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Motivation in Decision-Making Systems

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Abstract: In the decision-making system, the decision-maker is typically motivated in advance and prefers one solution over another. There are various motivational theories, but there is no universally accepted one. This article is dedicated to the problem of creating a generalized decision-making system that automatically takes into account the state of the motivational component when making decisions. It has been shown that in this case, more effective decisions are reached with lower risks in the managed system. It is emphasized that in decision-making systems, motivation plays the role of a catalyst that compels the decision-maker to make decisions even in conditions of uncertainty, ambiguity, and significant risks, but even in this case, the choice of decisions can be optimal. A sufficiently general discrete mathematical structure is used to describe the decision-making system. The same is done for motivation. A generalized model of the decision-making system is proposed, in which the discrete structure describing emotions is appropriately embedded in the decision-making model.

Keywords: decision-making system, motivation, system design.

1. Introduction

Motivation plays a crucial role in the decision-making process. Both individuals and organizations are driven by motivation to achieve specific goals that require objective decision-making. For example, a recent research related to the excessive use of smart technologies [1]. Considering the importance of the role of motivation in the decision-making system, this paper examines this influence on the decision-making process.

There have been numerous studies investigating motivation in decision-making systems. Abraham Maslow's research [2, 3] focuses on the theory of hierarchical needs, which describes the fundamental needs of individuals and how they impact their behavior and decision-making. Deci and Ryan [4] and Hackman and Oldham [5] concentrate on how existing motivational factors can influence productivity and creative thinking in organizational settings. Additionally, studies by Locke and Latham [6] demonstrate that clear and measurable goals can enhance motivation and improve the decision-making process within organizations. The type of orientation, according to the theorists of this approach, offers a contextual framework in which individuals understand, analyze, and operate with knowledge and engage with specific outcomes in an academic setting. The dominant perspective identifies two forms of orientation: task orientation and ego orientation. Employees with a task orientation focus on learning the information and its practical application. Those with an ego orientation are motivated by the need to demonstrate their talents, evaluating task performance based on the results of others. They strive to appear competent or avoid circumstances in which they are unable to function adequately [7].

2. The Essence of Motivation

The word "motivation" originates from the Latin word "motives" or "motivum" which means a reason for movement or stimulus. Motivation is the process of stimulating or energizing internal motives or reasons for human action in order to behave in a certain way or achieve a specific goal. A motive is the internal force that drives a person to act in a particular manner. It can be physiological, such as thirst or hunger, or psychological, such as the desire for achievement and recognition. Motivation plays an important role in managing people in business and other contexts. The decision-making system is a complex process that involves gathering, analyzing, and evaluating information with the aim of making decisions. It can be formal or informal, aimed at simplifying complex problems and ensuring rational and effective solutions. Ultimately, the decision-making system is a process used to overcome complex problems and make rational and effective decisions.

3. Motivational Theories

There are several motivational theories that are of significant importance in decision-making.

The Needs Theory, developed by Abraham Maslow in the 1940s, is based on the fact that individuals have certain needs that must be fulfilled, leading to motivation in decision-making. This theory is important as it explains that an

individual's motivation for a particular action depends on their current needs. When leaders understand the needs of their employees, they can provide the means and conditions to help satisfy those needs.

The Needs Theory finds wide application in areas such as marketing, human resource management, and financial planning. These are fields closely associated with decision-making, as people's needs are one of the primary motivators for their actions and behaviors.

An example of the application of the Needs Theory in business is Apple Inc. The company focuses on designing and manufacturing products that meet not only the functional needs of consumers but also their emotional and social needs. Apple's products are known for their high quality and innovative features. Apple associates its products with well-known personalities and marketing campaigns to emphasize their uniqueness and appeal.

The Self-Determination Theory (SDT), developed by E. Deci and R. Ryan [8] is a macro-theory of human motivation and personality that seeks to explain why individuals exhibit certain behaviors and the factors that contribute to their motivation. According to the theory, individuals are more motivated to work when they have the opportunity to choose what to do and how to do it. When employees have more freedom and control over their work, they are more motivated and productive.

The company Zappos [9] (an online retailer of shoes and clothing) is known for its culture of customer service. In "Delivering Happiness", the founder of Zappos, Tony Hsieh, shares his experience and philosophy for successful business, focusing on the importance of creating happy customers and employees. The book emphasizes the significance of building relationships with customers and directing attention to their needs and desires, integrating the principles of self-motivation into its culture and business model, which leads to significant success for the company. This makes Zappos one of the most desirable employers in the United States.

Hackman and Oldham's Theory (Job Characteristics Theory, JCT) is a model for designing job roles in organizational settings. It provides a set of principles that can be applied to enhance motivation, satisfaction, and productivity of workers. The original version of the theory proposes a model of five core job characteristics – skill variety, task identity, task significance, autonomy, and feedback – that impact five job-related outcomes: motivation, satisfaction, performance, absenteeism, and turnover. These interactions are mediated by three psychological states – experienced meaningfulness, experienced responsibility, and knowledge of results. Hackman and Oldham's theory finds application in various fields, including business, sports, education, and healthcare.

Hackman and Oldham aim to examine the relationship between job characteristics, motivation, and productivity in the work environment. To conduct their experiment, the authors select 658 volunteers divided into groups working with different job characteristics. After a certain period of time, the researchers examine the results and conduct statistical analysis. The results of the experiment demonstrate that job characteristics such as task variety, skill autonomy, and control have a strong influence on motivation and workplace productivity. Specifically, the researchers find that employees are more motivated when they have a higher level of control over their work, engaging and challenging tasks, and when they can see the outcomes of their efforts. The findings of this experiment have implications in the field of personnel management and organizational behavior.

Goal-setting theory, proposed by E. Locke and G. Latham [10], examines the relationship between goals, motivation, and performance. Research conducted by Locke and Latham focuses on the impact of goals on motivation and achievement. They argue that setting specific, measurable, and challenging goals can lead to higher motivation and better results.

The goal-setting theory is widely used and has numerous applications in various management fields, such as project management, sales, and marketing.

Let’s consider the example of XYZ company, which intends to establish a management system for its employees involving goal setting, evaluation of performance against development plans, and planning for future growth.

Management and employees work together to set clear and specific goals that are aligned with the organization’s business objectives. For instance, increasing revenue by 10% for the next quarter.

After a certain period, an evaluation of the predetermined goals is conducted, which includes self-assessment by the employees as well as assessments by the management. Through the “360-degree feedback” technique, the evaluation can also involve comments from colleagues and clients. The aim of this approach is to provide impartial and comprehensive feedback from different individuals who have direct contact with the employee.

Subsequently, training and development plans are formulated to acquire new skills and qualities that benefit both parties involved. This is one way a corporation can utilize a goal-setting system to measure performance and plan employee development, allowing employees to grow in accordance with the organization's business objectives, while providing them with a clear understanding of their roles and expectations.

All these theories have their strengths and weaknesses, but they offer approaches and principles for understanding and managing human motivation. There is no universal theory of motivation that applies to every situation. Each case needs to be evaluated individually to select the most appropriate approach.

4. Motivational Methods

In decision-making, management can utilize various methods to improve employee motivation and enhance organizational performance.

- Providing rewards: Offering rewards such as bonuses, salary raises, or other forms of recognition for good performance is an important motivational factor for many employees.
- Offering opportunities for professional development: Providing employees with opportunities for training, courses, or involvement in new projects can help them develop and advance in their careers, leading to higher motivation and productivity.
- Granting autonomy and responsibilities: Granting individuals autonomy and responsibilities aims to stimulate and motivate them to show greater initiative and work more actively.
- Providing support and recognition: Offering support and recognition
- through praises or other forms of acknowledgment for employees' achievements can boost their motivation.
- Setting clear goals and expectations: Providing employees with clear goals and expectations, along with greater clarity regarding their work tasks and the expected outcomes, can encourage their engagement and efforts toward achieving desired results.

5. The Role of Motivation in Decision-Making Systems

Motivational strategies can contribute to better goal attainment when making decisions. Some of the motivational strategies used in decision-making include.

- Establishing clear and motivating goals: Clear, specific, and motivating goals can provide individuals with a sense of direction and help them work towards desired outcomes.
- Providing support through feedback: Supportive feedback can be a motivating factor and help individuals feel valued.
- Using external motivators: External motivators such as bonuses, promotions, and other rewards can be significant incentives that make individuals feel appreciated and motivated to achieve their goals.
- Offering opportunities for growth and advancement: Opportunities for development and progress can motivate individuals by instilling a sense of progress and achievement at higher levels of performance.
- Involving individuals in the decision-making process: Participation in decision-making can help individuals feel engaged in the outcomes and

have a greater stake in their achievement, leading to higher levels of motivation and better results.

There are several possibilities for building decision-making systems that take into account the motivations of the decision-maker, including.

- Assessing the impact of motivational methods and tools, as well as the choice of decision-making systems by the managing entity (subject).
- Evaluating the motivational behavior of an individual or system by considering the results of the decision-making system built on a mathematical model.
- Formalizing, to the extent possible, the motivational behavior of the managing entity or system and incorporating it into the decision-making model. This leads to a unified decision-making system that considers the motivation of the decision-maker when calculating optimal behavior.

Among these three possibilities, the third one is the most significant. The subsequent discussion relies on it.

In such a generalized decision-making system, models from discrete mathematics, graph flows, Markov decision processes (MDPs), transportation network problems, and others can be utilized. In their most general form, all of these models can be classified into the following abstract models.

In Fig. 1, an abstract decision-making system is depicted. It is interpreted through a graph, where X represents the set of states in which the process of the decision-making systems (CBP) can exist, and U represents the set of edges that describe the possibility of transitioning from one state to another.

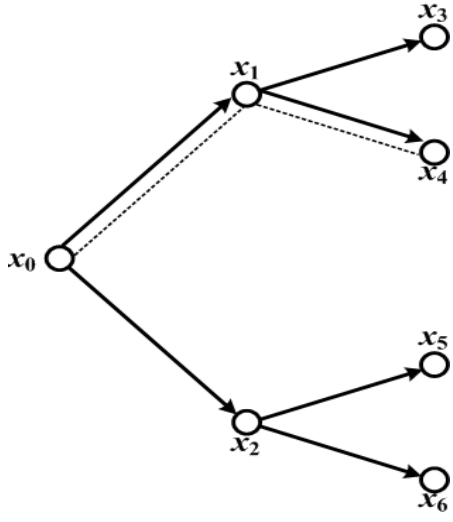

Fig. 1. Abstract decision-making system

The graph $G(X, U)$ depicted in Fig. 1 has the following parameters:

$$X = \{x_0, x_1, x_2, x_3, x_4, x_5, x_6\} \tag{1}$$

$$U = \{(x_0, x_1), (x_0, x_2), (x_1, x_3), (x_1, x_4), (x_2, x_5), (x_2, x_6)\} \tag{2}$$

$$f_{ij} = f(x_i, x_j);\ f_{ij} \in F;\ f_{ij} \leq 0\ or\ 1 \tag{3}$$

$$a_{ij} = a(x_i, x_j);\ a_{ij} \in A;\ 0 \leq a_{ij} \leq m \tag{4}$$

$$k_{ij} = k(x_i, x_j);\ k_{ij} \in K;\ 0 \leq k_{ij} \leq n \tag{5}$$

where f_{ij} is the arc flow function from x_i to x_j, a_{ij} is the target arc function from x_i to x_j; k_{ij} is the motivation coefficient for the transition from x_i to x_j, $\{a_{ij}\}$ is used to evaluate the value of individual steps and the optimality of the overall process, $\{k_{ij}\}$ is used to assess the motivation as a whole and its impact on the decision-making process, $\{f_{ij}\}$ represents the computed optimal path corresponding to the best solutions.

In Fig. 1, the dashed line represents the conditionally optimal path corresponding to the best multi-step solutions. The optimality in dependencies (1) to (5) of Fig. 1's mathematical structure indicates the path of decision-making systems with consideration of motivations. Based on this, significantly more complex decision-making systems can be constructed, taking motivations into account.

6. Conclusions

This study examines the role of motivation in decision-making systems and demonstrates that it can enhance the effectiveness of the decision-making process. It is highlighted that external motivation, such as financial incentives or other material rewards, is effective in the short term, while internal motivation, driven by personal achievements and job satisfaction, is more sustainable and generally leads to better results.

It has been proven that appropriate leadership and communication contribute to motivation and efficient decision-making. Various theories of motivation have been discussed, among which the goal-setting theory is considered the most relevant. It has been shown that this theory also increases motivation.

A method for a general description of motivations and their integration into decision-making systems has been proposed, indicating that it leads to better results compared to other approaches. It has been demonstrated how various mathematical structures can be effectively utilized for optimization in decision-making systems.

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