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Dynamic Strategies Formation via Sensemaking and Sensegiving mechanisms in an Agent-based Organization

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Abstract

To survive and progress in an environment where the commercial rules are constantly evolving and overwhelmed with data, agent-based organizations are forced to apply new strategies and methods in an attempt to offer products and services that are in line with the market demand. To any system designer, it is especially difficult to apply some of the key characteristics in the agent-based organization's dynamic capability. These capabilities include an organization's sense making ability as well as the organizational effectiveness in executing new found opportunities in a radically changing environment. In this article, we will examine in greater details the design concept on strategy of agent-based organizational sense making and sense giving process. Three dimensions of the concept will include agents in each level of the system (horizontal), agents interaction between system levels (vertical) and finally, dynamic adjustment of the system itself (dynamics). Through these dimensions we hope to apply a systematic understanding as to how these agent-based organizations formulate successful and innovative strategies via effective sense making and sense giving process design.

Keywords: sensemaking; sensegiving; agent-based organization

I. Introduction

Organizations are consistently seeking innovations in a changing business environment; however, directing an organization in the right path along with consensus from its members and continuously adjusting and improving upon its capabilities is an extensive process that needs to be considered by the system designers. More and more researches pay attention to the AI system's dynamic decision capability. Eisenhardt and Martin considered that scanning may represent a 'dynamic capability' for an organization [11]. Fittingly, with thorough understanding of agents themselves and their surrounding environment, they are more easily equipped with the capability to identify resolutions in a timely manner. Therefore, an agent-based organization seeking, practicing and adjusting to strategies dynamically will depend heavily on the effectiveness of its sensemaking mechanism. In order to understand related issues of this study, in the following we will discuss additional literatures in 'organizational sensemaking', 'sensemaking for strategy' and 'the interaction and survival relationship among the organizational sensemaking, environment and strategy'.

A. Organizational Sensemaking

In regards to the definition of 'Organizational Sensemaking', Ring and Rands [18] noted that sensemaking activity is a process, in which an individual will build the cognitive map of the environment. Thomas, Clark and Gioia [9] offered a more concrete account of organizational sensemaking activities. They suggested that organizational sensemaking activities include information seeking, meaning ascription and action. However, organizational sensemaking is driven and generated by beliefs and actions. Belief drivers is when an entity collects information based on his/her beliefs. Action drivers contain commitment or manipulation actions and both are initialized from actions. If sensemaking is driven by commitment, the purpose of the entity's action is to build meanings for proving the committed actions are legit.

However, if sensemaking is driven by manipulation, the purpose of sensemaking is to building meanings for explaining the action causing changes [10].

Hence sensemaking is essentially a form of cognitive behavior, through the process entities become aware of their positions in a given environment as well as the perceived circumstance between the environment and themselves. Even more, organizational sensemaking involves seeking related information for a specific intention, exchanging shared meanings and explanation, and carrying out these immediate actions.

The aim of organization processing information is to makesense of its environment, to create new knowledge, and to make decisions [3]. The above opinion by Choo included three parts: sensemaking, creation of knowledge and decision formulation. These series of actions initialize from the organizational sensemaking. He advised that when organizations operate in a changing environment, they tend to interpret and construct shared meaning and purpose among all the members for resolving their problems or taking actions on the opportunities. The sensemaking results will affect the follow-up actions taken by the organization and the final results of these actions may lead to either successful or unsuccessful innovation production or services. Consequently, the correctness and timeliness of organizations' sensemaking ability with respect to the demand of the environment will directly affect the fitness between outputs and demand of innovation.

B. Sensemakingfor Strategy

In the studies of relationship between strategy and organizational sensemaking, Gioia [6] adopted a national university as the research subject and studied the initial effects during the strategic changes. This study shows that thesensemaking mechanism operates and encourages the new strategies development. Thomas, et al [9] focused their research effort on the relationship between the strategic sensemaking process and organizational performance. Their research showed that when people employ information to explain the strategic issues during the information searching period of strategic sensemaking process, such a behavior will result in a positive effect. In addition, strategic explanation will also positively affect the strategic actions of products and/or services. The strategic actions will positively influence the market shares, profitability and degrees of acceptance in organizational performance, too. Rouleau [12] tried to understand how managers can maintain their competitive edge in the strategic sensemaking and sensegiving process. Choo ([4], [5]) thought that strategies are formed by the cycles of making sense with the environment, creating new knowledge and making decisions. After this study, Choo[5] utilized this framework to exploit how the project members of a financial institution were able to effectively develop and complete an innovative e-commerce system they designed.

C.The Interaction and Survival Relationship among the Organizational Sensemaking, Environment and Strategy

Organizational sensemaking not only serves as an interactive bridge between organizations and the external environment but it also provides a stage to form a shared common view among internal members. To the external environment, Porter's Five Forces Model [14] has pointed out that through an organization's interaction with its customers, suppliers, new entrants and substitutions, a competitive and coordinated external environment is created.

As organizations begin to recognize their industry position and the changes taking place that threaten their survival, it will force them to generate new survival strategies. To the internal environment, each organization's members understand the need to practice and adjust their work to the strategies through interacting with internal and external entities in their daily routines (see Fig. 1).



Fig. 1 Relationship among the organizational sensemaking, environment and strategy

From the evolution theory viewpoint, an organization in a competitive environment will adjust itself to meet the requirements for survival in such an environment. To break through the current state, an organization's strategy depends on the top-level entities' integration and leadership abilities, and effective communications that they can give their intention smoothly to the other agents. Automatically, the entire organization will reach a common understanding and start making adjustments [6]. This adjustment mechanism is driven by the organizational sensemaking, as a consequence, higher organizational sensemaking capability will result in faster and more accurate organizational adjustment.

In the study of this article, we hope to examine the relationship between the organizational sensemaking and strategies in the AI system design concept. To construct this concept, we suggest three dimensions that need to be considered by the system designer.

II. Three Dimensions for Design Concept

Currently, the latest computational paradigm focus on the development of artificial organizational software component that is robust enough to handle complex, dynamic and unpredictable environment [15]. As a result, it is imperative to ensure that the intelligent agent is capable of understanding and making critical task adjustments in accordance to the changing environment. The concept of programming environment awareness and the understanding capability in an intelligent agent is not new. For many years researchers of this topic have been developing intelligent agents with the ability to perform sensemaking, goals, environment scanning, and even complex reasoning.

On the other hand, many researches have shown that organizational sensemaking capability and process will affect the development of organizational strategies ([7-9],[21]). This is the result of organizational strategies being developed to meet the needs of a niche market based on the understanding of the environment and itself. Therefore, one of the key system design requirements in an intelligent agent is the ability to apply complete and effective sensemaking in the agent-based organizations. As such, an organization can form its strategies through individual-based sensemaking, or more effectively, an integrated organizational-based sensemaking.

Due to the nature of complex and unpredictable environment, agents in an organization often perform completely different tasks; designing an agent-based sensemaking mechanism is particularly difficult for system designers. Therefore, it is very important for designers to have a solid understanding of the fundamental concept behind agent-based sensemaking.

For the purpose of using various views to account the design concept of organizational sensemaking on strategies, we try to build up three dimensions. Through these dimensions, we are able to obtain a varied and integrated outlook. In the first dimension, we gain a high-level view of every agent's sensemaking activities in each organizational level. In the second dimension, we get a better understanding of members' interactions and connections between organizational levels and through these process agents in each level will gain insights into the coordination and common views of sensemaking. In the last dimension, we will use an auto-adjustment viewpoint to see how an agent-based organization applies its self-adjustment ability to meet the needs of the environment. Therefore, our conceptual model on the strategic sensemaking mechanism include three parts, which are detailed activities of each level's sensemaking, integration of main levels and sub-levels' sensemaking, and the entire organization's dynamic adjustment in moving forward to successful strategies.

III. Members in Each Organizational Level (HORIZONTAL)

The sensemaking of each member is the first dimension of our design concept. We can use the sensemaking properties and process provided by Weick [10]. These properties have been quoted in many studies ([17], [19], [23]). However, we not only use these properties but also categorize organizational members' respective group to distinguish the sensemaking attribute and thought process of these agents. A brief introduction of these seven properties as follow:

- Grounded in identity construction: The impression of self is persistently redefined by how we interpret our actions and environment. Individuals gradually construct his/her identity by the coordination of the interpersonal and self-cognition in the interaction process.
- Retrospective: The world known and felt by people is from history. If the 'memory' comes from previous experiences, then all the feelings that people sense is, in fact, a form of memory. There are many meanings and experiences that need to be synthesized during the retrospective process.

□ Enactive of sensible environment: People in the organization often try to create an environment that is beneficial to them. For the future, they create constraints and opportunities by taking actions. Therefore, people's behaviors are evolving with the environment and it becomes very important to be aware of the events which will happen in the evolving environment.

□ Social: People often make sense of others' conversation and behavior because they are living in a social network. Different social contexts always result in diverse sensemaking content and scope.

□ Ongoing: Sensemaking is constantly taking place. People are continuously updating their cognitive map.

□ Focused on and by extracted cues: The purpose of extracting cues is to search out which are the significant and interrelated messages in a complex environment. These messages are the seeds which will trigger and develop a larger sense.

□ Driven by plausibility rather than accuracy: The world is dynamic and chaotic. Most of the organizational action is time sensitive, which means that it is in a speed and accuracy trade-off [24]. Therefore sensemaking gives quick responses to the shape of events rather than the accuracy of recognition. Since there are differences among the organizational agents' tasks, responsibilities and abilities (i.e. computing speed, memory space and compatibility), the content of the sensemaking activities will be different as well. As a result of different tasks, responsibilities and abilities of agents, an agent-based organization could be divided into three parts: 'top-level agents', 'mid-level agents', and 'general agents' ([1], [2], [9], [20]).

Typically, top-level agents have to become the forerunners who control the environment and the directions of their organizations vigorously. It is because the role of top-level agents bears the greatest overall responsibilities. Mid-level agents must accept and buy into the organizational mission set by higher levels. The general agents often have the duties to carry out the tasks according to the plans. Therefore different roles and tasks of each organizational member will display very different styles of strategic sensemaking.

As a result, during the development of agent-based organizations, designers should consider the tasks and abilities required for agents in each level and design sensemaking capabilities (in each level) accordingly.

In general, agents in each organizational level possess seven properties of sensemaking abilities as states by Weick [10]. However, based on different tasks in each level, there are some special and distinct features:

□ Top-level agents- In this level, the agents should be good at knowing the overall situations and the organization's competitiveness. In order to recognize the threats and chances, these agents are specifically designed with the ability to integrate and judge the internal and external business information. They store and retrieve the experience and finally generate the creative thinking and strategies for the organization.

□ Mid-level agents- Agents are embedded with the function to filter useful information from noise, monitor and verify the progress of tasks in the lower level. Even more, they should often understand the lower level agents' sensemaking activities and results of these activities. When lower level agents need support from others, the mid-level agents have to renew plans and deploy resources. The output of this level is to develop decision and plans in accordance to the organizational strategies.

□ General agents- The agent is designed to collect and share information and execute assigned tasks. The purpose of the agent's sensemaking in this level is to produce actual products and services which can meet the market demand.

IV. Members Interaction between Organizational Levels (Vertical)

Sensemaking between levels is the second dimension. In the research of organizational sensemaking, Gioia [6] added the dimension of bottom-up sensemaking and top-down sensegiving. The bottom-up sensemaking depicts the source of environment related data collected by higher level managers actually comes from the lower levels. These data from lower levels becomes the basis of top-level agents' strategies. However, to practice these strategies, higher level agents need to delivery their intention and opinion to the lower levels through top-down sensegiving. In another study, Hill [22] built the mental models of innovative activities with this dimension, too. This dimension includes bottom-up sensemaking and top-down sensegiving in the following sense:

1) Bottom-up Sensemaking: In the bottom-up sensemaking, organizations' major activity is to collect data, information and ideas; the collection will in the end support their strategies. During this period, high-level agents may query external agents, who act as consultants and experts, and frequently discuss and exchange information with lower level agents. Through these activities, high-level agents are able to understand the activities of all members in the organization, environment challenges to be faced and their organization's strength and weakness.

These agents use their computing and integration ability to generate the new strategy. Obviously, the flow of information to the organization comes from the bottom-up. The ultimate purpose of the bottom-up information flow is to make sense with the actual situation internal and external to the organization and seeking out new opportunities and strategies.

2)Top-down Sensegiving: When the organizations' new strategies have been approximately generated, top level agents confirm the organization's new position through the release of related messages. By system functions, high level agents announce the new strategic directions and consign important plans and activities to lower level agents. In another side, high level agents let other members know about their new tasks and upcoming challenges. In the process, not only the agents' roles and tasks have to be adjusted but also the organization's resources (i.e. system resource and the authorities given by the human users) and plans. These adjustments are adapted with new strategies. Hence, the sensegiving aims at carrying out and making adjustments for the new strategies.

3)Conflict and Coordination: Coordination is an important mechanism both in the process of sensemaking and sensegiving. Both processes may go through various stages of weary, unknown and conflicts, because of the dissimilarity between each agent's subject of intention, expertise and experience as well as the external complexity. Choo [4] clearly stated that organizational sensemaking is the process that forms the shared meanings and goals among the organization's members. Consequently, the organization forms clear visions and coordinated intentions as the result offrequent information and ideas sharing among its members. Conflict resolution and coordination process in the sensemaking and sensegiving will help the organization's members come to a joint and integrated relationship, consonant goals, new ideas, strategies and unanimous actions (see Fig. 2).

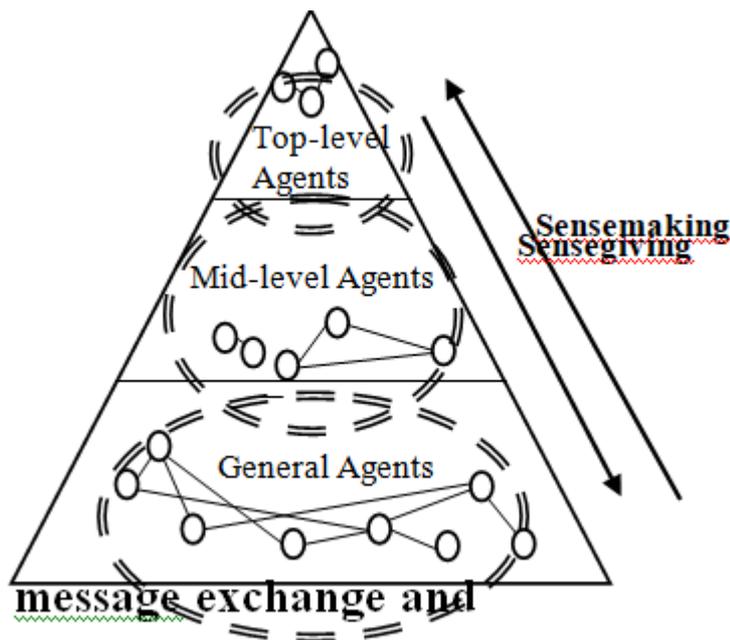


Fig. 2. Interaction between organizational levels (vertical)

V. Dynamic Adjustment of the Organization Itself (Dynamics)

The dynamics of organizational sensemaking is the last dimension. In this section, we will take the stance of dynamic view to examine an organization's adjusting actions. With this viewpoint, we can see that an organization generates its strategies, plans and actions on a whole and its direction is adjusted toward the ultimate goal in a dynamic way.

Based on Bratman's BDI (Belief-Desire-Intention) model [13], Wooldridge and Michael [16] proposed the dynamic process about how entities make sense with the states of the environment and then modulate their sensemaking and goals in the changing environment. Their dynamic process has two main processes, deliberation and means-ends reasoning.

Deliberation process is the interactions among entities' beliefs, desires and intentions to produce a new intention (goal). Deliberation functions include option generation and filtering (see Fig. 3).

The option generation function utilizes the original beliefs and intentions to generate additional desires and options. Figuring out appropriate desires to be the new intention (goal) is the function of filtering.

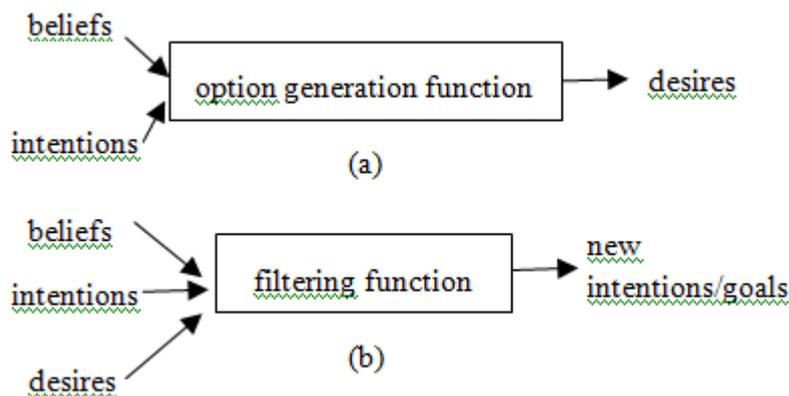


Fig. 3. (a) Option generation function (b) filtering function

Means-ends reasoning process accepts the results (new intentions/goals) of the deliberation, and reasons the means needed in order to reach the goals. The final purpose is to create the methods and plans to help entities reach goals. Therefore, the output of the means-ends reasoning process is the plan of actions (see Fig. 4).

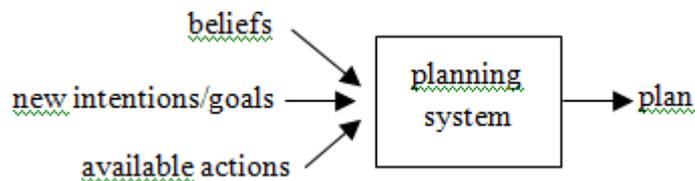


Fig. 4. Means-Ends reasoning process

We base on the above two basic processes and examine the organizations' adjustment process of sensemaking on strategies is shown in Fig. 5. To illustrate Fig. 5 in more detail, we have divided the description into Accounting for the Stages and Accounting for Dynamic Adjustment.

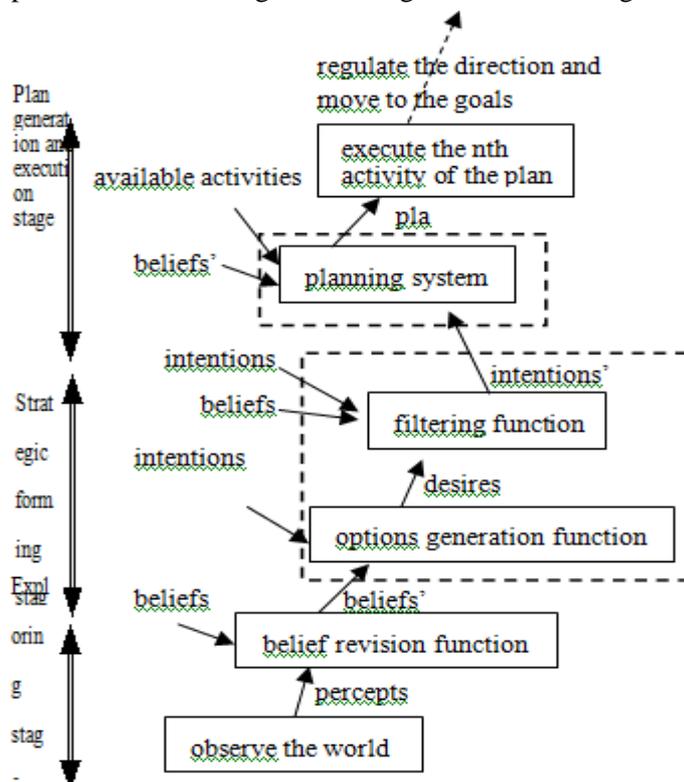


Fig.5.Dynamicadjustmentoftheorganizationitself(dynamics)

Accounting for the stages

1) Exploring Stage: To form effective strategies, organizations need to learn the importance of observing and understanding events and things in their surroundings. This scanning range covers area both internal and external to the organizations for any possible opportunity [25]. After observing and exploring their options, organizations will come to realization about the environment, organizations' status in the new domain and their position and innovation abilities.

2) Strategic Forming Stage: In order to progress and survive in a competitive environment, organizations will attempt to execute some activities to obtain their goals. However, the agents sometimes cannot directly reach their exact goals they have set for themselves due to the bounded rationality. For this reason, agents will use the option generation function to generate some forms of desires (goals/strategies). On the other hand, in order to work within resource constraints, organizations will depend on their beliefs and intentions to filter out only suitable new intentions to move forward.

3) Plan generation and Execution Stage: Intentions and goals have little purpose if there are no actions. Based on the beliefs and goals, they have to create some plans that contain a series of effective actions which help them to reach the goals. These actions will affect the surrounding environment and organizations' own position. Thus, organizations may need to modify executable action according to their new intentions (goals/strategies) and beliefs. If organizations execute the activities of their innovation strategies smoothly, the whole sensemaking activities will go on until all of the action plans have been accomplished. Otherwise, they will stop when their goals have been realized or been deemed unreachable.

Accounting for Dynamic-adjustment

In the first stage of figure 5, organizations observe the environment and generate new beliefs repeatedly until they have a clear understanding of the trends and visions of the environment. Even when they have arrived at the end of the final stage - executing the activities of plans, it is highly probable that the above activities will continue to take place, because members in organizations will keep on creating new beliefs after they complete an activity. Once a new belief is created, members will go back to the starting point of the process (see the dotted-line boxes). Members may base their new intention (goals/strategies) and beliefs to measure the current plan results, and then decide whether to go back to adjust a new plan. Another condition may occur as members consider whether their intentions (goals/strategies) generated in the strategic forming stage is adequate. Members have to undertake the activities of selection generation function and filtering function again, if their intentions (goals/strategies) are not adequate.

Organizations create new beliefs and ideas during the sensemaking process, and then make adjustment in accordance to their new strategic goals and plans. They will create new beliefs again after executing existing plans and activities. The main purpose of this repeating process is to modulate the organizations toward successful goals with the aim to produce products and service that meet the market demand.

VI. Conclusion

The study of this article is mainly focused on establishing an integrated concept during the development of agent-based organizational system in the AI field. System designers should make sure that the environment sensemaking mechanism is planned when developing an agent-based organization. Especially the intention of the organization is to seek out opportunities and formulate strategies to face the complex environment and meet the market demand.

Key characteristics of an agent-based sensemaking model are not only focused on agent's ability to function automatically, but also interactions of the sensemaking and sensegiving that take place in all levels of an organization. Thus, system designers should include the mechanism for transferring and exchanging of information flow and meaning between agents in different organizational levels. In addition, in order to explain the movement of the changing environment, system designers should also include the self-adjustment mechanism, which will enable an agent-based organization to automatically adjust organizational directions in a changing environment based on organizational sensemaking and sensegiving, adjustment of strategies and plans, or even re-allocation of organizational resources.

As this article is to provide a high-level design concept, focal points of future studies will be on the detailed design and development of each dimension. In addition, given that interpretation of the meaning is needed during the development of agent-based sensemaking, as a result, it is also necessary to create a semantic system in such an AI system. In the development of a complex agent-based organization, system designers' full understanding of this overall concept is extremely important. The study of this article provides a point of reference.

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