

Quantitative Simulation and Qualitative Analysis of Theory X, Y and Z

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Abstract—Quantitative simulation has a significant influence on the research of management theories. Through a valid simulation, the motivation effect of the management theories can be seen directly from the simulation results. Then which theory is needed for a specific corporation and what we can do to develop the theory can be revealed. This research realizes the quantitative simulation of McGregor's XY Theory and Theory Z by agent model, quantified appraising performance and qualitative analysis. Based on the quantitative simulation result, a new qualitative simulation is realized which can help us to analyze the effect of the three theories. At last, we make a conclusion that Theory X and Y are only suited to motivate workers with a special attitude or character, while Theory Z has more power on different attitude workers. Therefore, Theory Z is more advanced than Theory XY.

Keywords—quantitative simulation; qualitative analysis ; McGregor's XY Theory; Theory Z

I. INTRODUCTION

Since Taylor initiates the era of scientific management in the early 20th century, the management thought has been developed around the topic on how to treat the human beings in organization. The cognition about humanity is always the core value and essence of different management eras [1].

Summarizing previous management theory in 1960, McGregor put forward the theory X and theory Y, according to the nature of people that whether they have a positive attitude towards work [2]. And this theory has become a fore fronted model till now. In 1970, J.J.Morse and J.W.Lorsch proposed Super Theory Y, pointing out that there is no a best method of management which can remain the same and be widely used [3]. Managers should take the corresponding management measures according to the inside and outside the organization environmental management idea and management technology. In 1981, William Ouchi, combining the American management theory with the Japanese challenge, puts forward the theory Z. Soon it performs a great significance for guiding enterprise management in both Japan and United State [4].

Simulation is perhaps the most widely used tool in the fields of industrial engineering, operations research, and the management sciences [5]. However, how to realize

quantitative simulation of management theories by computer and how to further analyze their effect for workers, become a hot topic in nowadays world. Based on the research of the Theory XYZ and putting forward reasonable assumptions, this paper completes the combining qualitative and quantitative simulation through MATLAB programs. Then the research tries to reveal these theories are suited to what kind of organization, and which theory is better through the simulation clearly.

II. BASIC DEFINITION OF MANAGEMENT THEORIES

A. Theory X and Theory Y

Douglas McGregor's theory of management, often referred to as McGregor's XY theory, remains a cutting-edge management model though more than 50 years old [6]. Theory X and Theory Y were proposed by Douglas McGregor in his 1960 book, *The Human Side of Enterprise* [2]. The two theories are opposing methods by which supervisors perceive employee motivation.

1) Theory X

Theory X states that people dislike work, don't have a creative nature and are self-centered in their actions, so they need the constant threat of job loss and financial incentives to work hard. In other words, this theory assumed that workers were drones, without ambition or initiative, had to be punished and bullied by bosses to achieve results. So Theory X is the belief that the only motivation for employees to succeed at their jobs is monetary gain [7].

2) Theory Y

Drawing on newly emerging psychological principles, Douglas McGregor's Theory Y offered a different model. It states that people are self-motivated, responsible, creative and need to work. Some key Theory Y principles are the following:

a) Work is as natural as play or rest.

b) Workers who are engaged and fulfilled actually enjoy their work.

This work is supported in part by NSFC (Natural Science Foundation of China) projects 71232006, 61233001, 2F12N02, and 91024030.

c) Under the right conditions workers actively seek responsibility, take initiative and make creative decisions.

d) Self-fulfillment is the real reward workers seek.

Theory Y has been adopted by more progressive management intellectuals that follow Elton Mayo's human relations approach [8].

B. Super Y Theory

Super Y Theory is mainly found in 1970, "Harvard Business Review," published in the journal "Theory of

The most effective organization in any particular case can be appropriate to their work and people need the kind of organization. Tasks between the organizations and staff seem more appropriate for individuals to promote a strong sense of competence motivation. Managers' role is to be concerned with the nature and the special needs of the organization to determine the appropriate form [3].

C. Theory Z

William Ouchi's management theory has its basis in his extensive study of the differences between American and Japanese business practices, which he first articulated in his 1981 landmark book "Theory Z: How American Management Can Meet the Japanese Challenge." In this book, he declared that the success of Japanese corporations was rooted in a corporate culture and management style that American companies could successfully apply. Ouchi's theory is a combination of Japanese and American management styles with the purpose of creating lifelong careers [4]. Theory Z, takes Theory X and Theory Y into account, and proposes a new management model [9]. This theory encourages creating company loyalty in the employee by providing long term employment and focusing on employee well-being both in and out of the office [4].

While Theory X refers to the old-fashioned, autocratic approach to management which is sometimes referred to as "hard" management and Theory Y represents a more "enlightened" and empowering management style generally thought of as "soft" management. Theory Z incorporates elements that make it an even more participative style than Theory Y. Some features of William Ouchi theory include [10]:

a) Collective decision-making is a core tenet of Ouchi management theory.

b) Long-term employment and job security also mark William Ouchi theory.

c) Job rotation, generalization and overall understanding of company operations, replace job specialization as a key component of the model.

d) Slow advancement/promotion is another feature of William Ouchi's theory.

e) Emphasis on training and continual improvement of product and performance are common to the model.

f) Holistic concern for the worker and his or her family further personalize management in Ouchi's theory.

g) Explicit, formalized measures, despite implicit, informal control, ensure efficiency of operations.

super-Y" article and published in 1974, "Organization and other members: the right to political reform," a book. The theory is that there is no hard and fast, universally applicable best management. Practices must be based on organization and management of internal and external environment variables such as thinking and management techniques, the functional relationship between the dependent variable, the flexibility to take appropriate management measures. Management should be suitable for the nature of work, members of the qualities.

h) Individual responsibility for shared accomplishments rounds out the theory.

D. The Comparison of Theory X, Y and Z

After introducing the definitions of Theory X, Y and Z, it is very important for us to find the common point and difference among them. In fact, Theory X and Theory Y pay more attention to workers' attitude. McGregor supposes it is the key towards workers' performance. However, William Ouchi argues that in Z-class group, workers' all kinds of quality will be improved through serials of training and make the company succeed as feedback. Having understood every theory accurately, we can start the quantitative simulation by MATLAB programs.

III. QUANTITATIVE SIMULATION

A. The Quantitative Simulation of Theory X

According to the definition of McGregor's XY theory, if it is valid for this research, the workers being analyzed are supposed to satisfy these hypotheses as below:

H1: depending on McGregor's XY theory, all the staves can be divided into two kinds: the positive-working staves and negative-working staves. The positive-working staves' work attitude is greater than 0.5 by quantization, while the negative-working staves' attitude is digitalized smaller than 0.5.

H2: under only one motivation, Theory X or Theory Y, every staff's character and attitude towards work won't be changed.

H3: for the major companies, there are the positive-working staves and negative-working staves at the same time.

H4: due to the random of appraisers' operation, not all the rules will be checked every day.

H5: with the more appraisals, the control ability of the rules over the workers will be receded more greatly

H6: according to Theory XY, workers' performance is related to three properties: work attitude, ability and their loyalty towards enterprise.

H7: as Theory XY argues that workers' performance mainly depends on their attitude, so we think the attitude accounts for 80 percentage proportion of the performance, while ability and loyalty account for 10 percentages each.

H8: due to this research focus on the relationship between work attitude and workers' performance, we believe their

ability and loyalty are in the middle level, which are both 0.5 after normalization.

H9: the appraisal rules will not be changed within 3000 days, and the motivation effect is more apparent in the middle age, while these rules cannot work well in the first 5000 days and last 600 days.

Based on the hypotheses above, the quantitative simulation of both the positive-working workers and negative-working workers’ performance, under the motivation of Theory X, can be done by agent model.

First, we should obtain the workers’ attribute matrix M as bellow.

TABLE I. WORKERS’ ATTRIBUTE MATRIX M

Agent	Attitude	Ability	Loyalty
1	0.1	0.5	0.5
2	0.2	0.5	0.5

TABLE II. APPRAISING RULES AND THEIR RELATED MATRIXES W, R

Rules	Weight W			Relationship strength R		
	Attitude	Ability	Loyalty	Attitude	Ability	Loyalty
Take part in the group safety study three times a month	0.6	0.3	0.1	0.8	0.9	0.7
Dressed in safety clothes according to the regulations	0.7	0	0.3	0.7	0.5	0.5
No smoking in the non-smoking section	0.7	0	0.3	0.8	0.5	0.7
Taking leave must submit a request from workshop director at last four hours in advance	0.6	0.1	0.3	0.6	0.4	0.7
Take part in all kinds of training and pass the exams	0.5	0.4	0.1	0.7	0.8	0.6
Be responsible for new staves’ induction training and exam	0.3	0.5	0.2	0.6	0.9	0.7
Hand in various reports and documents on time	0.4	0.3	0.3	0.8	0.6	0.6
Participate in team succession 10 times a month	0.4	0.4	0.2	0.7	0.7	0.8
Register by classification when you get material or goods from the office	0.3	0.5	0.2	0.7	0.8	0.6
Help each other and no flight	0.7	0.1	0.2	0.8	0.6	0.7

After these preparations, we can start the computing. To begin with, not all the rules will be reviewed in every process of implementation. So we should make sure how many and which rules are not checked in every performance appraisal.

Because we suppose that the control ability of management rules will become less powerful with days going on, so the control ability of every rule will become its 0.999 times as before. However, specially, if one rule is no used for more 10 days, it will keep its power as last time.

Then we can compute the relationship strength matrix between every rule and workers’ every attribute by $RW=[W \cdot R]^T$, and the workers’ weighting attribute matrix $M'=M \cdot MR$. Based on these, the relationship between every worker and his/her performance on every rule motivated daily can be computed as $P=M' \cdot RW$. After summing worker’s every performance on every rule motivated daily, we can get one worker’s total performance on one day, signed as matrix x. And x(n) is the number n agent’s daily performance.

Therefore, the one worker’s total performance, Psum, on one day depends on the whether x(n) is bigger than the threshold T. However, there is no a specially existing formula that can compute how performance is changed, so we do this compute experiment combined quantitative computing with qualitative analysis [11-12]. The computing relationship is as below:

3	0.3	0.5	0.5
4	0.4	0.5	0.5
5	0.6	0.5	0.5
6	0.7	0.5	0.5
7	0.8	0.5	0.5
8	0.9	0.5	0.5

Then, we should define workers’ attribute weight matrix MR.

$$MR=\begin{bmatrix} 0.8 & 0.1 & 0.1 \\ 0.8 & 0.1 & 0.1 \\ 0.8 & 0.1 & 0.1 \\ 0.8 & 0.1 & 0.1 \\ 0.8 & 0.1 & 0.1 \\ 0.8 & 0.1 & 0.1 \\ 0.8 & 0.1 & 0.1 \\ 0.8 & 0.1 & 0.1 \end{bmatrix}$$

The third step, we should confirm the weight matrix W and relationship strength matrix R, which reflect relationship between the rules’ function and workers’ attribute.

$$P=\begin{cases} \text{if } 500 < i < 2400 \begin{cases} \text{if } x(n) < T, P = P - x(n) + 0.5 \\ \text{else} \quad \quad \quad , P = P - x(n) * 0.1 \end{cases} \\ \text{else} \quad \quad \quad \begin{cases} \text{if } x(n) < T, P = P + x^2(n) \\ \text{else} \quad \quad \quad , P = P - x^2(n) \end{cases} \end{cases}$$

In this model, we both consider the static attribute and dynamic attribute. Because in the real system, the rules cannot keep control ability on workers as the same all the time, this becomes more complex than a static system. In the 3000 days computing experiment, the rules’ control ability will be updated every day. So the quantitative computing will be restarted as before again. The simulation result is as Figure 1. All the positive workers’ performance is described in full curve, while all the positive workers’ performance is described in dotted line. And their work attitude degree is higher, the line width is wider.

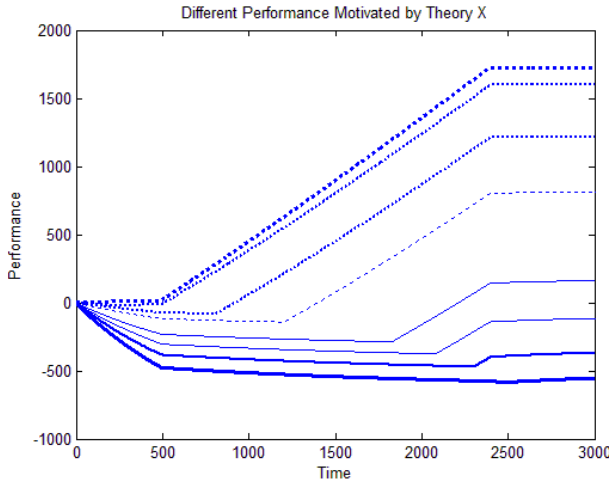


Fig.1. Different performance motivated by Theory X

B. The Quantitative Simulation of Theory Y

The quantitative simulation progress of Theory Y is similar to that of Theory X. But it has two differences. First, the workers suit to be motivated by Theory Y is more positive, so their performance judgment standard is greater than the threshold value T rather than smaller than it. Second, as Theory Y is more powerful when it motivates the positive staves, the computing in the middle stage will not be same with Theory X.

$$P = \begin{cases} \text{if } 500 < i < 2400 & \begin{cases} \text{if } x(n) > T, P = P + x(n) \\ \text{else} & , P = P + x(n) - 0.1 \end{cases} \\ \text{else} & \begin{cases} \text{if } x(n) > T, P = P + x^2(n) \\ \text{else} & , P = P - x^2(n) \end{cases} \end{cases}$$

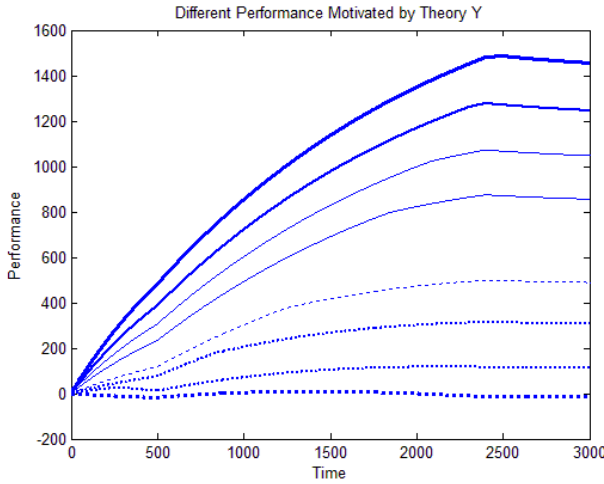


Fig.2. Different performance motivated by Theory Y

From the quantitative analysis of the works' performance motivated by the two opposite theory, it is not hard to find that both Theory X and Theory Y are not fitted to all the staves. Every theory can work only when it motivates the right members. And this also verifies the right of Super Theory Y.

C. The Quantitative Simulation of Theory Z

Comparison with McGregor's XY theory, Theory Z is no longer proposal a management model distinguished by character or attitude. Instead, from the view of enterprise cultural, it takes both Theory X and Theory Y into account to cultivate the staves' loyalty to the cooperation, by valid organizational forms and efficient communication modes. This theory allows the workers to participate in decision, and combine the enterprise's success with them, so that it can enhance the formation of corporate culture.

Because Theory Z pays more attention to training and enterprise cultural, so workers' work attitude, ability and loyalty will increase with the appraisals going on. In this simulation, we compute these attributes as $M = M + 0.001$. The other processes are all same as Theory Y.

$$P = \begin{cases} \text{if } 500 < i < 2400 & \begin{cases} \text{if } x(n) > TZ, P = P + x(n) \\ \text{else} & , P = P + x(n) - 0.1 \end{cases} \\ \text{else} & \begin{cases} \text{if } x(n) > TZ, P = P + x^2(n) \\ \text{else} & , P = P - x^2(n) \end{cases} \end{cases}$$

Based on the hypotheses above, the simulation result is as Figure 3.

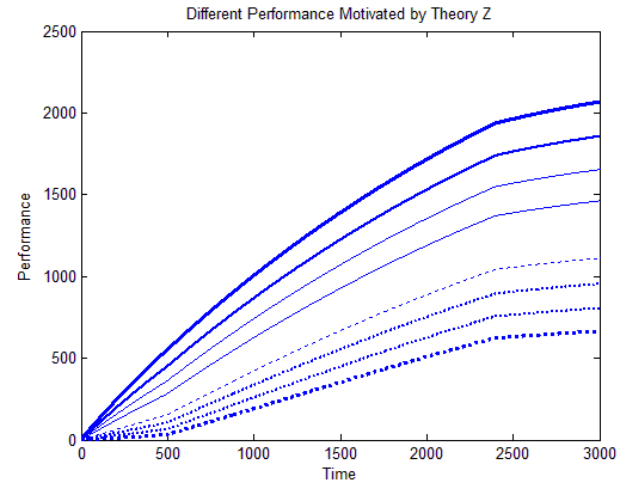


Fig.3. Different performance motivated by Theory Z

D. The Qualitative Analysis of Theory XYZ

After getting the quantitative simulation result, we can find the workers with different attitude have different performance. If we divide the workers into two groups, positive or negative, we can get the qualitative simulation from the pictures above.

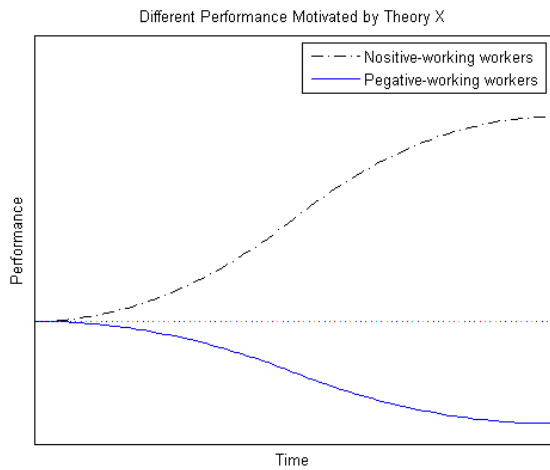


Fig.4. Qualitative simulation result motivated by Theory X

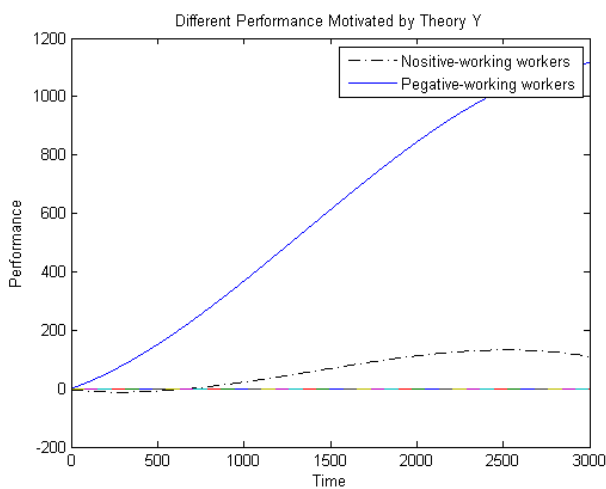


Fig.5. Qualitative simulation result motivated by Theory Y

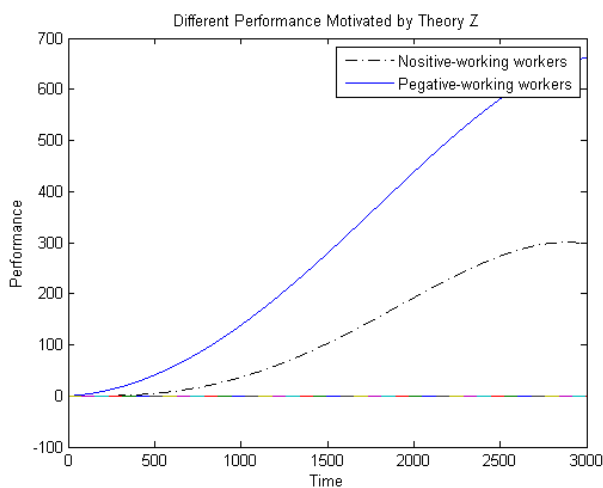


Fig.6. Qualitative simulation result motivated by Theory Z

Now it becomes more apparent for us to analyze the effect of Theory X, Y, and Z. Theory XY has more power on

workers with one special character or attitude, while Theory Z has more advances because it can enhance workers' attitude, ability and loyalty. So the workers motivated by Theory Z can perform better.

IV. CONCLUSIONS AND FUTURE WORKS

In this paper, a new way of quantitative simulation about different management theories is realized by agent model, quantified appraising performance, and combined with qualitative analysis. After getting the quantitative simulation result, this research completes a qualitative simulation, which makes it become easier to observe the workers' performance directly from the simulation figures. At the end, we make a conclusion that Theory X and Theory Y are only suit to one special character or work attitude workers, while Theory Z can meet most workers' need and has a more significant effect on their performance.

The management theories will not be stopped, instead, it will pay more attention about enterprise cultural to meet workers' all kinds of needs and to bring the success of corporation as a feedback. So new management theories will be proposed and new quantitative simulation should be done.

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