

# Decision-Making of Enterprise Leaders From the Perspective of Organizational Neuroscience

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Organizational neuroscience (ON) is an emerging discipline that provides effective interpretations and greater understanding of modern organizational operation. ON covers a variety of disciplines, including physiological psychology, cognitive psychology, and neuropsychology, as well as the study of management, industrial/organizational psychology, and consultants. So far, ON has made many contributions to organization studies. Given the rapid development of neuroscience, many scholars have studied the leadership behaviors of organizational leaders from this emerging perspective. However, not all neuroscience studies investigate the differences between specific leaders. In particular, previous neuroscience studies have not touched on the neuroscientific effects found during the issue of and response to instructions between leaders and followers. This study extends previous ON studies to other organizational factors, including leadership style, organizational atmosphere, and job performance. In the future, an empirical study will be conducted to guide the practical applications of ON.

*Keywords:* organizational neuroscience, leadership style, organizational atmosphere, job performance

## Introduction

Enterprises play a critical role in the development of a national economy and affect the trends of national and social development. In the future, those organizations that stimulate employees at different levels to work enthusiastically and learn continuously will be genuinely excellent. In view of this, scientific education must be emphasized on the development of enterprises, to help enterprise staff develop the logic, skills, expertise, and attitude of scientific thinking and turn enterprises into the backbone of society. Meanwhile, enterprise leaders are duty-bound to lead enterprises to develop scientific education patterns; they must make decisions and think from the standpoint of leaders to promote organizational development and set organizational objectives. Based on scientific education, enterprise leaders must formulate the overall business strategies, pursue sustainable

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development, and promote national economic development and people's welfare.

When an enterprise carries out scientific education, the learners range from top-level leaders to grassroots employees. People are viewed as the most important asset in an organization. Specifically, the implementation of organizational functions and realization of organizational objectives or visions cannot be achieved without organizational members. Besides, organizational performance also relies on the motives and efforts of organizational members. Leadership is an important means and method to give full play to the synergy of organizational members. Leadership refers to the ability to lead and influence a group to accomplish group objectives (Robbins & Judge, 2007); leadership plays an indispensable role in accomplishing the organizational objectives smoothly. Studies show that 45% to 65% of the variables affecting organizational success or failure are influenced by leadership (Bass, 1985).

To check whether human resources are fully utilized, it is necessary to investigate the influence of the organizational atmosphere as perceived by organizational members and the leadership style on members' work enthusiasm. Organizational atmosphere is relatively persistent inside an organization, indicating the emotional, attitudinal, and behavioral tendencies of organizational life and distinguishing an organization from others. Furthermore, organizational atmosphere is also a set of measurable work environment attributes and contains multidimensional environmental content and perception levels. Organizational atmosphere also plays an important role in connecting an organization with individuals and builds a bridge between an organizational system and organizational members. It influences the implicit psychological cognition of organizational members and influences their behavioral expression through their psychological cognition. To improve the explicit behavioral expression of organizational members, the key is to pay attention to how organizational atmosphere influences their implicit psychological cognition.

Brainwaves have been closely linked with leadership behavior patterns. Since the 1990s, scholars have been curious about how humans make risky or ambiguous decisions using their brains. Among numerous studies, the work of Platt, & Glimcher (1999) is the most well-known. Platt & Glimcher mainly investigated the correlation between economic decision-making and cerebral nerves from the perspective of neuroeconomics. Through single neuron recording and functional magnetic resonance imaging (fMRI), Platt & Glimcher found that humans and animals make delay-discounting decisions through different processing activities in different encephalic regions. In addition, Platt & Glimcher discussed in depth the role of the cerebral cortex in humans' risky or ambiguous decision-making procedures. This brought about an upsurge in studies of the neuroscience of economic behavior. Accordingly, this study will investigate the correlation between the brainwaves of organizational members (including leaders, senior managers, middle managers, and grassroots staff) and decision-making and organizational atmosphere.

### **Literature Review**

Based on a literature review, this study discusses the correlations among leadership style, organizational atmosphere, and job performance, and the correlation between neuroscience and enterprise leadership. The intent is to further investigate the influence of leadership style on the decision-making model from the perspective of brainwave studies in specific organizational atmospheres.

#### **Leadership Style**

Leadership refers to the ability to lead and influence a group to accomplish the group objectives (Robbins, 2007); leadership plays an indispensable role in accomplishing organizational objectives smoothly. Studies

show that 45% to 65% of the variables affecting organizational success or failure are influenced by leadership (Bass, 1985). Over recent decades, approximately 70,000 articles and/or books on leadership have been published (Robbins, 1998). Koontz (1990) argues that leadership is a power, skill, or procedure that can influence others to accomplish group objectives voluntarily and enthusiastically. Robbins (1998) argues that leadership is an ability to influence a group to accomplish its objectives. By contrast, some studies focus on the effectiveness of leadership between leaders and followers. Leadership is an ability exhibited by an individual when he/she influences others to strive toward a specific direction through steering, encouragement, feeling, deliberation, and support (Robbins & DeCenzo, 2004). Table 1 lists the evolving theories of leadership.

Table 1

*Evolution of Leadership Theories*

Period	Theory	Content
Before the 1970s	Trait theory	Leadership (or leadership trait) is inborn; this theory only emphasizes the personality traits of leaders.
Late 1970s to late 1990s	Behavioral theory	Leaders are not born possessing leadership traits, and the effectiveness of leadership is related to leadership behaviors.
Late 1990s to early 2010s	Situation (contingency) theory	This theory contends that an optimal pattern of leadership should be adopted according to the actual situation, and considers three dimensions, including leaders, followers, and situational factors.
In the late 2010s	Modern leadership theory	Leaders are those who possess a vision and know how to stimulate their followers.

Source: Developed in this study.

Most of the early leadership theories focus on leader traits and behaviors in various situations, and measure the effectiveness of leadership in terms of these behaviors. These leadership theories were highly popular for a time, but were gradually abandoned because they were considered extremely narrow. Since the 1980s, scholars have been interested in the influence of leaders' emotions and symbolic significance on followers. Early leadership theories cannot reasonably explain why followers put organizational objectives above their private gain. Therefore, a new group of scholars began to investigate leadership behaviors from different perspectives. At the present stage, various leadership theories focus on the interaction between leaders and followers' needs and personality traits, as well as the influence of cultural and environmental factors on leadership behaviors (Bargal & Schmid, 1989). At this stage, the situational relationship between leaders and followers has transformed from "adaption" to "interaction". In recent years, new widely discussed leadership theories include the attribution theory of leadership, neo-charismatic leadership theory, transformational leadership theory, and transactional leadership theory. Among the diverse leadership styles, transformational leadership and transactional leadership are discussed the most. Both these leadership patterns exhibit similar characteristics in that the followers are influenced through leaders, and leaders can assert the effectiveness of leadership on followers. Burns (1978) proposes the concept of "transformational leadership", and classifies leadership into transformational leadership and transactional leadership. He believes that leadership is different from management. This theory seems to imply that transactional leadership can be viewed as traditional leadership. In addition, Bryman (1992) argues that transformational leadership can be viewed as leadership, whereas transactional leadership can be viewed as management. In transformational leadership, followers feel trust, loyalty, and respect for leaders, and are motivated by them to deliver more than what was originally

expected. In contrast, transactional leadership is a reciprocal process in which followers accomplish the objectives of leaders, whereas leaders grant rewards to followers. Transformational leadership and transactional leadership are different in terms of their essential connotations. Specifically, transformational leadership emphasizes self-transcendence to meet higher-level needs. Transactional leadership emphasizes management for the purpose of improving organizational efficiency and highlights the exchange of resources for the purpose of meeting the needs of both leaders and followers. For an organization, transactional leadership and transformational leadership are equally important. Kotter (1990) contends that good management can control complexity, while effective leadership can produce useful changes, and that a combination of leadership and management provides the maximum benefit to an organization.

### **Organizational Atmosphere**

Originating from the concept of “the life space (L)” (Lewin, 1936), organizational atmosphere provides a basis for what Lewin called field theory. Lewin (1939) extends field theory and contends that the behavioral outcome of humans is closely linked with the total situation of behaviors. The total situation includes personal characteristics and environments and can be denoted as the function  $B = f(P, E)$ , where B denotes behaviors, P denotes personal characteristics, and E denotes environments. Overall, this function means that the behavioral outcome of an individual is due to the interaction of personal characteristics and environments. In addition, Lewin (1951) expounds further on field theory, arguing that the life space comprises persons (P) and their psychological environments (E), while the foreign hull (F) is the environment outside this life space to be perceived or sensed by persons; this can be denoted as  $P = F(B + E)$ . The subjective psychological perception jointly developed by persons and objective environments is “atmosphere”, and organizational atmosphere is the perception of organizational members regarding the organizational environment. Based on a systematic literature review, Hellriegel and Slocum (1974) provide the definition and implications of organizational atmosphere. Organizational atmosphere refers to a set of perceivable characteristics of an organization or its subsystems and is triggered by the way the organization or its subsystems treats the members and the environment. The above definition implies four characteristics of organizational atmosphere: (1) It is mainly descriptive and does not undertake value judgments; (2) it should be discussed from a macro perspective, rather than a micro perspective; (3) the unit of analysis should be an organization or its specific subsystems, rather than any individual member; (4) perceptions have considerable behavioral outcomes. Half a century after Lewin proposed field theory, Burnes and Cooke (2013) argue that the life space and field theory still play an important role in understanding, predicting, and changing human behaviors, and have become the basis for designing the pattern of interaction between organizations and organizational members. This argument is accepted by a considerable number of scholars.

Organizational atmosphere is a psychological environment perceived by individuals, and the description of organizational atmosphere varies from person to person. For example, to describe organizational atmosphere, Halpin and Croft (1962) use words such as “morale”, “care”, “performance orientation”, “alienation”, “harassing”, “intimacy”, “rigidity”, and “examplng”. Likert (1967) uses words such as “leadership”, “incentive”, “communication”, “decision-making”, “objective”, and “control”. Tagiuri (1968) uses words such as “ecology”, “background environment”, “social system”, and “culture”. To measure organizational atmosphere, Litwin and Stringer (1968) propose nine constructs, comprising structure, responsibility, reward/punishment, risk, human relation, support, performance standard, conflict, and identification. Schneider and Bartlett (1968) propose six

dimensions, including management support, care for new staff, internal conflict, work independence, general satisfaction, and management structure. Sisk (1969) proposes the following dimensions: organizational size, interactive state, member personality, goal congruence, decision-making level, and organizational status. Schneider and Bartlett (1970) propose the following dimensions: management support, care for new staff, internal conflict, work independence, general satisfaction, and management structure. Campbell, Dunnette, Lawler, and Weick (1970) find that organizational atmosphere can generally be measured by six dimensions, namely, autonomy, structure, reward/punishment, care, human relation, and support. Downey, Don & Slocum (1975) proposes the following dimensions: decision-making, human relation, risk, openness, reward/punishment, and structure. Churchill, Ford, and Walker (1976) propose the following dimensions: rigor of superior supervision, performance standards, communication frequency, number of superior departments, innovation need, role ambiguity, and role conflict. Joyce and Slocum (1984) propose nine dimensions, including leadership ability, decision-making, communication and coordination, objectives, innovation and creativity, training, job satisfaction, environment, and labor management. Patterson et al. (2005) state that human relations in organizations involve employee autonomy, team integration, employee participation, managerial support, training and development, and employee welfare; internal processes involve formal rules and regulations and traditionality; the open system involves innovation and flexibility, market orientation, and responsiveness; and rational goals involve common goals, efficiency, effort, performance feedback, working pressure, and quality orientation.

To define the measurement unit more clearly, Patterson et al. (2005) use the competing value model (CVM) as a theoretical framework, investigate various effectiveness indices (including internal/external environment, flexibility, and control), and develop a new organizational climate measure (OCM). The OCM comprises four dimensions. An organization presents different intensities along each dimension and is not excessively intense within a specific dimension. The four dimensions are as follows.

**Human relations.** An organization emphasizes the flexibility of the internal environment. An organization should care for the development of human relations and its commitments toward organizational members, and conduct educational training and human resource activities, to arouse the cohesiveness and trust of organizational members. This represents an organizational atmosphere characterized by support, mutual trust, cooperation, and sense of belonging.

**Internal processes.** An organization attaches importance to internal process control. Through formal and systematic regulations and procedures, an organization controls the stability, efficiency, and quality of the work completed by organizational members.

**Open systems.** An organization attaches importance to the ability to flexibly adapt to the external environment. Organizational managers should attach importance to the interaction of the internal and external environments and encourage organizational members to respond to rapidly changing environments and market demands in an innovative manner.

**Rational goals.** An organization conducts strict internal control to respond to external environmental change. An organization should define its common goals and organizational orientation clearly, and try to accomplish various rational goals (e.g., productivity, efficiency, and performance feedback).

### **Job Performance**

There is a great diversity of theories on job performance. In terms of the perspectives of various disciplines or research objectives, the studies on job performance cannot cover all the views provided by

different fields. In the literal sense, performance refers to the degree to which a specific goal is accomplished. From the perspective of organizational behaviors, job performance refers to the overall performance of an individual or organization in terms of efficiency, effectiveness, and efficacy. Sloma (1980) defines performance as the degree to which an organization accomplishes its organizational objectives. Boyatzis (1982) defines job performance as the conditions, policies, or procedures that can meet job requirements, and maintain or conform to the organizational environment through specific actions. French and Seward (1983) define performance as the degree to which an action plan can accomplish its objectives. In the opinion of Chakravarthy (1986), performance comprises three parts: (1) short-term economic efficiency; (2) meeting the needs of various stakeholders; (3) the ability to respond to the future. The first and second parts are necessary conditions for excellent corporate performance, while the third part is a sufficient condition for such performance. The three parts collectively constitute corporate performance. Edwards (1991) contends that individual and job performance can be interpreted from two perspectives: (1) requirement and ability; (2) demand and supply. From the perspective of demand and capacity, job performance refers to the degree to which personal ability agrees with the ability required by a job. From the perspective of demand and supply, job performance refers to the degree to which individual demand agrees with job attributes. Brouther (2002) contends that personal performance comprises three main factors, these being personal traits, job effort, and organizational support, and can be expressed as the following equation:  $\text{personal performance} = (\text{personal traits}) \times (\text{job effort}) \times (\text{organizational support})$ . Personal traits and job effort are linked with personal working ability and work willingness; organizational support is linked with external opportunities. Campbell, Gasser, and Oswald (1996) argue that job performance is equal to competence multiplied by driving force; they emphasize the importance of driving force. Schuler (1995) argues that performance appraisal is a set of formal and structural institutions, which are used to measure, appraise, and influence the characteristics, behaviors, and results related to employees' jobs; to get to know the job effectiveness of employees; and to check whether employees can deliver better performance, thus benefiting both themselves and the organization.

Campbell et. al., (1996) contend that the general job performance theory or model should comprise two wide perspectives: (1) The dimensional structure in the field of performance should include the classification results of job performance that can roughly define or distinguish all jobs; (2) the causal relationship between the antecedents of job performance and its dimensional factors should include factors that can identify changes in job performance, as well as results that can display the causal sequence. Schuler (1995) simply defines job performance as all behaviors performed during a job. Brouther (2002) defines performance as the degree to which managers attain their job objectives. From the perspective of human performance technology, human resource development, or organizational development, performance can be roughly classified into organizational performance, group performance, and individual performance (Cummings & Worley, 1993; Rashford & Coghlan, 1994).

Campbell et. al., (1970) defines job performance as the job behaviors of employees, which must contribute to organizational objectives. Accordingly, job performance refers to the performance of employees during their jobs. Campbell divides job performance into effectiveness and productivity. Effectiveness is used to appraise the outcome of employees' performance during their jobs. Productivity is used to calculate the cost paid to attain a certain degree of effectiveness; the lower such cost is, the higher the productivity is. In brief, job performance refers to all measurable and appraisable behaviors that an individual performs during his/her job to contribute to organizational objectives. Campbell et. al., (1996) define job performance as the behaviors related

to organizational objectives, which can be measured in terms of the degree of contribution made by individuals to the organizational objectives. Schermerhorn (1989) defines job performance as the quality and quantity of tasks that are accomplished by an individual or group during the work. Schmitt (1993) argues that job performance is a synonym of an individual's role behaviors and is the observable and measurable result of an individual's behaviors or actions; such results of behaviors or actions are linked with organizational objectives. In summary, job performance refers to the measurable degree of contribution that an employee makes according to organizational expectations and objectives. Rowland, Ferris, and Sherman (1983) discuss the objectives of performance appraisal from three aspects:

A. For an organization

1. Objectives of performance appraisal

(1) Provide feedback to subordinates in respect of their performance;

(2) Obtain effective information to serve as a reference for making decisions about salaries and promotion, and provide a communication tool;

(3) Obtain effective information to serve as a reference for making decisions about staff appointments.

2. Objectives of tutoring and development

(1) Tutor and guide the subordinates, to improve their performance and develop their potential;

(2) Discuss career opportunities and planning with subordinates, to develop their commitment to the organization;

(3) Stimulate the subordinates through understanding and support;

(4) Strengthen the relationship between managers and subordinates;

(5) Diagnose the problems between individuals and the organization.

B. For a manager

1. Provide feedback to employees, and express his/her comments on their performance;

2. Ask subordinates to measure the manager's performance cognition;

3. Serve as a reference for finding possible steps to improve future performance.

C. For an individual

1. Get performance feedback, to know his/her current performance and management value (reward);

2. Develop himself/herself and serve the improvement objectives.

### **Neuroscience and Enterprise Leadership**

Since the 1990s, scholars have been curious about how humans make decisions with their brains when in a risky or uncertain state. Among numerous studies, the work of Platt, & Glimcher (1999) is the most well-known. Platt & Glimcher mainly investigated the correlation between economic decision-making and cerebral nerves from the perspective of neuroeconomics. Through single neuron recording and FMRI, Platt & Glimcher found that humans and animals make delay-discounting decisions through different processing activities in different encephalic regions. In addition, Platt & Glimcher discusses in depth the role of the cerebral cortex in humans' risky or ambiguous decision-making procedure. This brought about an upsurge in studies of the neuroscience of economic behavior. Based on neuroscience, this study further investigates the influence of brainwave changes of enterprise leaders on corporate organizations when they make decisions.

Gazzaniga, Ivry, and Mangun (2002) argue that creatures have no way to perceive directly the external world or perform any action, but can only perceive, think, and act through the conversion and calculation

activities inside the cerebrum. On this premise, Farwell, Richardson, & Richardson (2013) contend that the study of neuroscience within organizations should focus on the analysis of human brain data, to investigate further how the brain activities of organizational leaders influence their decision-making, as well as their degree of influence on organizations. In other words, through the analysis of brain data, the related studies of neuroscience will provide new insight about organizational leadership for related scholars and enterprise leaders. Accordingly, scholars refer to this field of study as organizational neuroscience (ON).

Academically, ON refers to a process that studies how human brains influence humans to make decisions, take action, and interact inside organizations. In other words, ON refers to a discipline that studies deeply what influences the structure of the human brain will have on human behaviors inside organizations (Eysenck & Keane, 2000). This is a precise and prudent study approach, and effectively bridges the gap between neuroscience and organization science. Based on the above definitions of ON and the needs of this study, we use ON to investigate the influencing mechanism of people's working attitudes and behaviors and introduce genetics and biophysiology. The intent is to further discuss the decision-making of organizational leaders through ON.

Given the rapid development of neuroscience, many scholars have studied the leadership behaviors of organizational leaders using its research tools, including FMRI and quantitative electroencephalogram (QEEG); the intent is to investigate the influence of neuroscience on leadership behaviors from a micro perspective (Tuncdogan, Acar, & Stam, 2016).

However, not all neuroscience studies investigate the differences between specific leaders. In particular, previous neuroscience studies do not touch on neuroscientific effects during the issue of and response to instructions between leaders and followers (Yousaf & Rehman, 2017). In this regard, this study investigates the influence of leaders on organizational atmosphere. Using ON as a moderating variable, this study explores how the brainwave changes of organizational leaders adjust the influence of leadership style on organizational atmosphere.

## Discussion

Based on a literature review, this study tries to investigate the regulating effect of leaders' brainwaves on leadership style, organizational atmosphere, and job performance. Figure 1 shows the conceptual framework.

Within this conceptual framework, a brainwave test can be conducted empirically in the future; specifically, the brainwaves of subjects are tested and analyzed. Brainwaves are electric field changes that are generated when nervous impulses are transmitted by the nerve cells and nerve fibers of brains. Brainwaves ultimately reach the scalp via the meninx, cerebrospinal fluid, and skull, so the brainwave signals are extremely weak. The electric potential changes in the cerebral cortex can be recorded through electrodes attached to the scalp. The waveforms generated due to electric potential changes are brainwaves. The records of brainwaves vary with environmental influence, measuring method, location, and amplitude, thus generating different electroencephalograms. In addition, the measurement of brainwaves is susceptible to external noise disturbance, and in particular, to physiological reactions and ambient disturbance. Such disturbing physiological reactions include pulse, breathing, blinking, body movement, and head movement. Ambient disturbance is mostly generated by ambient electriferous metal devices and the brainwave disturbances are referred to as artifacts. If artifacts are generated, it is necessary to find a solution to them. If disturbances are unavoidable, they can be filtered out through software or hardware, thus minimizing brainwave interference.



Based on the brainwave test above, we can further discuss the influence of leaders' brainwave activities on leadership style, organizational atmosphere, and job performance.

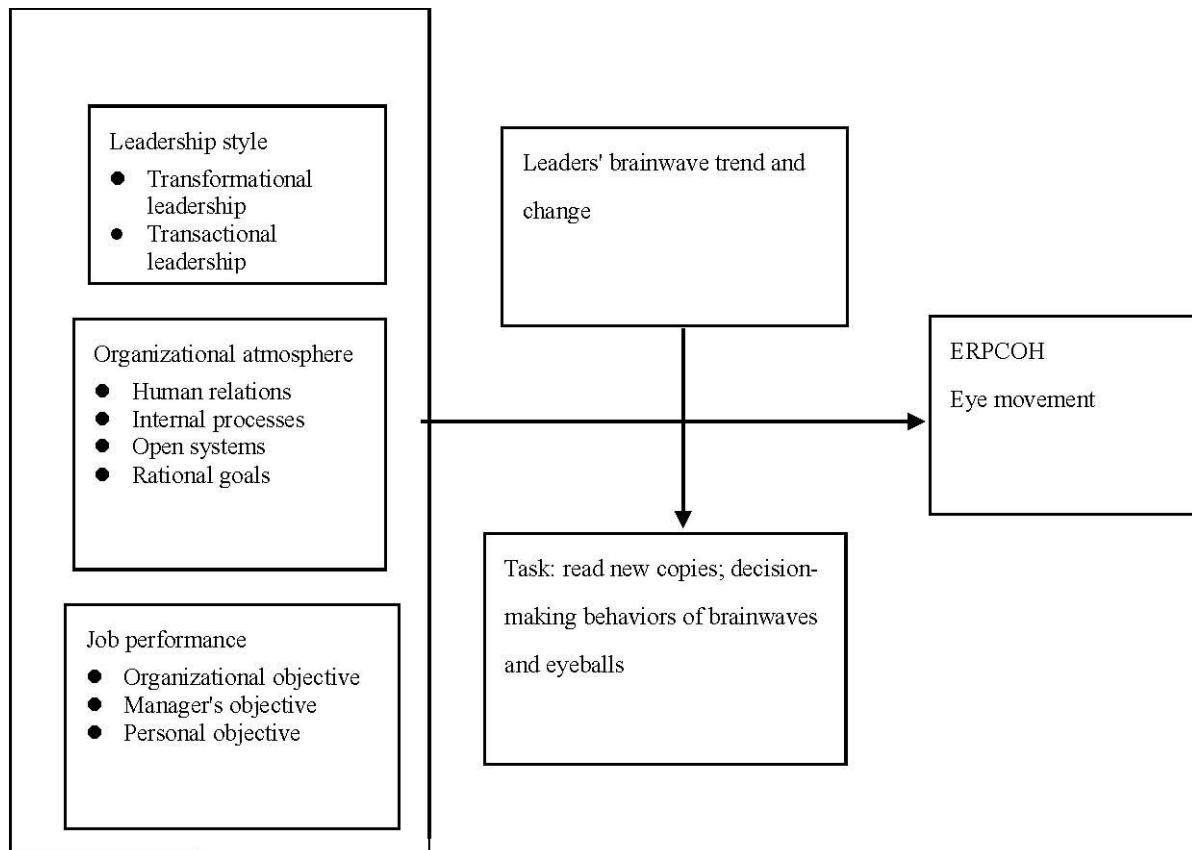


Figure 1. Conceptual framework of this study.

## Conclusion

Through the study of ON, we can roughly summarize four advantages that are beneficial to organizations. First, through studies of ON, the scholars of organization science can acquire more data that are related to organization science, but have not been tapped previously. For example, they can acquire more detailed measurement data by measuring the status of brain activities. Second, ON can be used by organizational members as a self-appraisal tool, thus preventing errors due to repetitive study methodology. Third, ON can increase the relevance of the theoretical framework of our study and strengthen the contribution of empirical data. Fourth, ON provides a new study approach, and can refine the theories of researchers; this has been proved by related studies on Machiavellianism. Therefore, the scholars of ON studies all agree that this research trend will promote the theoretical and empirical evolution of the study of organization science.

The theoretical concepts used in this study agree with previous ON studies. For example, the ON study by Volk, Kohler, and Pudelko (2014) proves that the communication mechanism inside an organization can be designed considering ON theories, thus promoting the interactive communication of different languages, cultures, and cognitive styles internally. In addition, Yousaf & Rehman (2017) argue that ON studies enable researchers to gain a more in-depth understanding about how the self-complexity of leaders in accomplishing organizational objectives influences their decision-making and then influences the organizational members in

accomplishing the organizational objectives. Furthermore, Tuncdogan et. al. (2016) suggest that to investigate the influence of neuroscience on leaders, brain studies can be conducted not only on the leaders themselves, but also the followers (namely, the influenced people), thus exploring the micro-foundations of leadership behaviors. Meanwhile, certain studies contend that neuroscience can be used to investigate how strategic decisions are made through the brain structure and order output of leaders, thus identifying their decision-making inclination and ability. This study extends previous ON studies to other organizational factors, including leadership style, organizational atmosphere, and job performance. In the future, an empirical study will be conducted to guide the practical applications of ON.

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