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Organizational Behavior Factors In Responding To Project Risks Using System Dynamics Approach

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Abstract This article focuses on introducing qualitative parameters which are commonly used in Organizational Behavior (OB) science in project risk management models by means of System Dynamics (SD).One of the most important areas of concern in project management is the possibility of occurring risks. Project managers try to forecast probable risks making use of experiences in similar projects. They do their best to plan and adopt strategies to deal with risks which may occur during further steps of the project. Managers are used to take only quantitative parameters into consideration while facing with risks in projects. Making use of qualitative factors in analyzing and responding to the project risks has been suggested in some literature but the matter of fact is that including Organizational Behavior factors in project risk management is a new approach. It should also be considered that literature is not completely vain in the area of using qualitative parameters (e.g. OB factors) in project risk management models.

Keywords: System Dynamics, project risk management, Organizational Behavior

1. Introduction

Today's fast changing environment of project management needs new ways to deal with the complex nature of risks during a project. The latest 2008 edition of PMBOK considers six management processes to encounter project risks: planning, identification, qualitative analysis, quantitative analysis, response planning and monitoring and control." The traditional tools and techniques used in these processes were not designed to address the increasingly systematic nature of risk uncertainty in modern projects"(1).

However common standards of project management (such as PMBOK) fail to encounter a problem that all factors forming a risk itself as a complex mixture of different parameters. Take the following domino into consideration as an example. When for example project is faced with lack of budget, employers will no longer get their salaries consequently a late of them will quit their jobs. As a result of increasing turnover rate work load on the remaining employees will increase and so on. "It is impossible to quantify the net result of a set of risks without modeling the interrelations of risks thoroughly. The limitation of traditional tools and techniques calls for further developments in project risk management"(2).

In recent years System Dynamics approach has offered a new solution for problems pertinent to risk management. Developing a dynamic model for risk management will help us in identifying risks along with analyzing and responding to them (2).This article suggests a new approach including OB factors to deal with project risks management using system dynamics.

2. System Dynamics Review

System dynamics is a way by which we can analyze the world around us. In spite of other sciences which cling to separate every issue into little parts to be able to analyze them, system dynamics looks at the issue as a whole. The main concept in system dynamics is that it focuses on the interactions between components of a system. System in this science covers all kinds of mechanical and social mechanisms such as machines, football team, and so on. Components of dynamic systems interact through feedback loops. A change which occurs in one component within a feedback loop will gradually affect the other component

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which is in direct relationship with the first component. This cyclic cause and effect phenomenon continues to the first component in the loop. A group of components which interact with each other to get to a common goal is called a system. A system can be open or closed. An open system is a system which is not affected by its own output. For example a clock which does not work properly is an open system, because of the fact that the output of the system (wrong time demonstration) does not affect its performance. A closed system is a system that is affected by its output. In clock example if you consider a clock and its owner as a system, you will have a closed system, because the output (wrong time demonstration) will be understood by the owner who will modify that. In analyzing system using system dynamics we use closed systems.

3. Organizational Behavior Review

Motivation is an area of OB which is discussed in individual level of organizational behavior science. It is the processes that account for an individual's intensity, direction, and persistence of effort toward attaining a goal – specifically, anorganizational goal. (3). Different kinds of theories relating motivation impacts on some sort of organizational parameters have been developed all of which indicate the influences of this individual dimension on organizations' effectiveness.

4. ProposedModel

4.1 Dynamic Hypothesis

Project risks behave dynamically. This means that different parameters which cause risks are totally interrelated within a chain of cause and effect loops. In fact each cause influences the latter one in a closed loop of cause and effects making a domino. Causes and effects which lead to project risks are both qualitative and quantitative. Literature pertinent to this area of project risk management dominantly include quantitative factors while there are some qualitative factors (e.g. OB factors) influencing response to project risks.

4.2 SD Model

For example in Figure 1 when perceived schedule slippage increases in a phase of the project, project management team decides to deal with this risk by employing new labor. This decision will affect the behavior of system in two ways in terms of both new labor and current employees. Regarding current employees, they may infer that project management team believes that lack of current employees' productivity has made this slippage increase. This inference directly influences current employees' morale and motivation which in turn affects their productivity. Decrease in productivity will be followed with decrease in work rate. As can be seen on the model work rate decrease will influence perceived schedule slippage. This means that these cause and effects will make a positive loop (reinforcing or snowball effect).

One of the approaches to deal with increase in schedule pressure (which is a risk) is to increase the overload amount. Overload is also a result of schedule pressure increase. There are some other parameters which act as a media between increase in schedule pressure and decrease in employee morale and motivation. Two of these parameters suggested in figure 1 are "employee mistreating" and "employee trust".

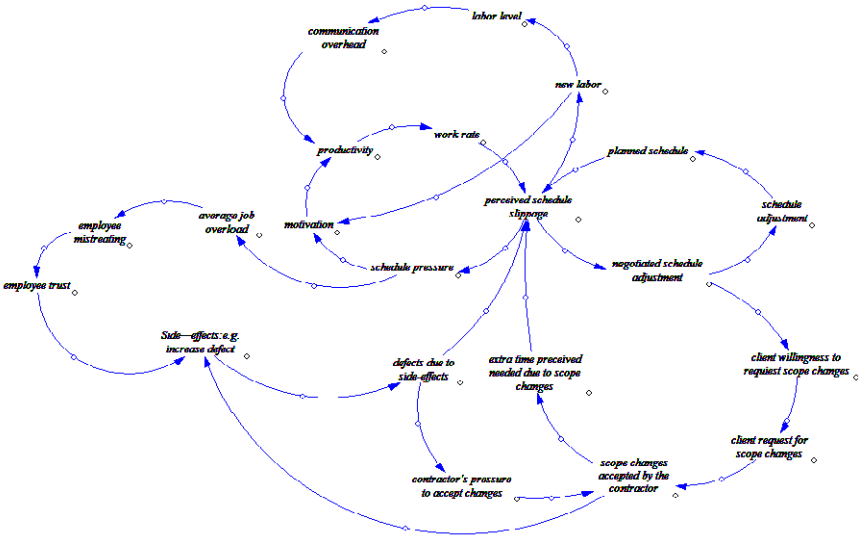

Fig.1: Proposed model

According to experience, in most of the projects there is an average amount of job overload on employees ordinarily. When project progress rate decreases and all schedules falls behind forecasted completion dates, schedule pressure goes up. In this situation project management team decides to compensate delays by increasing the amount of job overload on employees. Employees on the other hand infer that this decision is some sort of mistreatment. This is because they think that project management ignores all other probable causes of progress rate decrease (e.g. lack of resources, lack of labor, and ambiguity in task definition…) and blames only employees as sources of delays. From this point of view employees trust fades away which in turn will be followed by decrease in employee morale and motivation. All of the assumptions mentioned here are based on relevant experiences of a number of project managers. After discussing with them it was found that there are some qualitative factors specially those relating to communications between employees and managers that affect the risk management processes.

4.3 Previous Models

Considering little literature regarding SD application in project risk management two models developed previously is taken into account. The framework of encountering project risks according to common processes as what has been specified in PMBOK has been analyzed using system dynamics modeling in [5].Model depicted on figure 2 tries to define interrelations between different causes which lead to risk occurrence. This interconnecting chain of cause-and-effect loops makes risks as a network of dynamic behaviors. Developing such model shed a light into the systematic nature of risk behavior which is neglected in traditional ways of dealing with risks. Dynamic behavior of project risks is difficult to understand and control [5]. SD model framework proposed in this study is limited to the processes and parameters specified in PMBOK.

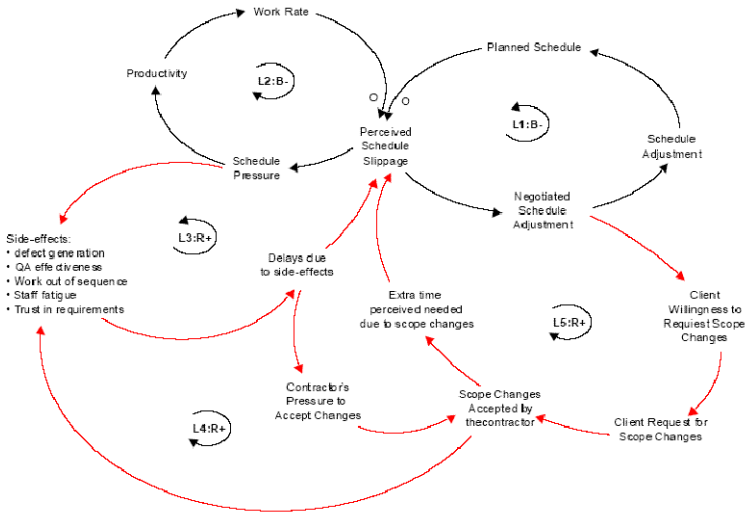

Fig.2: First example of a project feedback structure

The latter model step beyond factors mentioned in PMBOK and tries to develop a model which tries to entail some other qualitative parameters (e.g. motivation) to previous model of project risk management(2). Model shown on Figure 3 has modified the previous one in two aspects. First it does not focus solely on watching the processes of project risk management as a whole. Along with this holistic view it also enjoys considering details within every loop. Secondly it tries to use some qualitative factors which do influence the behavior of risk management system which at the moment of issuing the model were hard to put into numbers. This approach helps managers specifically in three areas of risk management: risk identification, risk analysis and risk response planning. .

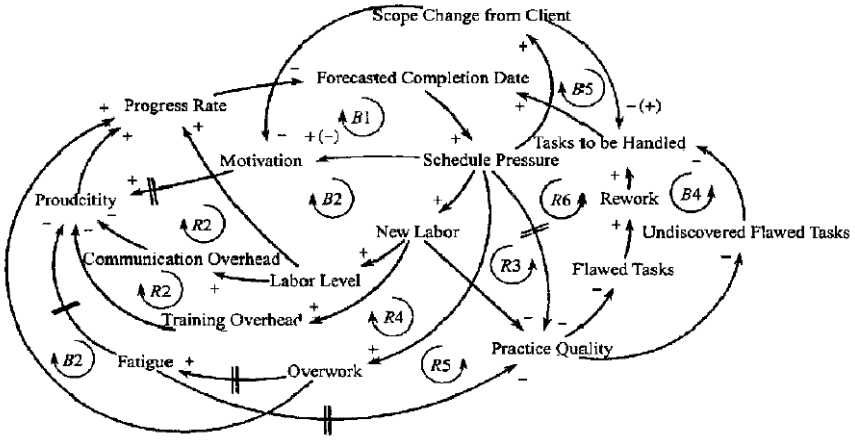

Fig.3: Second example of a project feedback structure

4.4 The main flaws of previous models

One of the most prominent flaws of previous models mentioned is that they have limited their analysis to classical parameters which is considered in common approaches such as PMBOK standard. In both of mentioned models project risk management has been modeled using some general parameters. According to experience there are a number of qualitative parameters that must be added to these modelsin order to get more accurate results from them. By using these parameters added to model behavior of the project system in response to different kinds of risks will be analyzed more precisely.

System dynamics approach will lead to reasonable results under the condition that all parameters affecting the system are considered in developed model. Considering this fact it seems necessary that some kinds of qualitative parameters be added to previous models of risk management. Using experiences in a variety of projects two qualitative parameters is selected to be used in developing SD model. These parameters are employee mistreating and employee trust. Below figure shows our model.

5. Limitations of this study

Only one of the processes in risk management field which is pertinent to progress rate decrease is analyzed in this article. Other areas of risk management can be investigated using SD approach. Furthermore other qualitative parameters could be inserted to these models to make them more precise and powerful in analyzing project risk management loops. Using parameters which stem in roots of organizational behavior science is suggested to make future models more precise.

6. Conclusion

Current models which try to analyze, identify and respond to the project risksmainlyinclude qualitative factors. Lack of introducing qualitative factors (specifically OB factors) has lead to drawbacks in analyzing behavior of the system in responding to the courses of action that project team take to compensate risks in critical phases of the projects. Model developed in this article tries to entail these kinds of factors (employee motivation, employee mistreating and employee trust) in a SD model to help managers forecast probable results of their decisions in response to risksoccurred.

7. References

[1] *Managing and Modeling Project Risk Dynamics A System Dynamics-based Framework.* **Rodrigues, Dr. Alexandre G.** 2001, Presented at the 4th Eroupean PMI Conference , pp. 1-7.

[2] *Advantages of System Dynamics Approach in Managing Project Risk dynamics.* **WANG Qi2fan, NING Xiao2qian, YOU J iong.** 2005, Journal of Fudan *Universit* y (Natural Science), pp. 1-6.

[3] **Robbins, Stephen P. and Judge, Timothy A.***Orgvioranizational Behavior.* s.l. : Pearson:Prentice Hall, 2010.

[4] **Forrester, J.***Industrial Dynamics.* Cambridge : MIT Press, 1961.

[5] *Towards a risk maturity Model.* **Hillson, D.A.** s.l. : 35-45, 1997, International Journal of Project and Business Risk Management, pp. 35-45.

[6] **(PMI), Project Management Institute.***A Guide to Project management Body of Knowledege.* North Carolina : Project Management Institute, 2008.

[7] *SYDPIM-A System Dynamics-based Project-management Integrated Methodology.* **Rodrigues, A.** Istanbul-Turkey : s.n., 1997. International System Dynamics Conference "Systems Approach to Learn and Education into the 21st Century". pp. 439-442.

[8] *Findinga common language for global software projects* . **Rodrigues, A.G.** 1999, Cutter IT Journal.

[9] **R., Turner J.***The handbook of project-based management.* London : Mc Gro Hill, 1998.

[10] *On the nature of disruption and delay.* **Eden C, Williams T M, Ackermann F, et al.** 2000, Journal of the operational research society, pp. 291-300.

[11] *The role of system dynamics in project management* . **Rodrigues A, Bowers J.** 1996, *International* Journal of Project Management , pp. 213-220.

[12] **Qi-fan, Wang.***System Dynamics* . Beijin : *Tsinghua* University Press, 1994.

[13] **Abdel-Hamid T, Stuart M.***Software project dynamics, an integrated approach* . s.l. : Prentice- Hall Upper Saddle River, 1991.