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Effect of KM enhancement for R&D innovation and Firm performance: A System Dynamics perspective

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Abstract: *Due to globalization, customers have got variety of choices and the companies are in a fierce combat of survival. They are struggling to keep themselves in the competitive market. On other side, people in the organization are moving in search of better remuneration, leaving project unfinished. In such a situation, the organizations need to implement Knowledge Management to gain the side of benefit. The research work was conducted to find the relationship between Knowledge Based Enablers, Innovation process and Firm Performance.*

The methodology pertained are detailed literature review of Knowledge Management, KM Enablers, innovation process and effect of these on firm performance. Considering different KM variables, innovation constructs and organizational parameters, a questionnaire was developed. In order to collect data online industrial survey was done using a website named surveymonkey.com. The survey was targeted to employees of two companies who have successfully implemented KM in their organization. The results of the survey are hypothetical tested and strength of the relationships is found. Finally SD model is developed to see effect of KM on R&D Innovation and Firm Performance over a period of time.

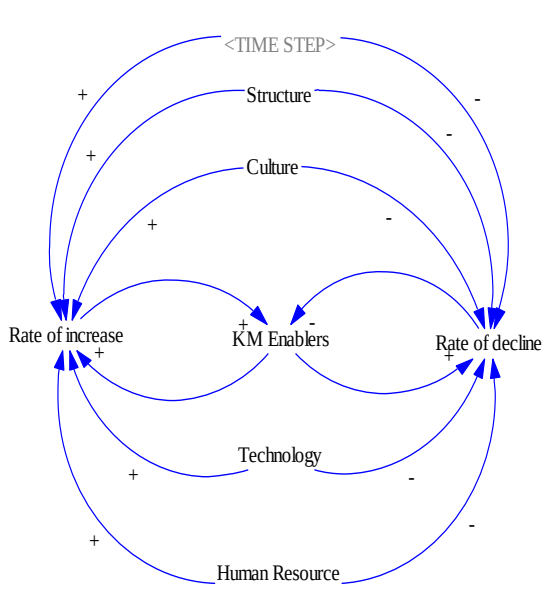
The result highlights the areas to focus on benefits and barriers of Knowledge Management concept in an organization.

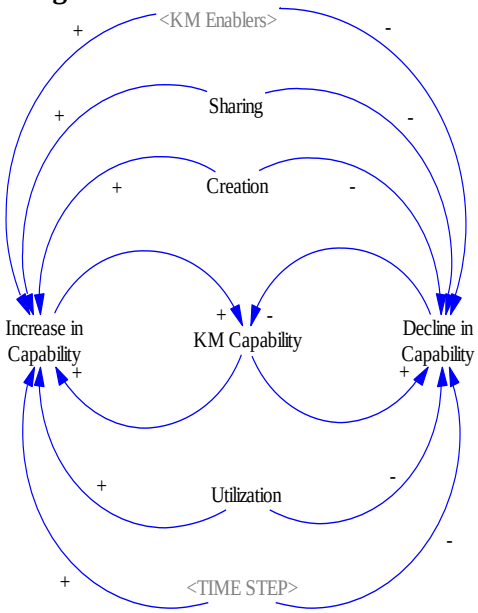
Keywords: *R&D, Innovation, KM, System Dynamics.*

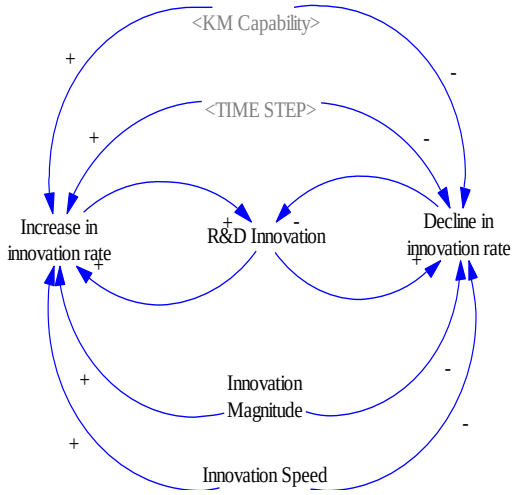
I. Introduction

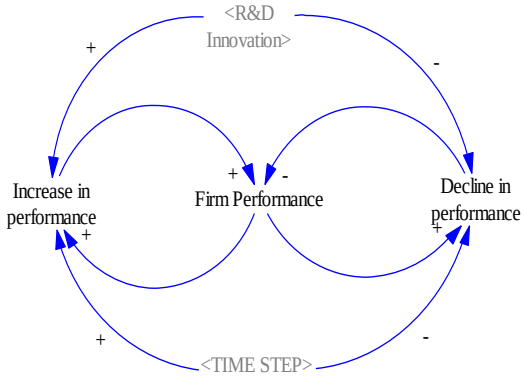
Knowledge Management (KM) is referred to as the process creating, codifying and disseminating knowledge for a wide range of knowledge intensive tasks in an organization (Harris et al., 1998) [1]. KM captures the brain, collects experiences, creates insights and shares it among others.It has been observed that knowledge is playing a vital role for ensuring an organization's long-term survival and success of its product in recent years. KM acts as a key instrument for the improvement of organizational effectiveness and its performance. KM mainly stresses on means of obtaining, generating and distributing knowledge and the cultural and technical foundations that support them. With impact of revolution of information technology the preservation intellectual assets are becoming inevitable [2]. More detailed information about knowledge management and system dynamics based approach for explaining importance knowledge management is well various research articles, books and various documents[3-148]

II. Causal Loop Diagrams.



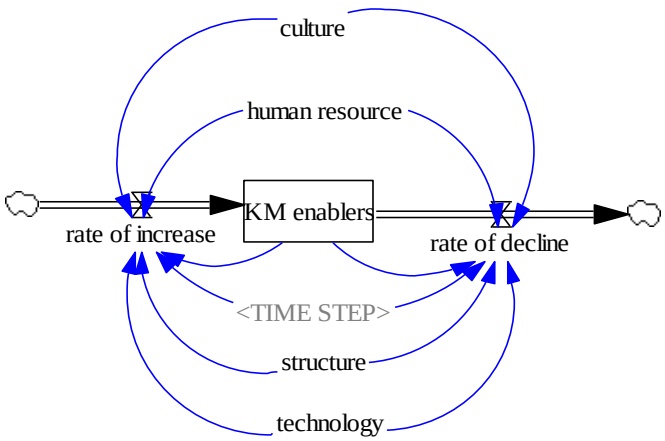




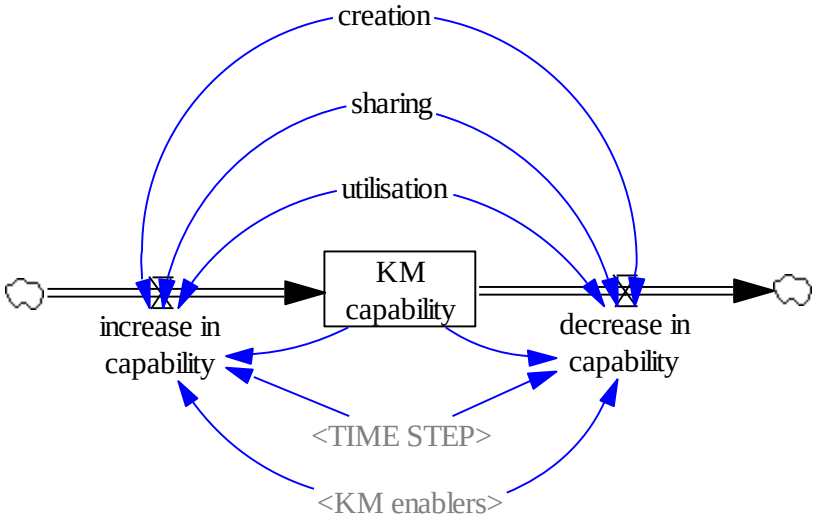


III. Stock and Flow Maps

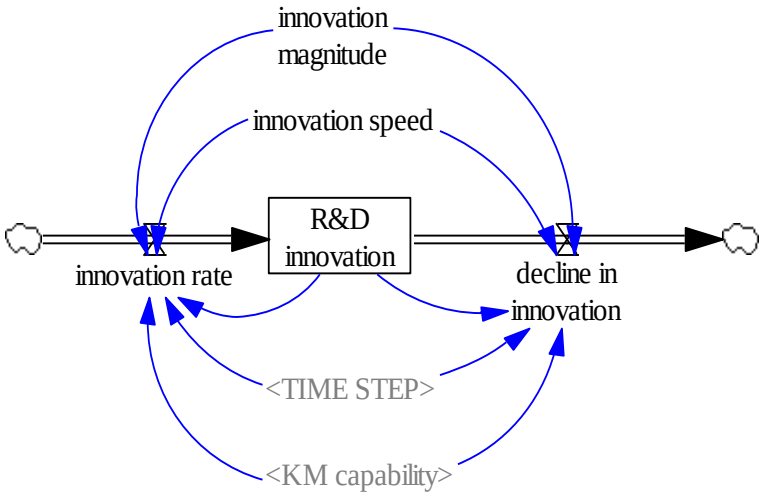
1. KM Enablers



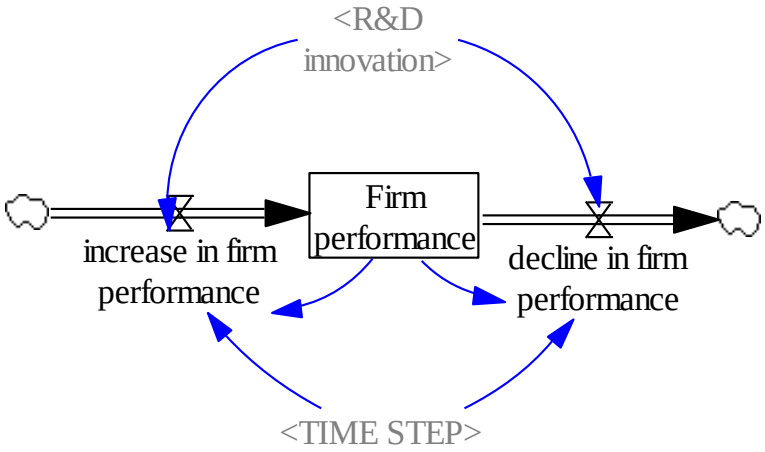
2. KM Capability



3. R&D Innovation



4. Firm Performance



IV. Formulating a Simulation Model

Once a dynamic hypothesis, model boundary, and conceptual model are created, testing of the model comes into picture. Sometimes the hypothesis can be directly tested through data collection or experiments in the real system. Most of the time, however, the conceptual model is so complex that its dynamic implications are unclear. Hence, simulations are very handy under these circumstances. To venture into this space, one must move from the conceptual domain of diagrams to a fully specified formal model, complete with equations, parameters, and initial conditions (Annexure I).

V. Results

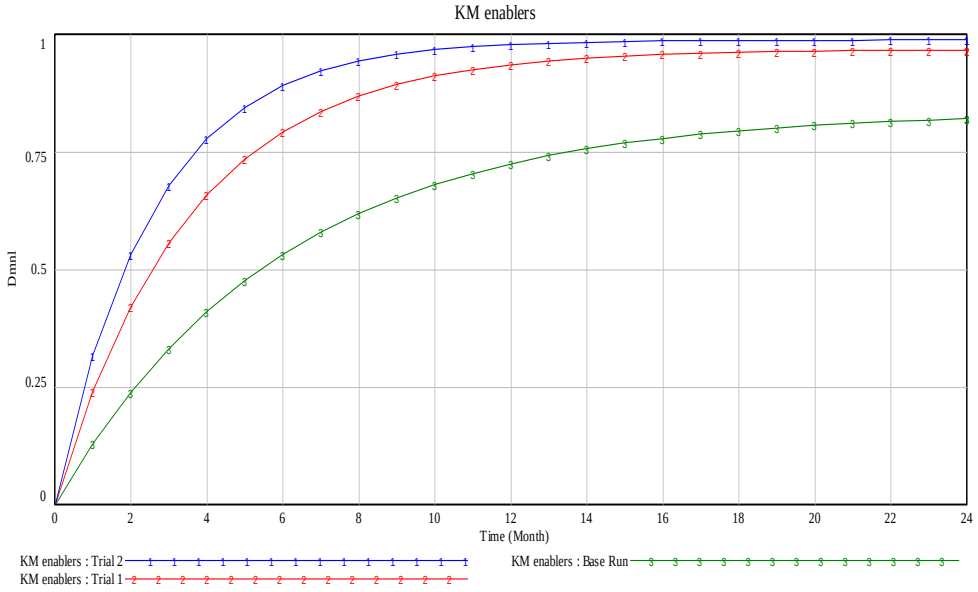


Fig. 1: Effectiveness of KM Enablers.

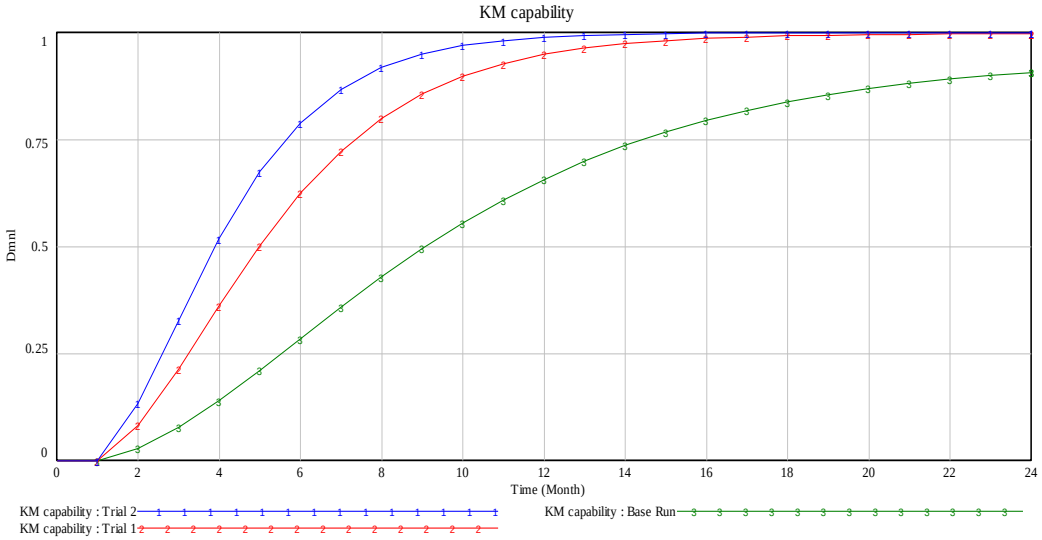


Fig. 2: Effectiveness of KM Capability

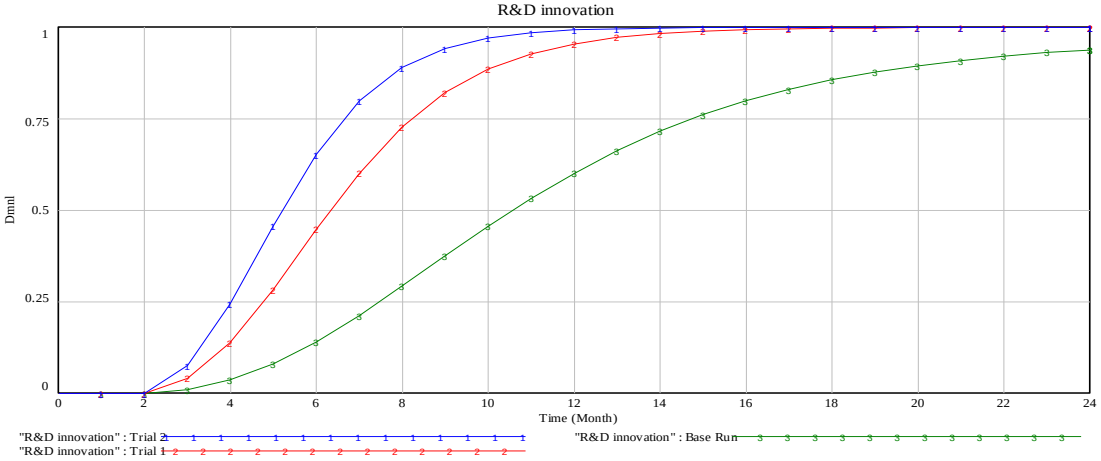


Fig.3: Effectiveness of R&D Innovation

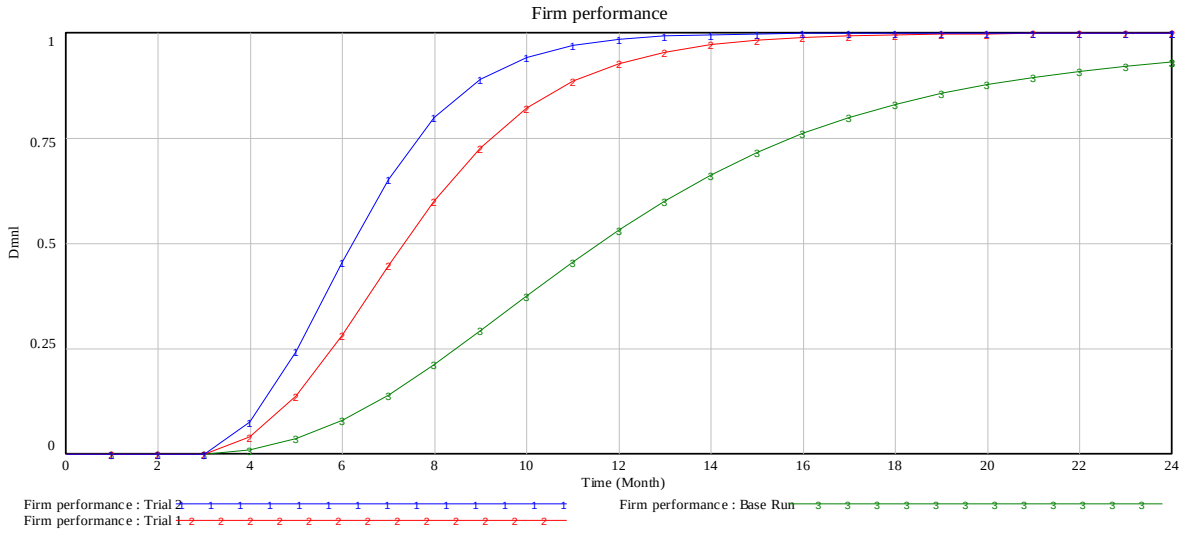


Fig. 4: Effectiveness of Firm Performance.

Inference

The simulation tests focuses on the improvement of effectiveness across the efficiency level created. As it shows it takes a time delay at every step to implement itself on the organization. Initially it starts and increases gradually and reaches a stable rate after a certain time period. And the result reinforces the idea that as the efficiency increases, the effectiveness is quicker and higher.

Test of Suitability

Dimensional Consistency test:

The dimensions of all the variables were checked and the equations were verified and balanced.

Example:

Firm performance = INTEG (increase in firm performance - decline in firm performance, 0)

LHS= RHS= Unit/month

Extreme - Condition test:

The model was tested for Firm Performance against extreme values of KM Enablers which were varied from 0 to 1.

Once the model was simulated by maintaining all the parameter values at 0 (Low), and the result was analyzed by observing the graph (Fig. 5).

Again the model was simulated by maintaining all the parameter values at 1 (High), and the result was analyzed by observing the graph (Fig. 6).

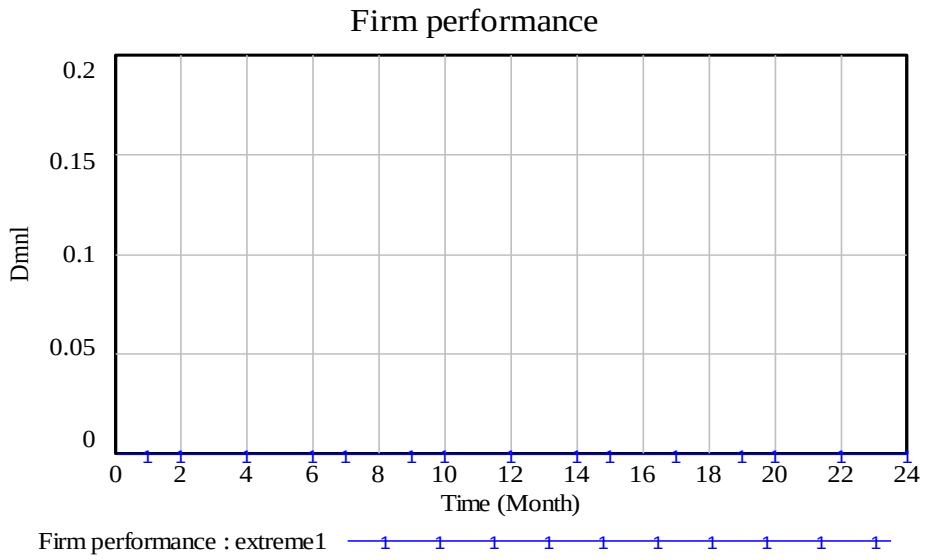


Fig. 5: Firm Performance at Extreme (Low) Value

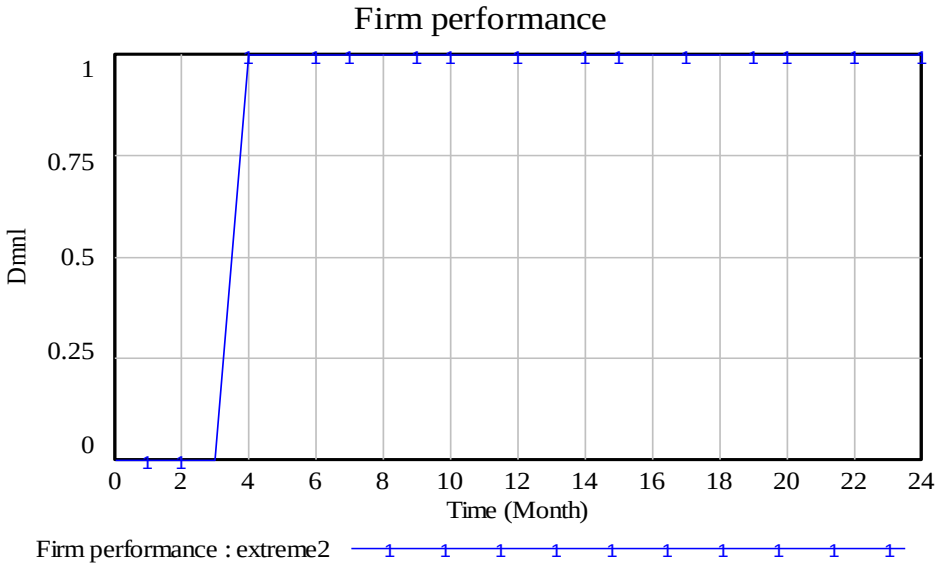


Fig. 6: Firm Performance at Extreme (High) Value

Test for consistency

Behavior – Anomaly Test:

No erratic behavior was observed during the course of the simulation and hence, anomaly of any kind does not exist.

Boundary Adequacy Test:

Importance of both feed-forward & feed-back loops were observed from this test & the behavior of the system without these loops were also observed which happened to be a flat.

Tests of utility and effectiveness

Counter intuitive behavior:

This test proves that the model does not exhibit any contradictive behavior in response to some policies.

Appropriateness for audience:

The model is easy to understand with simple feed-forward & feed-back structures. All the terms used are appropriate to the context and easily understandable by the practitioners.

Policy Design and Evaluation

Once enough confidence is developed in the structure and behavior of the model, it can be used to design and evaluate policies for improvement.

VI. Conclusions And Future Scope

System dynamics based approach of explaining various parameters is found to be very feasible method of various parameters involved in research and development innovation of firm performance as well its survival in long run.The potential of expanding a System Dynamics model is always a possibility of future research. The model can become more realistic and reliable when more factors are identified and the relationships between the new variables are defined correctly. The current model has considered the most important factors which have been discussed in the KM literature as the variables of KM. The model can be possibly extended considering more factors of knowledge management. It would be interesting to consider people factors like top management support, employee commitment etc. which will influence the performance of an organization. The current SD model can act as a starting point for researchers. Hence it can be improved by considering various factors in detail to analyze the success of Knowledge Management System in improving the performance of an organization. Considering the global scenario, there is a scope for a comparative study between the Indian industries and the global leaders in KM. This could help in identifying the gap in performance and also in bench marking for attaining better performance levels.

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