



A Formal Model of Managerial Decision Making for Business Case Description

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Abstract. This paper proposes a novel formal description model of organizational decision-making: the Managerial Decision-Making Description Model (MDDM). This model introduces a four terminal element representation to describe managerial decisions redefining relationship between their objectives and resources. It enables them to compare various decision-making processes from not only actual business cases but also virtual ones, from an agent-based simulation, too. This model is also applicable in facilitation support for business gaming.

Keywords: Decision making · Formal description · Business case

1 Introduction

This paper proposes a formal description model to describe managerial decision-making processes used to transform the business organization. This heuristic tool named as the Managerial Decision-making Description Model (MDDM) provides common way to visualize a decision-making process within the business case method as well as the agent-based organizational simulation and business gaming.

In contrast to the Case Management Model and Notation (OMG [6]) with the Business Process Model and Notation (OMG [4]) and the Decision Model and Notation (OMG [5]) describing the static process of the business, MDDM focuses on describing the organizational decision-making that causes a one-shot transition process in which the whole business structure is changed.

A High-Level Business Case in Sawatani [7] is presented to describe such a one-shot transition of the business structure. While their HLBC represents the evolution of the functions and services of the business structure, the MDDM focuses on the decision-making process driving the transition of the business structure.

Accordingly, we started by defining the key terminologies for the MDDM. First, the business structure of the organization is defined as a multi-layered structure of combinations of business objectives and the related resources or means. Next, managerial decision-making is understood as a means that an agent (i.e., an actor or a player in the organization) defines or redefines the combinations of business objectives and their related resources in the business structure.

To formally describe the managerial decision-making that change the business structure of the organization, we require that MDDM represent following items.

- (a) the multi-layered structure of the organizational business, and its transition,
- (b) the focus (or bounded scope) of the agent's observations and actions,
- (c) the agent's position corresponding to each layer in the business structure,
- (d) the chronological order and the causality of the agents' decisions.

Those enables the MDDM to describe "who" decides "what", "when," and "where" it fall within the business structure," along with how the decisions change.

2 Methodology

To represent the transition of the business structure as a decision diagram, the Managerial Decision-making Description Model (MDDM) uses three kinds of components. With placing and connecting those components, the decision diagram describes organizational decision-making as if it were an equivalent circuit. The decision diagram satisfies the condition presented in chapter one.

2.1 Three Major Components

The MDDM uses following three kinds of major components: (i) the business structure component, (ii) the environment component and (iii) the agents' decision element.

- Business Structure Component

This component represents the multi-layered structure of objectives-resources couplings in the organizational business process. It comprises the objective symbols, resource symbols and the connections between them. Each objective symbol represents a goal, an objective, or a target in the layer of business. A resource symbol represents a resource, an operation, a product or a means required to achieve the objective symbol. By heaping up the objectives-resources couplings, the business structure component represents the multi-layered structure of the business.

- Environment Component

This component describes the states, the transitions of the status, and events outside of the organization. It consists of status and event symbols. Each status represents the situation or condition of technology, the market or another organization. The event indicates something that happens with the status and triggers the agent's decision, or indicates something that is caused by the agent's decision. The order of these symbols from left to right indicates their chronological order.

- Agents' Decision Element

The agent's decision element describes how the agent redefines the objectives and means in the business structure of the organization. Each decision of the agents is represented as a "decision element" with 2×2 terminals.

Each terminal has a specific function. The left hand’s dual terminals of a decision element represent the agent’s observation-action pair before the decision. In contrast, the right-hand two terminals represent the agent’s observation-action pair as a consequence of the agent’s decision. The upper dual terminals indicate the agent’s objectives or targets, and the lower dual terminals indicate the corresponding resources or means to facilitate those objectives.

2.2 Composing the Decision Diagram

With allocating and connecting those components, the MDDM describes the managerial decision-making as a decision diagram (Fig. 1).

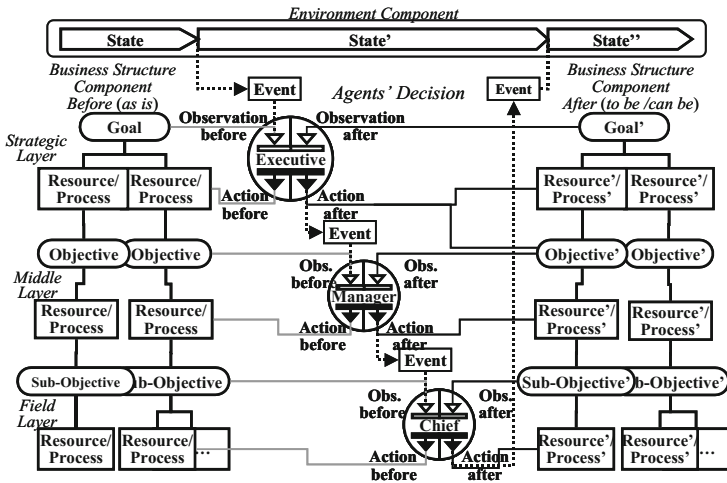


Fig. 1. The MDDM represents the managerial decision-making as a decision diagram with the three components, the Environment (top), the business structure (right and left side) and the agent’s decision (four terminal elements between the Business Structures).

To begin with, the environment component is placed at the top or bottom of the decision diagram. It introduces the time procession (from old to new) from a horizontal direction (from left to right) of the decision diagram.

Next, to describe the transition of the business structure, the two business structure components are placed on the left and right sides, respectively. The left-side component represents the business structure that existed before the agents’ decision. The right-side one represents the consequences of the agents’ decisions. We call the left-side structure “before” or “as is”, and call the right-side one “after”, “to be” or “outcome”. These business structures introduce vertical layers into the decision diagram from strategic management (upper) to the field operations (lower).

Third, the agent’s decision elements are allocated between the business structures. The allocation of the decision elements reflects the organizational position and chronological order of the agents’ decisions.

Fourth, these agent's decision elements are connected to the other components and decision elements. Each upper left terminal is connected to the symbols that the agent had observed as the objective or the target in the left ("before") business structure component. Each lower left terminal is connected to the symbols that the agent had taken action to as the resources or the means in the left ("before") business structure. Similarly, each upper right and lower right terminals are connected to the new objective and resources symbols in the right ("after") business structure respectively.

Finally, an environment-agent interaction or agent-agent interaction are represented by connecting the agent's terminals and related event symbols. For example, when an event that is related to the environment triggers the agent's decision, the event is connected to the agent's upper left terminal. Similarly, if an agent's decision triggers another agent's decision, the agent's lower right terminal and the other agent's upper right terminal are connected through the trigger event.

2.3 Properties of the Decision Diagram

The decision diagram of the managerial decision-making enables us to describe the following properties that are required in chapter one. (a) The decision diagram represents the multi-layered structure that is introduced by the business structure components before and after the transition of the business structure. (b) The decision diagram represents that each agent decides with specific observation-action (objectives-resources) pairs limited by their scope and position. (c) In the decision diagram, each agent's vertical position corresponds to the layer of the business structure to which the agent belongs. (d) In the decision diagram, each agent's horizontal position reflects the chronological order of the agents' decision, and event symbol connections represent causalities between the decisions and the events.

3 Applications

Here we briefly illustrate how the MDDM discriminates among some typical managerial decision-making styles. First, we show that the decision diagram reflects the difference among top-down style, bottom-up style and a style tolerant of informal communication. Next, we show another example of the decision diagram representing the differences and similarities of the KAIZEN activity and organizational deviation.

3.1 Differences in Decision-Making Styles

The MDDM discriminates between decision-making styles by allocating the decision elements both in the vertical layers and the horizontal chronological order.

As the most fundamental pattern, MDDM discriminates between top-down and bottom-up style of the managerial decision-making. In the decision diagram, the top-down style is described as the allocation of the decision elements from the upper-left (i.e., the strategic decision comes first) to the lower-right (i.e., the field-level decisions follow). In contrast, the bottom-up style decision-making is described by the decision elements' allocation from the lower-left (i.e., the field-level decision comes first) to the upper-right (i.e., the strategic decision follows) (Fig. 2).

Next, the MDDM describes the typical pattern of the informal communication making a shortcut in the organizational hierarchy. Related study Toriyama [8] showed that such informal communication promotes organizational decision-making. The decision diagram indicates the existence, related agents, content and point in time of the informal communication (Fig. 2).

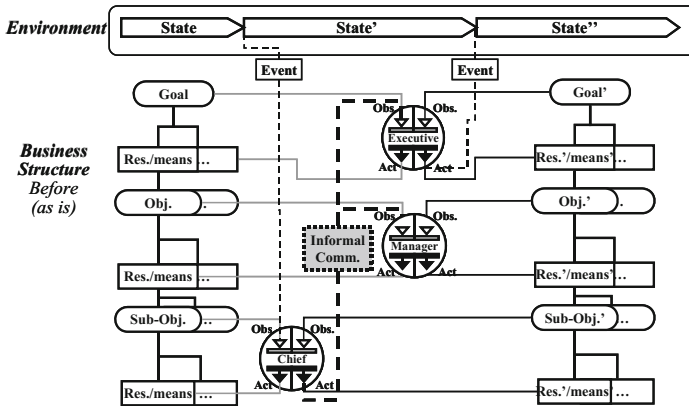


Fig. 2. A bottom-up decision making style is represented by the decision elements from the lower-left to the upper-right. An informal communication is expressed with the event (dotted symbol) among related agents' decision and the connections between them (thick broken lines).

3.2 Similarities in Decision-Making and Different Outcomes

MDDM describes both the similarities and differences of managerial decision-making. The related literature Kobayashi [2] mentioned that the spontaneous innovation and organizational deviation was derived by a common mechanism but caused the opposite consequences in terms of social aspects. They also demonstrated that the written cases from their simulation outcomes were grounded in the actual business case. MDDM illustrates formally the similarities and differences.

In such cases, MDDM represents the common mechanism by using a similar allocation within the decision diagram, and introduces an auxiliary business structure representing the social expectations on the right-end. The decision diagram discriminates between the spontaneous innovation and the organizational deviation from the aspect whether the "after" business structure is better or worse than the socially expected business structure.

4 Summary and Remarks

In summary, propose the formal description model for the business case. MDDM provides the decision diagram that illustrates the transition of the business structure caused by the related agents' decisions. The decision diagram also represents the chronological order and causalities between the decisions themselves and the decisions and the environment. MDDM discriminates between the decision style in the business cases, e.g., top-down, bottom-up, or informal communication.

As noted in the paper, MDDM provides decision diagrams that result from the transformation of formal descriptions of organizational, agent-based simulation (ABS) logs, along with business game logs as well as of the actual business cases. The case of the Kaizen and deviation, found in Kobayashi [1, 2] indicates that there is no essential difference between cases from organizational ABS logs and actual business cases. Because of limited space, we will exemplify the business simulation analysis with MDDM in forthcoming paper being prepared. Nakano [3] has already presented the business simulation gaming integrated with case learning, based on actual business cases. The MDDM will provide an effective way to describe the players' decisions and to compare them formally to the original business case.

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