To Main Proceedings Document

A Study on the Processes and Conditions of a Business Creation Model Using System Dynamics

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1. Background

In this paper we discuss a system dynamics approach for understanding the processes leading to success or failure in business flotation.

Recently the promotion of business flotation has become one of the major goals for ending Japan's extended recession. It has been pointed out that social customs are an entrenched obstacle to be overcome. For example, once a flotation fails, it is nearly impossible for a businessman to make a second attempt. In Japan, this has now become a topic of serious study.

We consider the following two mechanisms to be necessary to support business flotation in Japan. The first mechanism supports two prerequisites for new business creation. One prerequisite is to clarify the conditions for a successful business venture, and the other is to improve the draft of a business plan by adapting to the conditions before the business is launched. By utilizing this mechanism a company can choose a floatation opportunity which has the highest possibility of success. The second mechanism supports the company after the business has been created. This is done to avoid risks common to management in business ventures, such as those caused by a shortage of funds.

We understand that Japanese government-supported activity is mainly biased towards hardware. Therefore we proposed the necessity of a soft incubator as a mechanism to support the flotation through software (e.g. Sumita and Shimazaki (1999)). The success or failure of a venture business flotation is a complex phenomenon and it is necessary to understand the adaptability in the business environment to accurately model these mechanisms. It is such a system dynamics approach which we discuss in this paper.

2. The difference between conventional research and the system dynamics approach of this study

Conventional research follows a general approach in order to understand flotation. A general action guideline is obtained by extracting common features from data on the success or failure of business ventures in a past. The data include the ventures that have successfully supported business flotation in our country or foreign countries. Some research groups, such as Timmons (1999), have applied this approach to understanding flotation. When this approach is adopted, the framework of business flotation is assumed and every section in the framework is organized in the action guideline. However, with this method, the relationship between agents in the framework is not always clear. In addition, a general action guideline cannot cope with complex phenomenon, because flotation is a problem in which every agent's behavior is caused by complex change in the business environment.

We think that a system dynamics approach needs to be adopted in order to understand and adapt such complex phenomena. System dynamics can describe the probable behavior of a system through the use of computer simulation. The model is expressed in a series of causal-feedback relationships between the purposed phenomena. For this reason, it is not necessary to accurately understand the structural relationships beforehand. Therefore, it can be utilized as an instrument for decision-making when working on a policy plan for a particular social system even if the explicit structure of that system is not clear. Recently, Sterman (2000) organized applications for business using system dynamics. The procedure for system dynamics model is shown at Table 1 (Goodman (1974)).

Table 1. Construction procedure of a dynamic model in system dynamics (from Goodman(1974)).

1] The phenomenon is described in human language.
2] The description according to the language is converted into a causal loop chart and flow diagram.
3] A DYNAMO equation in proportion to the flow diagram is written.
4] The simulation run of a computer model is carried out.
5] The result of the computer run is analyzed.
  a) What kind of behavior does the model show ?
  b) How has the behavior changed from the previous computer run ?
  c) Why does the model show such behavior ?
  d) How can the behavior be changed ?

Next we shall discuss a method for modeling the business flotation process with system dynamics. It is difficult to model the process, because of the elusive process and the enormous number of interrelated variables. Therefore, the following three

approaches must be considered in order to assist in the preparation of a causal-loop chart and flow diagram:

1) Targeting only at a special case,
2) The utilization of computers for arranging the phenomenon,
3) Grouping agents in the system structure into functions.

However, approach 1) can only be used for a simulation in a special case, and it is difficult to apply except to a similar model. In approach 2), manual control is necessary to direct the arrangement guidelines in order to handle qualitative phenomena. Therefore, assuming the framework of business flotation is required. This is as disadvantageous as the conventional approach.

Finally, approach 3) is examined in order to create a flow diagram for the flotation process. The flow chart contains a tremendous number of interrelated phenomena. However, there are action subjects in every phenomenon. The action subjects can be grouped into functions without distinction of individual, human group or organization. Therefore, a representation is created for every function, in this way a flow diagram between the functions can be described. This technique simplifies the procedure in comparison with conventional methods.

The object-oriented approach for model construction is one of the appropriate techniques to use in conjunction with system dynamics. This paper proposes that this method be adopted for modeling a system dynamics flow diagram. The proposed model construction procedure is shown in Table 2. Notice that 3} in Table 2, the iterative function, includes time synchronization. A previously constructed System Dynamics simulator offers this function. 4} in Table 2 corresponds to the DYNAMO equation of System Dynamics, though generalization is difficult, because of the wide variation in business conditions.

Each function is likened to an object, and the modeling is carried out by the method detailed in procedure 1} and 2} in Table 2. It has more advantages than using the conventional arrow diagram for the following two reasons. The primary reason is that it is easier to handle complex phenomena and the multiple relationships in the network. The second reason is that it is easier to group and identify similar agents and meta-agents. As a result, it becomes possible to view the complex interaction between agents.

Table 2. Construction procedure for the object oriented model
(Indentations in the table show the hierarchical structure).

1} Functions of agent's group and environmental condition are defined.
- On each Functions
  - Input and Output are defined.
    - Functions between I/O are defined (I/O functions).
    - The group of resources necessary for the function is defined (structure or database).
    - The relationship between resources is defined as a function.
    - The relationship between the I/O functions and resources are defined as functions.
  - The delivery variables between functions are defined.

2} The operation of each function is defined as procedure.
- •Each generation, activity and disappearance procedure is defined.

3} Procedure definition for the system simulation (the part which the tool of SD is in charge).
- •Time synchronization.

4} The content of each defined structure, database, or functions is described in proportion to the situation.
(It corresponds to the DYNAMO equation of SD).

Grouping agents in the system structure into functions is required in order to apply system dynamics to the business flotation process. However, it seems to be possible to carry out an information compression that fulfills this purpose by adopting the object-oriented approach.

Still, this approach supports one of the features of system dynamics in which is it's adapting to change in the situations. Because the attribution of new other agents which effect the management environment is clarified, this approach seems to be useful from the viewpoint of the adaptation to the business environment.

3. Modeling the flotation process by using an object-oriented approach

Timmons (1999) states:

"Entrepreneurship results in the creation, enhancement, realization and renewal of value, not just for owners, but for all participants and stakeholders." "The result of this value creation process is that the total economic pie grows large and society benefits." Therefore, "entrepreneurs create value with high potential, high growth companies which are the job creation engines of the U.S. economy."

For a flotation based on such an attitude, entrepreneurs or entrepreneurial teams must acquire the ability to accurately catch the creative flotation opportunity and the ability for specifying, collecting, and controlling the minimum necessary resources for the business. The Timmons model highlights "Opportunity", "Entrepreneurial team", "Resource Creative and Parsimonious", "Fit and Balance", and "Integrated and Holistic" as the driving forces underlying successful new venture creations.

One of the necessary conditions for flotation is to develop a business plan. The business plan confirms the driving forces behind the business idea. A successful business plan should be arranged around four following points (Timmons(1999), Parenthetic phrases are our excursus).

- A product which has commercial and/or competitive superiority (creativeness in the flotation opportunity).
- Research and development for the flotation and a realistic design of the business process (reality in the flotation opportunity).
- Calculations and a method for supplying the resources necessary for keeping the business (operating policy of management resource).
- A calculation of the profitability of the business (validity in the flotation opportunity).

The entrepreneurial team then judges the feasibility of the business plan. If they decide that it is a realistic plan, they then collect the management resources, and construct a supply chain based on the plan.

Goods and services are then sold to the target customers. However, the continuation of business may become difficult for the following reasons; the appearance of a competitor, a change in character of the assumed customer group, a shortage of funds, or a deterioration in the customer's or supplier's management condition. The two following supports are necessary in order to cope with such changes. If these problems are simulated before the flotation, then the business plan can be made flexible enough to cope with these results. Or, the entrepreneur or entrepreneurial team can accurately anticipate and cope with the risk after the flotation has been launched.

Post-flotation behavior must be described along with the creation of the supply chain in order to accurately model the flotation process. It is necessary to group not only management resources, but also the ability and flotation opportunity of the management group for every function.

In consideration of the above, we try to model the general flotation process based on "The Business Plan Guide" by Timmons (1999). At first, a model is created using the plan in Table 2 in which "1} Functions of agent's group and environmental condition are defined" is applied to the supply chain. A summary is shown in Figure 1. Porter (1998) is the main reference for the framework of the supply chain. "2} The operation of each function is defined as a procedure" in Table 2 is necessary to improve the design of the business plan as it applies to the supply chain. An outline of the functions in the Business Simulation Model is shown in Table 3.

By making these two diagrams, it is possible to show the functions based interrelationships. For the actual simulation, a detailed flow diagram will be constructed. However, handling will be easy, because the phenomena are grouped with the function.

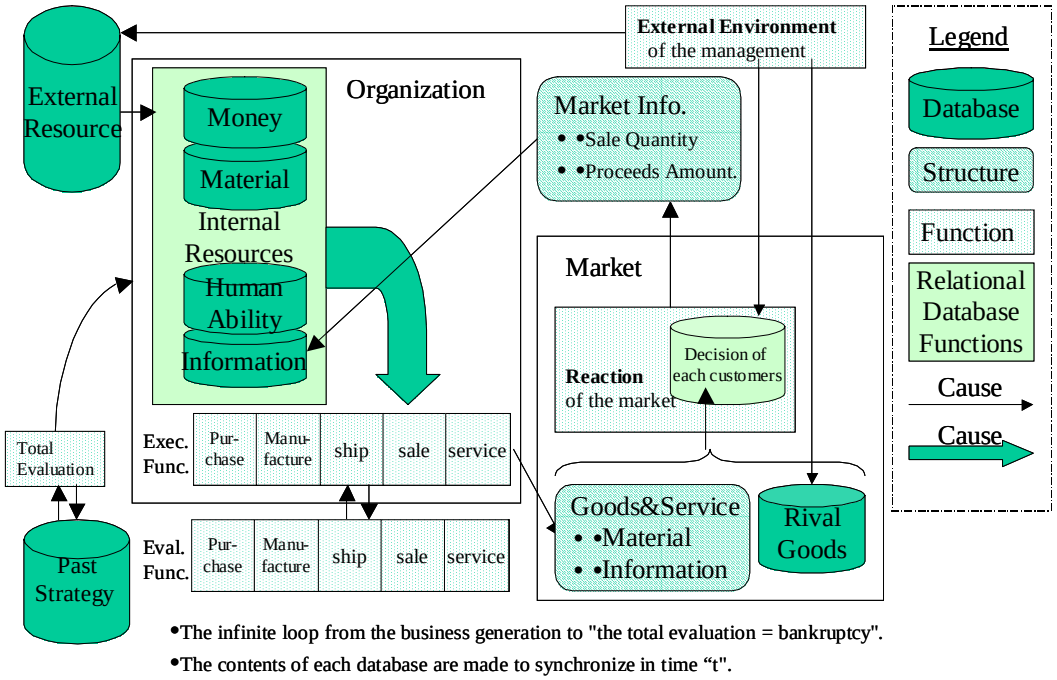

Figure 1. The outline of business simulation model by the object oriented approach

Table 3. An outline of the business simulation model function composition
(Indentation in the table shows the hierarchical structure).

- Business Environment
  - Organization Procedures
    - Business Creation Procedures (generation of the business object)
      - •Business Planning
        - * The preparation of an initial idea.
        - * The substitution of a resource called "Internal Resources DB" at present.
        - * Schedule and cost estimate for planning
        - * Decision and evaluation of the goods strategy.
        - * Schedule and cost estimate of research and development.
        - * Deciding on the supply chain.
        - * Schedule and cost estimate of the supply chain set-up.
        - * An evaluation of validity in the flotation opportunity
      - •Business Creation
        - * Research and development.
        - * Setting up the supply chain.
        - * A Business Management Procedure is formed in the Business Environment.
    - Business Management Procedure(business activity function group : Omission)
    - Business Withdrawal Procedure (business dismantlement function : Omission)
  - Market Behavior(Omission)
  - External Resources Behavior (Omission)
  - Outside Environment (Omission)

4. Conclusion

This paper proposes that an object-oriented system dynamics approach be adopted for model construction to aid in an accurate understanding of the numerous variables in the flotation process. Our model of the general flotation process has been based on this proposal. In order to more precisely understand the phenomena by using system dynamics, the function must be considered as a group of causal relationships. This clarifies the area of influence of the phenomena as an object.

By applying data from actual cases of success or failure to this model, we can view this problem from a higher perspective to gain a greater understanding of its adaptability to the business environment.

And, a better grasp of impacts which changing situations and combinations cause on business flotation can be expected by developing a system dynamics approach based on this model. In addition, it is assumed that information gathered from an internet-linked database will supply the "External Resource" and "External Environment" components of Figure 1. Thus a simulation adaptable to the business environment will become possible.

Acknowledgements

The authors wish to thank the contribution of S. Shucart, Associate Professor, Akita Prefectural Univ., who had checked and given many comments in this paper. Afterwards, we completed this paper.

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