

A Study on Human Resources Management Based on System Dynamics

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Abstract –Human resources management is a very complicated system, because it exists multiple information feedback structure and information transfer of amplification and delayed, causing reasons and results in space separation and time lag, at present many by experience and intuition judge and decision, so must find a better way to analysis the system. System dynamics is one of the features of based on activity plan uncertainty characteristics, as time changes, in the system of human resource management by using system dynamics, can make a lot of time based dynamic problem is solved. This paper, by using system dynamics of qualitative analysis, and analyze the combination of principle and method to establish human resource management system quantitative, the model of enterprise human resources management in order to provide scientific basis for the correct decision.

Keywords –Human Resources Management; System Dynamics; System Model

1. Introduction

Many organizations today are becoming involved with reengineering jobs, flattening the structure, and empowering their people to make on-the-spot decisions. To facilitate these dramatic changes most of these firms have set up expensive in-house training programs or have had special program, designed for them by the nation's leading business schools. However, despite these efforts, there is a gnawing "gut" feeling that continues to confront the management of these firms. Are all these latest training and development programs going to bring about the results they want. Many managers and opening-level employees who have been with their company for a decade or more have been these fads come and go. Management get all excited and implement the latest technique and then, after a few years, abandon them and move on to something else. So, in this paper, use system dynamics to find the human resources management innovation point.

2 . The Brief Summary of Human Resources Management of the Six Modules

Human resources management is including six modules: human resource planning, recruitment and allocation, training and development, performance management, salary welfare management, labor relationship management.

2.1 Human Resources Planning

Human resources planning is to make enterprise stable have a certain quality and necessary number of human, so as to realize the personal interests, including the organization goal and draw up a set of measures, and seek for a personnel demand and personnel between the ownership of enterprise future development in the process of mutual matching. Human resource planning goal: 1, get and keep a certain number have specific skills, knowledge structure and ability of the personnel. 2, make full use of existing human resources. 3, can predict enterprise organization potential over manning or a shortage of manpower. 4, build a well trained, operation flexibility of the workforce, and enhance the ability of the enterprise to adapt to the unknown environment. 5, reduce enterprises in the key technology and the dependence of the external links. Human resources demand forecasting methods are: intuitive prediction method (qualitative prediction) and mathematical prediction method (quantitative forecast). Job analysis, job analysis, also called job analysis, job analysis, it is human resources management an important conventional technology, is the human resources management of the foundation. Job analysis was made with the aid of a certain analysis method, to determine the nature of the work, the structure, requirements, and other basic factors activities. The effect of job analysis: 1, choose and appoint qualified personnel. To make effective personnel

prediction scheme and personnel plan. 3, design the active personnel training and development program. 4, provides the evaluation, promotion and operation standard. 5, improve work and production efficiency. 6, establish the advanced and reasonable work quota and compensation system. 7, improve the working design and environment. 8, strengthen the career counseling and career guidance. Job analysis program: preparation stage, the planning stage, the analysis phase, description stage, using the stage, operation control.

2.2 Staff Recruitment and Allocation

Recruitment: according to the requirements of the enterprise management strategy planning the outstanding, the right people recruitment into enterprise, put the right person in the right position. Commonly used recruitment methods are: recruitment interview scene simulation, psychological test, labor skills test

Employee recruitment costs include: the new hire cost; Replacement cost; Opportunity cost. Personnel assignment measures: 1, according to the enterprise internal and external human resource supply and demand the deployment of measures. 2, talent echelon construction. 3, from the enterprise internal priority allocate personnel policy. 4, implement open competition personnel policy. Human demand diagnosis steps: 1, the company unity of human resource planning, or by each department based on the long-term or short-term the actual need have work, proposed the human needs. 2, by human demand department fill out the "personnel demand schedule". 3, human resources audit.

Recruiting test and interview process: 1, organize various forms of examination and test. 2, the final determination for interview candidates, release the interview notification and the preparing work before the interview. 3, the implementation of the interview process. 4, analysis and evaluation of the result of the interview. 5, identify personnel employed the result, such as it is necessary to have a medical check-up. 6, the result of the interview feedback. 7, interview material filed for the record.

2.3 Performance Management

Performance evaluation from the connotation is the people and working status of evaluation, the people work as a result, through the evaluation reflected in the tissue of the relative value or contribution degree. From the epitaxial terms, is objective, organized to everyday people working in the survey, records, analysis and evaluation. The significance of performance evaluation are: 1, from the enterprise management target of evaluation, and make evaluation and evaluation after the treatment of personnel management can help the enterprises realization of the target of the management. 2, as part of the personnel management system, using a system of institutional norms, procedure and method to evaluate. 3, the organization members in daily work reflected in the work ability, work attitude and work performance, is based on the fact of the evaluation.

2.4 Training and Development

Performance evaluation from the connotation is the people and working status of evaluation, the people work as a result, through the evaluation reflected in the tissue of the relative value or contribution degree. From the epitaxial terms, is objective, organized to everyday people working in the survey, records, analysis and evaluation. The significance of performance evaluation are: 1, from the enterprise management target of evaluation, and make evaluation and evaluation after the treatment of personnel management can help the enterprises realization of the target of the management. 2, as part of the personnel management system, using a system of institutional norms, procedure and method to evaluate. 3, the organization members in daily work reflected in the work ability, work attitude and work performance, is based on the fact of the evaluation.

2.5 Salary Welfare Management

Salary is refers to the employee to provide enterprises with labor and get all kinds of money and material reward combined. Salary structure refers to an enterprise's organization in the position relative value and its corresponding real pay salary keep between what kind of relationship. Influence factors of salary set with internal and external factors. Internal factors include: the management of the enterprise property and content; Enterprise organization culture; Enterprise's ability to pay, Staff job. External factors include: social consciousness; The local living standards; National policy rules and regulations. Human resources market conditions.

2.6 Labor Relationship Management

Labor relations is to show laborer and unit of choose and employ persons (including all kinds of enterprise, individual and industrial and commercial door, institutions, etc.) in the process of their work to establish social economic relations.

Labor relationship is the essence of management and employee personal and group between heavy sound, from both sides interests cause performance for cooperation and conflict, strength and power relations combined it will be affected by certain social economic, technology and policy, legal system and social cultural background influence.

3. Review of System Dynamics Theory and Modeling Method

3.1 The put forward of system dynamics model

After the second world war, with the progress of industrialization, the urban population, employment, environmental pollution and resources, etc. Various kinds of social problems become more and more serious, the urgent need to use new methods for these problems in

comprehensive research. 1955 years later the electronic computer technology gradually matures and popular, so the Massachusetts institute of technology (MIT) Forrester (Jay. W.F orrester) professor proposes research system dynamic behavior of a kind of computer simulation technology, namely system dynamics (SD, System Dynamics). It first appeared in the 1950 s, in 1958, Forrester published the famous thesis "industrial dynamics", this paper and then published in 1961 (industrial dynamics "(industrial Dynamics), become a system dynamics of classic. 1968, forrester professor the publication of the system principle," a book, with emphasis on the basic structure of the system is introduced. And then, the system dynamics and get gradually perfect international attention. The system dynamics with a distinct system view after available, has been to the basic principles of system methodology to study the objective world, after decades of development, enrich the system. The system dynamics methodology of international academic circles to "system thinking" (System Thinking), a word to summarize the basic principles of system methodology and system view. With the development of the system dynamics, perfect the system thinking gradually formed a series of important principles, principle, become a research, processing, solve social and economic problems of complex system effective tool.

In 1969, Forrester professor issued the "city dynamics," a book, summarizes the rise and fall of the city problem theory and application research, so as to the formation of the system dynamics laid a foundation. In the 1970 s, Forrester students meadows (D.H.Meadows) application system dynamics model set up the world in 1971, and the club of Rome published titled "growth limit" (thelimitsofgrowth) study, then they studied within the scope of the world population, natural resources, industry, agriculture and pollution factors are related to each other, restriction and effect and to produce a variety of possible consequences, which make the system dynamics in theoretical research and practical application have been witnessed in progress. Since the early eighty s of the 20th century, the system dynamics and artificial intelligence and other new technologies, new management thought in research, establishing the new enterprise organizations play an important role. In the past the different times, it was successfully applied to enterprise, cities, local, regional, national, and even in the world scale of many strategic and decision analysis, is known as "strategy and decision-making laboratory".

3.2 Characteristics and Meaning of System dynamics model method

System dynamics research can be analyzed research nonlinear complex large system, with the aid of computer simulation, the qualitative and quantitative analysis of the complex system problems. From the above definition we can see, the system dynamics that the behavior of the system and characteristics mainly depends on its internal dynamic structure and feedback mechanism; System in internal and external motivation and restriction factors in a certain under the action of the law of the evolution of

development. This is the system dynamics famous endogenous view. So, the system dynamics from the system internal microscopic structure of the modeling, and at the same time, with the aid of computer simulation technology analysis system structure function and the dynamic behavior of the intrinsic relations, so as to find out the countermeasure for resolving the problems. Based on the cause and effect relationship and structure decision behavior, this is the system dynamics modeling unique feature. System dynamics method with other model, compared to have the following characteristics.

(1) Model capacity is big, the model and managers thinking model phase communication. System dynamics modeling technology will managers thinking are measured, in the model can accommodate thousands of variables.

(2) The research problem from causal mechanism pays attention to start, with feedback. Feedback loop by a series of causality chain and become, divided into positive feedback loop and negative feedback loop. Causal relationship is exist in various phenomena of universal relations. Starting from the causal relationship, analysis between various factors consisting of the causal feedback loop, can from complex phenomenon find found that these phenomenon intrinsic causes and formation mechanism.

(3) Nonlinear behavior. Enterprise and social problems facing the most highly nonlinear, so the nonlinear simulation can be exactly represent various management practical problems. System dynamics model can deal with complicated nonlinear system, and is fit to study the social economic system this complex system.

(4) Delay characteristics. The implementation of policy will have time delay effect, human behavior patterns usually need a debugging time, so the system dynamics model introduces delay mechanism, so that the model and the description of the actual system is more close to.

(5) The ability to carry out the simulation. System dynamics model is practical system lab, using the model simulation analysis system, get richer and more profound information, and then search way to solve the problem, the main results are the future a certain period of all kinds of variable time -varying curve. System dynamics is virtually the process of problem solving optimization process, and its ultimate goal is to find a system optimal structure, in order to achieve the better system function.

3.3 The Related Concepts of Workers System Dynamics Model

(1) Causal feedback. If the event A (reason) cause event B (results), AB they form causal relationship. Two or more causality chain end-to-end constitute a feedback loop, points are, the negative feedback loop.

(2) Accumulation. A term used to describe the system state, the system input/output flow rate of the difference to accumulate increment, "flow rate" is expression flow activity state, and accumulation is the result of flow rate.

(3) Flow chart. Flow chart by "flow position", "flow rate", "material flow", "information" and so on the symbolic form, visual image to reflect system structure and the dynamic characteristics. Not only show the

system behavior of the structure background, but also provide the system structure and system behavior relationships, and the relationship between the visual interpretations, and provides two aspects from the qualitative and quantitative description the possibility of system behavior.

The flow diagram of the variable categories:

① Flow a variable (Level): describe the state of the system, also known as state variables, Level variables, accumulated variables, which reflects the dynamic system variable time cumulative process.

② Flow Rate variable (Rate) : the level of the variable time changes, also known as decision variable, Rate variable, mathematics reflects the derivative concept, can't instantaneous can examine. System dynamics simulations by using interval in the average speed instead of instantaneous rate were calculated.

③ Auxiliary variable (Auxiliary): the system of the intermediate result, used to describe in a level and rate between the intermediate variable, located in level variables and rate between the variables in the information channel.

④ Supplementary variables: in the causal relationship, do not join in the feedback loop and do not affect any feedback loop of the other variable variables.

⑤ Constant: in considering time changed little or relative don't change system parameters.

All the above is called the endogenous variable. And restricts the endogenous variable, but not by the endogenous variable restricted variable called exogenous variables. Time is special exogenous variables.

3.4 The Review of the System Dynamics Model Application

In mid 1950 s, the system dynamics appearing that namely "system view" is the basic principle of its methodology. With its step by step perfect and development, which has been widely used in enterprises, cities, local, regional, national, and even in the world scale of many strategic and decision analysis, become solve social and economic problems of complex system effective tool. Commonly used a system dynamics model to have the following several kinds of:

(1) The world dynamics model, used to study global development strategy.

(2) National dynamics model, for the country's political, economic, military and foreign relations.

(3) Dynamic model city, the city development strategy.

(4) The regional dynamics model, the specific geographic region development strategy.

(5) The industry dynamics model, the industrial enterprise development strategy.

(6) Growth form dynamic model, including the study of disease occurrence, development and prevention strategy of medical dynamics model. Research crops, gardening, poultry rearing, pest control and ecological protection dynamic model.

And our country from 80 s application of system dynamics model analysis national economic system, and

other related issues, mainly concentrated in the following respects:

(1) Social, economic, ecological environment and resources between overall mutual influence and restriction relationship;

(2) Population, science and technology, education, energy and transportation factors and their relationship to the development of national economy effect and influence.

(3) The relationship between accumulation and consumption and its influence to the national economy;

(4) The total product of society and national income growth speed problem;

(5) Population target, age structure and the population problem on the social and economic influence;

(6) Energy development prospects, old and new energy alternately to economic development and its influence;

(7) The motive force of the economic development factors and the hindering factors. This model including population, non-agricultural production capacity, national income and distribution, consumer goods production, energy, transportation, science and technology, environmental pollution, education and a total of 12 is model.

3.5 The Introduce of System Dynamics Modeling Vensim software

By the Ventana System vensim is developed based on the model of system dynamics simulation software, is a visual modeling tool, through the use of this software can be on the system dynamics model design, simulation, analysis and optimization, and at the same time, can form document. Vensim using a toolbox of methods to deal with the model and data, graphical user interface can be liberated from the program, DYNAMO language all the equation, orders, etc all can through the corresponding toolbar to complete, the operation is very convenient.

Vensim software mainly has four characteristics network:

(1) Use of graphic programming model. In Vensim, programming actually does not exist, only the concept of modeling. In the startup Vensim system get in the main window, according to the operation button draw the simplified flow rate of the basic tree graph or flow chart, and then through the Equation Editor input equation and parameter, you can directly use simulation. In the equation and variable Vensim without coordinates, model is built around the causal relationship between the variables of the expansion.

(2) Run in the Wind, S operating systems, using a variety of analysis method, make Vensim output information is very rich. Output strong compatibility, general simulation results, in addition to instant display outside, also provides a save to file and copied to the clipboard methods such as output.

(3) The model analysis method. Vensim model is for structural analysis and data set analysis. The structure analysis including reasons tree (Causes Tree) analysis, the result tree (Uses Tree) analysis (layered list this variable for other variable role) and feedback list

analysis. Data set analysis including variable changes with time data value and chart analysis.

(4) Plausibility check. For the system and model of some important variables, it can be based on common sense and some basic principle, put forward the advance of the correctness of basic requirements. Hypothesis is set by the constraints of authenticity, will these assumptions added to build good model, the special simulation existing model in the runtime for compliance with these constraints or violation of case, judge the rationality of the model and authenticity, so as to adjust structure or parameters.

4. Modeling Human Resources Management Dynamic System

4.1 Human resources management system causality analysis

Causality diagram is used to reflect the system of human resource management between the main factors of influence each other and causal relationship, as the figure 1 shows.

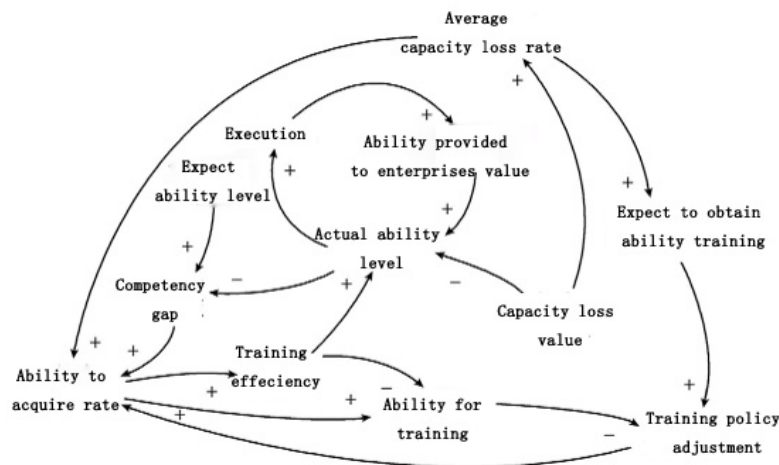


Figure 1 Human resources management system causality diagram

Figure 1 takes the arrows on the line for causal chain, shows that the two elements of causal relation. With a positive and negative sign of causal chain can show that the nature of the interaction, the plus (+) show that arrow pointing variables with the arrow source hair will increase with the increase of the variables, decreases; Minus (-) indicates that between variables take and the contrary relationship [5]. Those who need a specification is, in the rapid development of the information age, knowledge updating speed is the noticeable factors, a lot of the past applicable knowledge in a relatively short time may lose their meaning, this is what we call the knowledge of instability. At the same time, employees to leave their job mean that the loss of enterprise knowledge also can cause the enterprise ability level of loss. In the causality diagram these effects separately using feed forward and feedback loop to said. From figure 1 hr management system causal graph, we can see that the ability of enterprise loss rate is higher, the practical

ability level decay faster. Therefore, managers need to take appropriate measures for training policy including training time, training rate and so on adjustment, to keep can make enterprise normal business activities ability level minimum value, and, from the strategic point of view, the ability of enterprise knowledge level need to enterprise long-term competitiveness and maintain consistent force.

4.2. Human resource management system basic loop dynamic analysis

Figure 1 only describes the feedback structure of the basic aspects, cannot express different variable difference, must further using flow diagram to show. Through the human resources management model of the causality diagram can draw its flow chart, as shown in figure 2 shows.

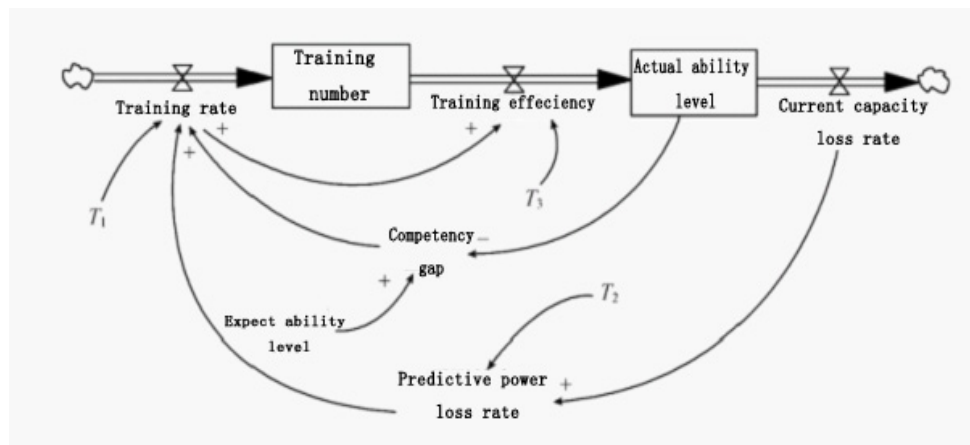


Figure 2 Human resources management system causality diagram

According to the above causality analysis, including "training personnel number" and "practical ability level" belongs to the level variables, "training rate", "training efficiency" and "current capacity loss rate" is rate variable, other variables are auxiliary variable. "Competency gap" refers to the actual capacity value and the difference between the expectation values. T1 refers to make up for the competency gap need time, T2 refers to predict "practical ability level" belongs to the level variables, "training rate", "training ability complete" loss of time consumed, T3 is refers to the training of the preparation time. Human resource management system flow chart reflects the enterprise policy planning structure change ability to acquire and maintain the dynamic process of the current and future. Enterprise training can through the current capacity loss rate of feed forward control to obtain, and at the same time, the current level of competence and training performance is also affected by the influence of the feedback loop.

References

- [1] YuXiang save, XiongShuChu. Systems engineering course [M]. Beijing: tsinghua university press, Beijing jiaotong university press, 2006, 18(1): 11-23
- [2] Baird, et al, Managing Two Fits of Strategic Human Resource Management [J]. Academy of Management Review 1988, 61(1): 1-13
- [3] Maria de Ia Cruz Deniz-Deniz, et al., A Resource-based View of Corporate Responsiveness toward Employees [J]. Organization Studies, 2003, 24 (2):63-67
- [4] Patrick M. Wright, et al., Desegregating HRM: A Review and Synthesis of Micro Human Resource Management Research [J], Journal of Management. 2002. 28 (3): 45.-55
- [5] Stone vinener. Economic growth and inputs of the system dynamics model and its application research [D]. Sichuan, sichuan university, 2007, 44 (1):33-37
- [6] Zhang ZhenSen. Our country enterprise E "project implementation problem system dynamics analysis [D]. Shandong, shandong university, 2006,37(1): 23-26
- [7] WangJiFan. System dynamics [M]. Beijing: tsinghua university press, 1994.
- [8] QiuWeiMing, LaiMaoSheng. China's software industry scale and software talents trend of the system dynamics analysis [J]. Information science, 2007, 259: 128721292.
- [9] Tom Redman, Adrian Wilkinson (2009). Contemporary Human Resource Management text and cases Human Resource Management (3nd Edition), UK: Peason Education. 2009, 32(1): 13-21
- [10] Valerie Y., and Elisa C., Pete W, (2000) Cross-cultural training: developing skills and awareness in communication : a manual for trainers(4th Edition) National Centre for Industrial Language Training. 2001, 43 (1): 33-37
- [11] Shahin Mohammadpour, Institutionalizing innovation in the organization [J], Advances in Asian Social Science, Vol. 1, No 1 (2012)
- [12] Rahim Asadian, Critical management [J], Advances in Asian Social Science, Vol 1, No 4 (2012)