while some nations have been successful to translate natural resource wealth into long-term development but many have failed too. Such failure is usually called “resource curse” in the literature of political economy. Employing a system dynamics approach, this paper addresses this question that whether natural resource wealth is a “cures” or “blessing.” In this regard, oil (and natural gas) export revenue is used as a case of natural resource wealth. Controlled experimentation through Monte Carlo simulations reveals that, on the contrary to the current belief, it is unlikely that natural resource wealth be detrimental to overall state of the social welfare in the mid- and long-term.

Keywords: development, social welfare, natural resource curse, simulation

A dynamic model to improve customer absorption in NPD

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Abstract

The key to success of companies in gaining competitive advantage is the successful and continuous development of new products, and identification of key factors in the development of new products can be useful in reducing risk decisions for managers.

The study attempts to library research and consultation with teachers and experts in industry and academia, as far as possible the key factors to be identified. The aim of this study raise rates to attract customers through identification and prioritization of the key factors in new product development, and for this purpose the Bass diffusion model is used, then the dynamics of the system, model development and model we've reached the final. The results of this study indicate that increased funding in research and development and marketing at the same time can be more effective in attracting customers.

Keywords: Bass diffusion theory, system dynamics, new product development, customer absorption.

Abstracts presented via CDs

Modeling and Simulation of The Dynamics of The Broiler Industry in Fars Province with a System Dynamics Approach

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Abstract

Broiler industry has always been faced with a variety of risks due to the continuous fluctuations existing in the market demand, prices and production costs. So, these fluctuations have greatly affected the ability to predict and manage the incomes and profits of the Broiler industry. Due to the importance of this issue, in this research, by providing a conceptual model, the factors affecting the profitability of the broiler industry have been identified and their relationships are drawn and simulated with a system dynamics approach under Vensim Dss software. The results of the current research indicate that in the next three years, the profitability trend in the broiler industry in Fars province has a high sensitivity to the changes of the market demand, compared with the changes of the level of product costs. In other words, creating at least 10% Change in the Market Demand will increase the broiler industry profitability to more than 70% in most of the domains studied in this research. The importance of this issue is so great that the adoption of a market preservation and penetration strategy for the next three years must be the first priority, rather than the adoption of a strategy for managing and controlling the broiler industry costs.

Keywords: System Dynamics, Conceptual Model, Profitability, Broiler industry.

Simulating the dynamic model of Mobarakeh steel stock price behavior in stock exchange market

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Abstract

Identify and assess the factors affecting stock price and predict behavior of prices is an important issue for activists Stock Exchange. This study has tried to simulate the behavior of Mobarakeh Steel stock price volatility in the stock exchange market and assist the share holder to analyze the fluctuations and forecast the future of the stock. For the aim of simulation behavior of stock, Various factors affecting the behavior of stock prices as well as the influential factors in production of steel products have identified and causal diagrams are drawn using system dynamics approach. Then the research model is simulated and analyzed by Vensim DSS. The results show that the production costs and world prices are the most important factors in shaping the fluctuations of the stock price. Finally, different scenarios such as, increase production costs and change in world price was proposed to predict future stock price movements. The simulation results show this scenarios will not affect on behavioral patterns of stock price in long term and are only decreasing or increasing stock price. Among the variables influence are discussed ,world prices and costs of production were the most influential variables on the behavior of stock price(without changing in proces) During their time. The simulation results show that in most scenarios the reduced price (if any negative news) is over rising prices (if any positive news).

Keywords: simulation, system dynamics, stock prices, Mobarakeh Steel, price fluctuations.

Dynamic model for distribution companies' business in Iran with system dynamics approach

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Abstract

In recent years, the number of distribution companies is increasing and with regards to unstable economic conditions, Management and decision making process for these companies is getting more difficult. In this paper by using system dynamics approach, main parts and challenging aspects of these companies are analyzed and with concentration on one sample of them, main causes for decreasing in sell and profit is discussed. Analytic results show that if company's marketing is successful and it could inactivate the effect of purchasing power, the sell trend sometimes can even raise. The results also show that raising sell price in different periods, has completely different effects on sell rate that this issue can inform managers about right time for raising sell price and inventory proper level. As simulation outputs shows decreasing trend in long term sell trend, a structural scenario is to improving the sell trend by linking visitors variable income to sell trend instead of sell in previous structure.

Keywords: System dynamics, start-ups, distribution companies, purchasing power, seasonal demand

Agent based modeling of Schwartz cultural model in economic agents

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Abstract

Consumers play an important role in supply chain management so that producers prefer to focus on consumers' needs for production as well as marketing. Many producers produce different products for different countries based on their needs mostly rooted in their cultural differences. Recognizing and prediction of consumer behavior is high of importance for producers. Culture as an important factor in buying process is modeled in consumer agents. The aim of this research is to model consumer behavior more closely to real consumers by modeling culture in agent's decision making process. The proposed model contains "Update Social and Personal Needs", "Motivation", and "purchase" processes. Consumer agent chooses a behavior related to its needs. The social behaviors are imitation, superiority, social comparison, and being different. Behaviors related to individual needs are enjoyment and safety. These behaviors are extracted from Schwartz cultural model. The results show that model is well verified at the individual-level and produces believable results at system-level.

Keywords: Agent based modeling, Consumer Agents, Economic Modeling and Simulation, Schwartz cultural model ,Consumer behavior.

A System Dynamics Model for Closed Loop Supply Chain in a vehicle manufacturer

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Abstract:

Recently, due to environmental, economical, legal and social factors, reverse logistics and closed-loop supply chain issues have attracted attention from manufacturers. In that phase, the original product is no longer produced and the sources of new parts are often limited. Decision makers have to choose when to buy new parts, when to recover used parts and either recover used part by remanufacturer or outsource them to remanufacturing subcontractors. In this paper we developed a system dynamics model that provides an evaluation for various scenarios to control closed-loop supply chain.

Keywords: Closed-Loop Supply Chain Management, System Dynamics, reverse logistic, remanufacturing subcontractors

Investigating the Effect of Structural Coupled Structural Indicators on the Success of Construction Projects with the Dynamics of Systems Approach (Case Study: Jihad Nasr Institute)

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Abstract

Examining the factors affecting success in development projects and achieving key factors for successful projects, which are the main pillars of the country's progress, is essential. This paper focuses on the impact of paired indicators on the success of development projects. In this research, literature was first reviewed and the factors influencing success were first identified. Among them, the factors that were more effective in this study were identification and modeling based on them. Then, the model and the relationships between them were modified and used by the experts. Finally, the dynamics of the system was created and its validity was confirmed by applying the past data and receiving a response in accordance with reality. The results of this study will provide project managers and project-based organizations with a better view to control the factors and points in the project and facilitate project success

Keywords:Project success, Project management, Structural pairing, System dynamics

A review of system dynamics usage in supply chain

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Abstract

The competitive advantage of each supply chain is to respond quickly to the needs of the customer, taking into account all the complexities and relationships between the supply chain elements. System dynamics, taking into account all the elements and interactions in the supply chain, and examining the linear and nonlinear relationships in the chain, lead to performance improvements. In this research, using the software of the network of documents and literature review, the studies carried out in the supply chain with the approach of system dynamics are examined and analyzed on some features of published studies.

Keywords: System dynamics, supply chain, systematic literature review, Hist Cite software.

On the importance of the correspondence between agent-based and system dynamics models in the modelling process of organizational learning

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Abstract

Despite the utilization of hybrid aggregate and agent-based approaches, the focus on mathematical and logical representation of the correspondence between these viewpoints distinctly is somehow ignored. Furthermore, the correspondence of agent-based and system dynamics models has been assumed mostly obvious in the literature. However, this research shows the mathematical representation of the relationship and prove it for a relative simplified problem. The results portrays that such a mathematical view helps the modelers to enhance the models of organizational learning and produces innovative modeling approaches. Therewith the innovation, different aspects of a system is investigated iteratively and development of models originated from each of the approaches improve significantly. Moreover, intereting hybrid equational-behavioral point of views emerge that are much more efficient than using any of the approaches alternatively as it has been frequent in the literature. In fact, by paying attention to this correspondence, modeler's designing viewpoint dominates the decision viewpoint and the modeling procedure improves as a result, which is essential in todays' analysis of complex socio-economic systems.

Keywords: Agent-based model, System dynamics model, Organizational learning

Investigating the Factors affecting the incidence of defalcation in Iran using system dynamics approach

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Abstract

Defalcation as one of the most undesirable phenomena in governmental systems, is a product of a complex system with faulty organizational structures that cannot be removed by omitting one individual or group of grafter managers in public positions. Many factors that can bring about the incidence of this inauspicious phenomenon in an organization, work in a feedback process and move through an enforcing loop. These factors also can pave the way for the emergence of another defalcation in the next short period of time in an even exacerbated one. This study applies a system dynamics approach in analyzing the phenomenon of defalcation in public space and is attempting to identify the factors impact on the phenomenon and its consequences. Also, the relationship between these factors in a reinforcing and balancing loops will be illustrated to give us a more accurate understanding of the conditions and underlying system. Finally, this study tries to suggest some solutions including the modification of corporate governance structure of state owned enterprises, improving administrative systems and reinforcing the socio-political space, as a new way to prevent the defalcation.

Keywords: defalcation, factors influencing defalcation, corporate governance, system dynamics, state-owned companies.

Investigation of couple burnout in women with diabetes type 2: by using system dynamics methodology

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Abstract

Feedback mechanisms, as multi-dimensional (biological – psychological and social) phenomena that are among various contributing and resulting factors in diabetes type 2, can lead to durability of its irreversible side effects. It is due to this fact that analyzing them systematically with different boundaries is of great importance. The question in this research is conceptualized based on the growth of couple burnout behavior in women with type 2 diabetes, and it is extracted from family therapy specialists, studies and clinics qualitatively. This study includes an analysis of two important levels of the growth of couple burnout in women with type 2 diabetes by using system dynamics methodology to offer a qualitative mapping for the complex feedback mechanisms of this phenomenon and facilitate understanding them. Among the aims of this research are the following: the answer to what the reinforcing patterns of couple burnout in women with type 2 diabetes are, how they can result in a lack of control over diabetes, understanding resistance sources against therapy, explaining the relationship between structure and behavior of couple sub-system in controlling this phenomenon, and their overall life challenges as a basic and fundamental model to find leverage points for future use. The causal loops are developed based on reviews of studies, group model building with specialists, deep semi-structural interviews with experts and women with type 2 diabetes who are purposefully selected between 14/1/2015 to 30/01/2016. The findings of this research include development of two conceptual models for feedback processes and key mechanisms. In the end, six key reinforcing loops and two temporary balancing loops are suggested as key mechanisms of the growth of couple burnout in women with type 2 diabetes. Future studies are necessary for quantitative development and simulation of the model. The quantitative development of the model can lead to a better understanding of the expansive texture of diabetes type 2 and effective choice of therapy by enabling scenario making.

Keywords: Type 2 diabetes, Couple Burnout, System Dynamics Modeling, Group Model Building, Feedback Loops. System thinking

Analysis of the relationship between knowledge management and attracting and retaining a capable faculty with the help of dynamic model

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Abstract

In the present time, organizations operate in environments where change, transition and innovation are one of the main components of the environment, and they face organizations with more challenges and dynamism. One of the main concerns of managers is how to retention and develop their organizational talent in such environments and to be effective in their reputation organization with managing them. Given this point that knowledge management and intellectual capital complement each other, and we can attract and retain better talents and empowered individuals with knowledge management help, The purpose of this research is identify the factors by whichthem knowledge managementAffect on the attraction and retention of empowered individuals for organization. This paper want to examine these effects using Cause and effect diagram and anticipate policies that, improve the process of attracting and retaining a capable faculty in university with using them.

Keywords: Dynamic system, Capable academic staff, knowledge management, attraction and retention.

Investigating the Impacting Processes of Economic Freedom and Good Governance Indicators on Investment Climate Using the System Dynamics Approach

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Abstract

Many international reports are published every year, such as good governance, ease of doing business, and economic freedom reports in terms of explaining and rating the investment climate of different countries. As investors and economic activists make own entrepreneurial and investment decisions based on such reports. Taking these international reports together can provide a more precise picture of the investment climate. Accordingly, this study has been identified the dynamic interactions of good governance (Macro-level institutional), ease of doing business (Micro-level institutional) and some of economic freedom indicators, and in particular their effects on investment and the rate of economic growth via heuristic approach and by using system dynamics method. The results of this study indicate that increasing the size of the government from the optimum level led to decrease in good governance indicators, such as corruption control, political stability and the quality of laws and regulations, and, consequently, increase in the rank of ease of doing business indicators, such as the ease of starting business, Obtaining permits and judicial independence; under such conditions, the investment climate becomes unfavorable. On the other hand, trade and financial freedom will reduce the size of the government to the optimum level and provide the necessary conditions for improving governance and ease of doing business indicators, and ultimately increasing investment and the rate of economic growth.

Keywords: Good Governance, Economic Freedom, Ease of Doing Business, Investment, System Dynamics Approach.

Merging and take possession of banks scenarios based on system Dynamics

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Abstract

Growth and development of Iran banking industry have been a major concern for the regulatory entities such as the central bank. Today there are 40 different brand of banks active in Iran which manage in total 21674 branches across the country. The rapid growth of banks and credit institutions and the decline of their performance have posed the issue of merger and acquisition as a serious path forward. Because there are divergent views about the importance or priority of the merger plan and some uncertainties involved, it is necessary to explore plausible scenarios that have been suggested. This paper applies System Dynamics mapping and identifies a number of balancing and reinforcing loops which are a) mushroom growth of banks and non legit credit institutions, b) social conflicts and the difficult regulatory supervision, c) performance, liquidity management and specialization, d) central bank ability for effective supervision, e) money market consolidation, f) banks' ability to achieve profit mobilizing resources, g) foreign investment and economic stability. Finally a set of creative recommendations are suggested for better preparation to encounter different plausible scenarios.

Keywords: Future studys, System dynamics, Scenario Building, Merge and Acquisition, Bank, Economy

Iran's Economic Scenarios in Trump era with emphasis on the Banking Industry

An application of the Future Wheel and Systems Dynamics

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Abstract

The US economy has a significant impact on the world and therefore its political upheavals can disrupt other countries and have consequences for other countries. Different gurus have already shared their analyses about the impact of Trump administration on the economy of Iran. The banks of Iran play an enormous role in the credit market of the country and this paper attempts to explore some economic and political consequences of the Trump administration on the Iranian economy and in particular banking ecosystem through the application of the futures studies methods such as Scenario Building, qualitative System Dynamics and the Future Wheel. Four layers of direct impacts are mapped using the Future Wheel. Three plausible scenarios are then developed. After application of system dynamics mapping five key reinforcing loops are identified that provide insights into the plausible scenarios that might emerge. The loops are a) war and national economy b) crisis and the risk of foreign investment c) foreign investment and tension reduction with world powers d) a culture of short term profit and speculation, and e) national security and resistant economy. This demonstrates the importance of governing political tensions with the Western powers and boosting integration of Iran's banks in the international banking industry in order to facilitate foreign investment. It is also shown that regardless of the tension reduction with the world powers and outside pressures and sanctions it will be necessary to improve the economic, social and cultural infrastructure of Iran to achieve a resistant economy and reduce the vulnerability against Trump administration policies.

Keywords: Future Studies, Future Wheel, Systems Dynamics, Trump, Bank.

Dynamic Analysis of Solar energy development in the Iran

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Abstract

The aim of this project is to implement system thinking and system approach in energy supply system of Iran and Development Study of renewable energy, and replacing it as a clean and optimal energy. In this study, at first the modeling divided to three parts of content, structural and environmental and simulation has been done over the next 30 years for renewable energy. And by changing in each of the levers such as interest rates, GDP, energy investment ratio, diversity and culture making, major changes occurred in improvement of renewable energy. The results of this research developed appropriate infrastructure of increasing in using renewable energy and energy saving policies in society, and by using levers to increase gross domestic product, should be tried on development in renewable energy and following that reducing unemployment and economic growth, and more importantly, healthy environment.

Keywords: Systems Thinking, Energy System, System Dynamics Simulation, Renewable Energy

Dynamic analysis of request of water in Qom city

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Abstract

Water scarcity is now one of the most critical challenges in most countries around the world, especially in Iran. One of the key ways to control and manage this issue is the investigation of the water demand. Qom city has always been encountered with a threat due to its location in the dry area of the country and in the absence of proper management in the near future, there will be serious dangers in this field. The purpose of this thesis is investigation of water demand dynamics from method of system dynamics in Qom city. Dynamic of various variables such as population, water demand, surface water resources, ground water, water supply in this model has been investigated by Vensim software. The maximum relative difference (%) of this model for estimation of water demand was found to be 7%. The change of birth rate from 4% to 2% resulted in 29% reduction of water demand level in 1405 with comparison of current trend. Based on this result, the policy of population control had the most important effect on water demand. The price effect on water demand is negligible, so that, 20% increase of price led to 2.04% reduction in level of water demand in 1405 with comparison of current trend.

Keywords: Water scarcity, water demand management, system dynamics, Vensim software

Evaluation the process of national shoe production according to the current situation of shoe trafficking based on the system dynamics method

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Abstract

The shutting down of shoe production units in the past few years and the unemployment of many workers in those units, the increasing trend of shoes trafficking in the country, the presence of poor quality Chinese shoes, the dissatisfaction of managers of shoe production unit, the concern of many economical experts from the current situation, the contradiction in existing statistics and so much else cases are all about an existing trouble and hidden pain in the shoes sector. Perhaps the first problem that can be outlined is that how the current process will continue to go. Therefore, this research has been prepared in order to assess the state of domestic production during the next 3 years up to 1399 Hijri. The main objective of this paper is firstly to identify the status quo, and then provide a model that can predict the future trend of the current situation. Due to the ability of the system dynamics to analyze and model issues, especially socio-economic problems, this method and its tools have been used to simulate the process of production of shoes. By examining the results, it was found that if the current situation continues, the amount of shoe trafficking will increase by 40 to 50 percent in the coming years, and consequently domestic shoe production will decrease and the situation will get worse. Therefore, by implementing resistance economy policies, providing appropriate incentives for manufacturing workshops, we can stabilize this situation this year, and in the coming years, by implementing a suitable culture for the purchase of Iranian goods and preventing smuggling of shoes and also increasing the import of shoes, We will see a leap forward in domestic shoes production.

Keywords: System Dynamics, National Production, Shoe Industry, Causal Loop Diagram, Stock Flow Diagram

Investigating the Unintended Consequences of Increasing the Ph.D. Admission Capacity in Iran

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Abstract

The growing number of Ph.D. students in recent years has raised concerns that this sudden growth will have unintended consequences. Because in every social phenomenon, any sudden growth usually has many unwanted consequences. This article seeks to investigate the unintended consequences of increasing the capacity of Ph.D. in Iran. This research is based on the systems dynamics approach and by analyzing the narration of each of the problem actors by identifying the blind spots of the problem and, by examining each of the causal circles, attempts to identify and express any of the unintended consequences of the decision. In the following, causal loops are presented as an integrated model.

Keywords: System dynamics, higher education, doctoral admission capacity.

A system dynamic model for analyzing consumer preferences: case study

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Abstract

Selling the product is always the cornerstone of each firm. Therefore, it is important to analyze the preferences of consumer purchases. In this paper, a dynamical model of the system has been developed based on theoretical foundations of behavior and consumer preferences. Also, in this model, the impact of the social network of individuals, which is an important variable in today's markets, is designed. Accordingly, social influence is modeled on every consumer factor. The results indicate that social influence and environmental conditions affect the preferences and, in some cases, change the preferential behavior of individuals from commodity to other commodities.

Keywords: Dynamics of Systems, Dynamic System, Purchasing Preferences, Consumer Behavior.

Modeling of Supply Chain dynamics Based on Pull and Push Strategies, case study: SAADAT CO.

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Abstract

In this research will Endeavour to present a structured approach in order to analysis an appropriate supply chain for participative corporations that in the international and global are facing with the globalization phenomena. For this purpose, after identification the structure and internal processes of the case study, effective factors of its supply chain dynamics were identified. Then for analysis of supply chain the system dynamics model, in accordance to its structure, was provided and effect of applying different strategies on the supply chain performance based on existed scenarios was investigated. It's useful to mention that the exerted variables in the proposed model, was provided based on discretion of the experts and managers of different departments of the case study and after provision the final model of system dynamics, simulation process by means of VENSIM software was implemented. In the final, results come from simulation of model was analyzed

Keywords:supply chain, system dynamics and simulation

Promotion of Systems Thinking Approach in Tackling Iranian Society Challenges; Iranian System Dynamics Society Responsibilities

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Abstract

Iran faces many challenges that some of them are worsening rapidly. Tackling these problems, requires insight, courage, long-term thinking, and social acceptance of difficult solutions. Iranian System Dynamics Society (ISDS) as an entity close to academic community, and as an institute equipped with systems thinking tools and skills, has a historical responsibility. This paper explains this opportunity and responsibility, proposes some objectives to be pursued by ISDS, and as a case study, briefly explains pension funds instability in Iran. The instable status of pension funds, as a sample from a lot, shows how legislators, government, and the people, in a vicious cooperation, create a structure that prefers today's relief to future crisis.

Keywords: Systems Thinking, Pension Funds, Iranian System Dynamics Society

Modeling Assistance Workshop (MAW)

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Introduction

Modeling Assistance Workshop in the first national conference of the Iranian system dynamics society is organized in the case of training and helping to solve the researchers and student's problems in system dynamics modeling, by Nasim S. Sabounchi and Dr. Ali H. Saryazdi.

This workshop was for one-on-one coaching and answering to the specific questions related to models studying or developing by researchers and students or other models that exist in system dynamics resources and also a variety of modeling softwares.

Questions may consist of various steps of modeling (structuring the issue, Dynamic hypothesis compilation, model compilation, figuring flow and cause and result diagrams, validation, design and policy analysis).

