Computer Aided Organizational design

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Abstract

This paper discusses about computer aided organizational design by reinforcement learning. In the past days, organizational design is done by the experience and some intuition of corporate planning department staff or other similar functional department staff. This means there is no expert or specialist for organizational design in the corporation. We propose "Computer Aided Organizational design" ,here. This organizational design system is build on the basis of the Enterprise Model and Corporate Information Structure Model.

Organizational design is implementing through computer simulation that is done by using actual markets data. This system uses banking business as an example. After implementing dealing for 1 month, the system start to make several monthly financial reports ,that is, B/S, Income statement, and Risk Analysis. Organization will be redesigned its initial structure by performance which is indicated in above mentiond reports of each functional team and player's dealing.

According to this designing process, organization(=corporation) gain robust structure, in another word, organization adapts environment change through this process.

Keyword

reinforcement learning, organizational design, enterprise model

1.Introduction

This paper discusses about computer aided organizational design by reinforcement learning. In the past days, organizational design is done by the experience and some intuition of corporate planning department staff or other similar functional department staff. This means there is no expert or specialist for organizational design in the corporation. In the activity of airplane design, we can find out designer as a specialist who has educational background of its field, usually. However, in the case of organizational design, we never find out such a person in the corporation. Certainly, we know some specialist for it who is called Management consultants, but they are mere adviser or temporary staff of the corporation. Accordingly, we propose computer aided organizational design system here.

2. Organizational Design System by reinforcement learning

This organizational design system is built on the basis of the enterprise model(EM) and corporate information structure model(CISM). And principle of the organizational design is based on reinforcement learning. Organization will be redesigned its structure through evaluating each team and player's financial and risks data getting through autonomous dealing by expert system in this system. The dealing is doing by using actual financial markets data.

2.1 Enterprise Model

Enterprise model(fig.1) provides whole structure of this design system and also overall scope of the enterprise. This model can divide 2 parts. First one is market as environment of the enterprise which include other enterprise as competitor, customer and so on. Another one is enterprise itself. Enterprise part of this model is consisted of 4 parts. First part is Management, second one is employee(=staff), third one is organization, last one is Information Technology.

At first, function of the Management is to create idea and vision as basic concepts for corporate strategy . Idea and vision function to indicate direction of behavior for each member in the enterprise. Corporate strategy presents domain of enterprise and scope of diversification strategy which is according to above idea and vision. Business strategy is to brake down the corporate strategy to each business group, and present competitive strategy and functional strategy. Each actual business activity in enterprise is done on the basis of this business strategy. These strategies sophisticate through learning by doing processes. Secondly, function of the employee is to actualize the strategy through their daily business action.

Financial data as result of business action register to data-base of Information systems. Thirdly, organization is designed to be based on the strategy. If the

strategy are replanned by causes of circumstances change etc., organization must redesign to be based on new strategy at the same time. Last is Information technology, this includes 2 type of technology.
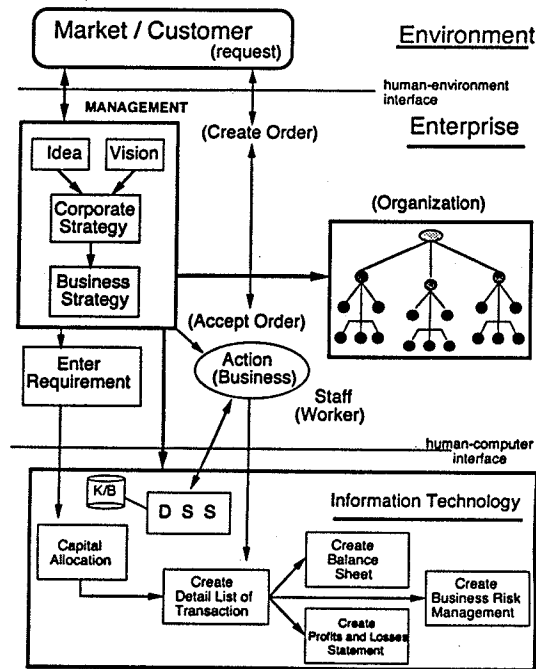

fig.1 Enterprise Model

One is MIS(Management Information System) which is written in procedural language, second one is DSS(Decision Support System) which is written in declarative language. Business expert system play business which is dealing / trading / investment etc., instead of human being, autonomously. MIS includes financial accounting system, detail list of transactions management system, personnel management system . This enterprise model describes the structure of enterprise and also framework of Organizational Design System itself.

2.2. Corporate Information Structure Model

This model(fig.2) shows relationship between organization and information systems. Information systems are classified two part by written language ,namely, procedural or declarative language. Upper layer in fig.2 shows business structure that is built by declarative language as business expert system. This business structure includes lending business, bonds trading, equities dealing etc., and they make deal autonomously under supporting expert systems. Intermediate layer is base layer of this model, it shows human structure that mean real organization of the enterprise. Lower layer is information system structure that is built by procedural language as business information system like MIS(Management Information System) and/or SIS(Strategic Information System). This system includes

financial accounting system, providing Balance Sheet(B/S), Income Statement at the end of every month. And analyzing various financial risks by ALM(Assets and Liabilities Management) system at same timing.
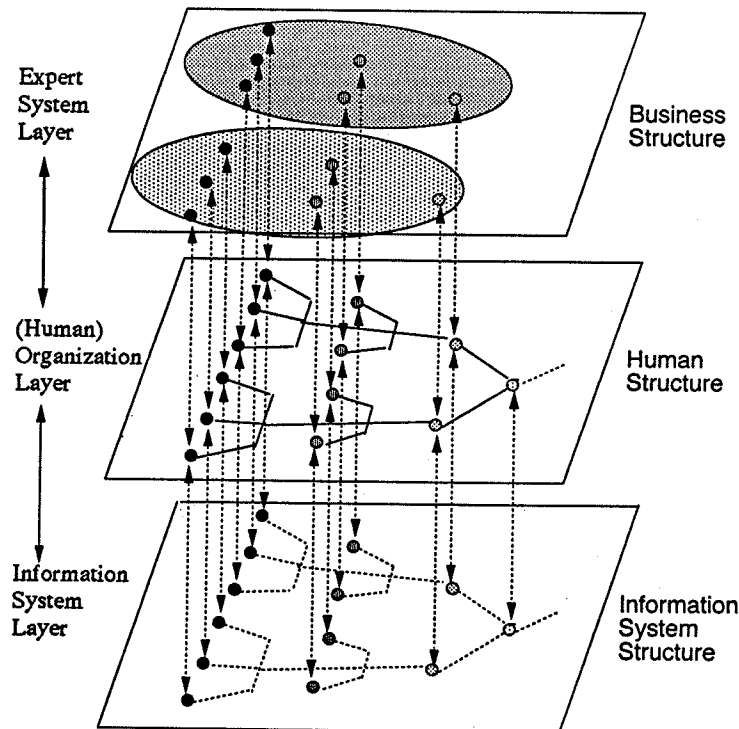

fig. 2. Corporate Information Structure Model

All player, in above mentioned each business, is evaluated their performance by using those financial and risk analysis data. It means each player has own B/S and Income statement, and they are evaluate their payroll by using that data. Farther more,each functional business team is also evaluated its monthly performance by using team base B/S, Income statement, and ALM. The first and second layer in this system is developed by using KAUS(Knowledge Acquisition and Utilization System)(Yamauchi 1985;Ohsuga 1992) , third layer is built by spread sheets macro, and it has been working on UNIX Work Station.

3.Organizational design by computer simulation

3.1 Initial Organization Model for simulation

We start the simulation by using initial team structure model(fig.3) as an example. This team is consisted of 5 person - 1 team manager, 2 senior staff, and 3 junior staff.Payroll amount and dealing upper amount make difference this hierrarchy.

We should use actual organizational structure as an initial model for rhe simution to adapt real business world.
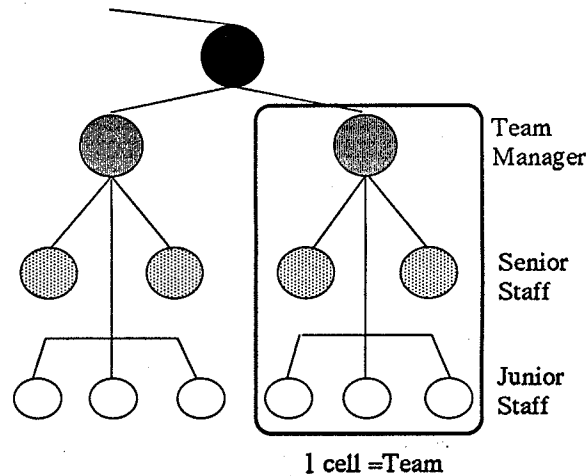

fig.3 Initial Team Structure

3.2 Simulation flow of organizational design

Organizational design is executing through computer simulation(fig.4) that is based on actual market data. We use traditional baking business as examples, i.g. loan business, securities investment, money dealing in this system, and those are function of the expert system.
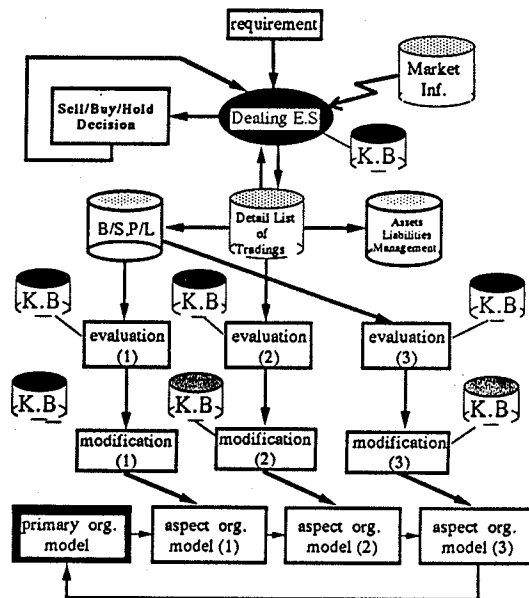

fig. 4 simulation flow of organizational design

After executing 1month dealing(=20 times deal), system start to make B/S, Income statement, and Risk Analysis. Organization is redesigned its initial structure that is called primary model through evaluation on the basis of each functional team and player's monthly performance. That redesigned organizational model is called aspect model, the simulation will start to use this aspect model as primary organization model in next month. Simulation repeats this cycle.

3.3 Organizational redesign by reinforcement learning

A reinforcement learning means agent as learner decides his behavior by observing circumstance around himself, state of himself, or combined both condition. Agent is provided reward or punishment because of his decision making by circumstance. Main aim of learning is to maximize sum weight of reward. Reward and punishment are called reinforcement. Reward is positive reinforcement, and punishment is negative reinforcement(Unemi 1994; 40-41).

Organization structure changes by two way evaluation. First one is private evaluation, second one is team evaluation. Private evaluation means if the Bonds trader's performance is lower/higher than last month it, firstly his payroll amount is reduced / increased some percentage from current payroll, secondly his dealing upper limit amount is also reduced / increased some percentage from current upper limit . When lower staff catch up the higher person's payroll amount, that player up the hierarchy. Team evaluation means if the total amount of monthly profits is lower / higher than last month, the number of team member quit / hire a junior staff. Reinforcement in this system is to up/down the payroll,promotion,to increase or decrease number of the team member and team itself. This process

According to this reinforcement leaning process, organization(=corporation) adapts environment change, and gain the robust structure through reallocating number of member in each team, and dealing/investment amount. And also organization can get high profitability and low risks structure.

4. Conclusion

We discussed about organizational design which is aided by computer system. This design system is built by using reinforcement learning approach as principle. We could show you to get robust and emergent organizational structure and adaptation for environment change through this system.

We believe this organizational design methodology is very useful for developing virtual banking system especially, and have many possibilities to apply various industries' organizational design problem.

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