從腦神經經濟學探討人力資源利用之研究

A Study on the Human Resource Utilization through Neuroeconomics

謝明瑞
Ming-Jui Hsieh

摘要

人力資源利用包括神經學、企業管理學、資訊管理科學…等相關領域科學的認知與學習，而傳統經濟學中的「經濟人」具有理性而自私的特性，因此，人類的決策行為是基於利潤的極大化，然而，在現實社會中，人類的許多決策行為都是非常理性的；本研究即在說明人類資源利用與腦神經經濟學的關聯性，經由最新的神經科學與認知心理學的理論，用以解釋人類的決策行為，並建議人類的決策行為應是受腦功能與腦利用二者相互結合的影響，且在影響人類決策行為的因素上比現實因素還重要。

關鍵字：腦神經經濟學  人力資源利用  非常態現象  行為決策

*國立空中大學商學系副教授
A Study on the Human Resource Utilization through Neuroeconomics

Hsieh, Ming-jui, Ph.D*

Abstract

Human Resource Utilization includes courses taught in the fields of Neurology, Business Administration, Management and Information Sciences etc., and the Economic Man is characterize as being rational and selfish in traditional economics theories, therefore, the human beings’ behavior in decision making is usually base on maximizing profits. However, in reality many decisions are made irrationally by the human beings. The present study explores this aspect with Human Resource Utilization and Neuroeconomics, and explains human beings’ behavioral decision through theories of the latest knowledge of Neurology and Cognitive Psychology. It is suggested that the human being’s behavioral decision is affected by a combination of brain function and brain utilization, and the human resource utilization element is always more important in affecting the human beings’ decision than that of the reality factor.

Keywords: Neuroeconomics, Human Resource Utilization, abnormal phenomena behavioral decision

* Department of Business, National Open University
172, Chung Chen Rd., Lu Chou city, Taipei, Taiwan
e-mail：ming@mail.nou.edu.tw
1. INTRODUCTION

Human resource is a concept, and then Human Resource Utilization (HRU) was the connections between the research studies and the knowledge management descriptions. In order to describe human resource utilization from the standpoint of Neuroeconomics, this paper has included the following sections of discussion: introduction, literature review, theories and application in the Neuroeconomics, conclusion and findings.

1.1. Background

Generally, the HRU includes courses taught in the fields of Neurology, Business Administration, Management and Information Sciences etc., More recently, other fields that include those focused on human resource utilization such as the public health and public policy, also have started contributing to HRU research.

In the real society, many irrational factors of the decision making behavior can lead to anomaly phenomena, such as the St. the paradox of Petersburg, Allais paradox, Prisoner dilemma, Ultimatum game… etc., none of these can be judged by rational behaviors (Hsieh, 2008). The economic decision behaviors of people are influenced by factors such as environment, culture, mental state and emotion...etc. it also the basic idea of HRU.

Neuroeconomics developed only in the end of the 20th century, with the cooperation of economists, psychology experts, neurology scholars, and the invention of measure instrument in medical technology such as the EEG, MEG, PET, SPECT, MRI, fMRI … etc. for the measure of the wave variety of brain. This research explores the decision behavior of the human beings through theories and measuring methods of HRU and Neuroeconomics.

1.2. Methodology

Neuroeconomics emphasizes on the research of the rational/ irrational factors of human brain, and adopt the measurement methods of Neurological wave in measuring neuron responses, and it is the application of Human Resource Utilization through these, and Neuroeconomics tries to understand the factors involved in the decision-making of
human beings and explains that this process can be influenced by the emotional elements from the brain and not the rational factors hypothesized in the economics theories. This study applies document research and analyses the decision making behavioral model of human beings through the concept of HRU and the measuring methods of Neurological waves. The main purpose of this study is to explore and examine the change in neuron reaction and how the HRU and brain function can influence decision behavior of the human beings.

1.3. Objective

The development of the HRU Series on training work over the past few years. and the objectives of the research are as followings:

1. to explore the decision behavior of the human beings through theories and measuring methods of HRU and Neuroeconomics.
2. to explore and examine the change in neuron reaction and how the brain function and the theories and practices of HRU can influence decision behavior of the human beings.
3. to explores the aspect with Human Resource Utilization and Neuroeconomics, and explains human beings’ behavioral decision through theories of the latest knowledge of Neurology and Cognitive Psychology.
4. to promote awareness among policy-makers and senior officials of the latest social development thinking, and concepts and practice.

2. Literature Review

The theories and practices of Human Resource Utilization and Behavior Economics thus gradually gain its importance and the concept of Neuroeconomics evolved as the technology in medical science develops. The following section summaries the related literatures:

ESCAP(1947)
Human Resources Development is defined as a virtuous cycle of: investment in human resources to enhance productive capabilities; utilization of those human resources to produce increased/higher output; and consumption by those human resources of the benefits arising out of that increased/higher quality output, thereby leading to an enhanced quality of life. ESCAP’s mission in the field of HRD is to strengthen national capacity to plan and deliver HRD services to the people of Asia and the Pacific. This is done through the development of institutions and the enhancement of government performance to promote HRD.

The premise of ESCAP’s work in this field is based on the conviction that training of social development personnel is a form of investment in human resources with possibly the greatest multiplier effect. Utilization of the value-added service of trained social development personnel, in their capacity as service providers, will result in an enhanced quality of life for a large portion of the population. These short-term professional training courses would be addressed for both policy-makers as well as those at the programme management level.

Kahneman, D. & Tversky A.,(1979)

The psychology professor of Princeton university in USA Daniel Kahneman and Amos Tversky proposed the Prospect Theory in 1979. They consider that, in cognition of certain events, personal dissimilarity in the location of reference point will lead to different risk taking attitudes and decision making modes and eventually causes different decision outcomes. Kahneman and Tversky applied the psychological factors on the theories and practices of economics, this is especially on people’s judgment and behavior made under the indetermination condition.

Alavi, Maryam & Dorothy E. Leidner (1999)

Knowledge Management is the combination of data, information, knowledge, and wisdom. Generally, when a pattern relation exists amidst the data and information, the

---

1. as adopted in the *Jakarta Plan of Action on Human Resources Development in the ESCAP region.*
pattern has the potential to represent knowledge, where pattern is more than simply a relation of relations. Pattern embodies both a consistency and completeness of relations which, to an extent, creates its own context. It only becomes knowledge, however, when one is able to realize and understand the patterns and their implications. The patterns representing knowledge have a tendency to be more self-contextualizing (dependent each other). Patterns which represent knowledge have a completeness to them that information simply does not contain, so the knowledge comprises strategy, practice, method, or approach.

**Addicott, McGivern & Ferlie (2006).**

Knowledge Management (KM) comprises a range of practices used in an organization to identify, create, represent, distribute and enable adoption of insights and experiences. Such insights and experiences comprise knowledge, either embodied in individuals or embedded in organizational processes or practice. Many large companies and non-profit organisations have resources dedicated to internal KM efforts, often as a part of their 'Business Strategy', 'Information Technology', or 'Human Resource Management' departments.

**Hsieh, Ming-jui (2008)**

The decision making of Economic Man can be influenced greatly by mental factors. The author synthesizes the many researches that looks at Behavioral Economics, including contents such as abnormal phenomenon in Economics, the irrational behavior in Economic Man, and the theories and experiment of Behavior Economics…etc., it is an extension of research issues in Neuroeconomics.

**Hsieh, Ming-jui (2009)**

The Economic Man is characterize as being rational and selfish in traditional economics theories, the enterprise’s behavior in decision making is usually base on maximizing profits. However, in reality many decisions are made irrationally by the enterprises. This research to explores this aspect with knowledge management and Neuroeconomics, and explains enterprises’ behavioral decision through theories of the
latest knowledge of Neurology and Cognitive Psychology. It is suggested that the enterprise’s behavioral decision is affected by a combination of rationality and emotion, and the emotional element is always more important in affecting the enterprise’s decision than that of the reality factor.

Based on the literature review above, one can understand the important elements in the development of Human Resource Utilization, behavioral economics theories, and the theoretical analysis and measurement method of Neuroeconomics is probably more likely to explain the human beings’ operation and management decision behavior of decision-makers.

3. Human Resource Utilization and Function of Brain

In general, Human Resource Utilization is the combination of construction and transformation of knowledge management, structure and function of brain, and the process of Human Resource Development (HRD), the following section discusses the relevant issues.

3.1. Construction of Knowledge Management

Knowledge Management is the combination of data, information, knowledge, and wisdom, and the Data refers to pieces of information or fact usually collected as the result of experience, observation or experiment, or processes within a computer system, or a set of premises; Information as a concept has closely related to notions of constraint, communication, control, data, form, instruction, knowledge, meaning, mental stimulus, pattern, perception, and representation.

Knowledge is defined as (i) expertise, and skills acquired by a person through experience or education; the theoretical or practical understanding of a subject, (ii) what is known in a particular field or in total; facts and information or (iii) awareness or familiarity gained by experience of a fact or situation. Knowledge acquisition involves complex cognitive processes: perception, learning, communication, association and reasoning. The term knowledge is also used to mean the confident understanding of a subject with the ability to use it for a specific purpose if appropriate. (Oxford English Dictionary)
3.2. Transformation of HRU

According to Mike Davidson (1996), the transformation of Human Resource Utilization include those items such as mission, competition, performance, and change as follows:

(1) Mission: What are we trying to accomplish? The human beings major mission is maximum profit? full employment? or human beings reputation?...etc.
(2) Competition: How do we gain a competitive edge? The competition is come from domestic or international market? The leadership or labor quality?...etc..
(3) Performance: How do we deliver the results? Is it necessary to consider those factors such as twin R(returns & risk)? The strategy of leader or follower?...etc.
(4) Change: How do we cope with change? Is it necessary to analyze the human beings making decision behavior from Traditional to Behavior economics? or Neuroeconomics? ...etc.

3.3. The Structure and Function of Brain

Neuroeconomics base the measurement mode of economic decision behavior on the function and operation of the human brain, and the HRU was the base of decision-making. It is the most influential factor in determining human consciousness and behavior. In the development history of mankind, human beings have not been so close to understanding the operation of brain as we are today. With the progress in medical theories and computer technology, the structure and function of human brain have been explored to a significant extent. The following section discusses the relevant issues.

3.3.1. Structure of Brain

Generally speaking, when categorizing the brain by its structure, one can divide it into several parts: the Cerebral cortex, Cerebellum, Brain Stem, Thalamus, Hypothalamus,
Limbic System, Hippocampus, Basal ganglia, Midbrain… etc., each fraction controls a realm; The structure of the brain is illustrated in figure 1 below:

In addition, each area of the brain has its own nerve system in cerebral regions, and is responsible for different task. For example, the main work of Cerebral Cortex include thinking, independence exercise, language, logicality, consciousness… etc.; The Limbic System is in charge of mankind's emotion reaction; and the Hippocampus is responsible for the mankind's learning and memory etc..

3.3.2. The Function of Brain

The brain dominates for the disposition, is the mainly behavioral organ that influences mankind, also is the base of the theories of Neuroeconomics, and the job description or function of each main section concerning mankind brain structure, can read table 1 as follows:
### Table 1  A Comparison on the Cerebral Structure and Function

<table>
<thead>
<tr>
<th>Brain Structure</th>
<th>Brain Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cerebellum</td>
<td>1. Exercise  2. Balance  3. The posture adjusts</td>
</tr>
<tr>
<td>Brain Stem</td>
<td>The Brain Stem include those parts such as the Medulla, pons, tectum, reticularformation, and the tegmentum…etc., the main functions are 1. Breathe 2. Heartbeat 3. Blood pressure</td>
</tr>
<tr>
<td>Thalamus</td>
<td>The Thalamus is responsible for reception to come from sensory apparatus of signal, and inform it to the Cerebral Cortex. The main functions are 1. Feeling  2. Exercise</td>
</tr>
<tr>
<td>Hypothalamus</td>
<td>The Hypothalamus is the center of the temperature conditioning in the human body and the canning induced body temperature variety also gives to adjust in good time. The main functions are 1. Body temperature 2. Emotion 3. Hungry 4. Thirsty 5. Heartbeat rhythm</td>
</tr>
<tr>
<td>Limbic System</td>
<td>The Limbic System included those parts such as the amygdala, hippocampus, mammillary bodies, and cingulate gyrus…etc., this system responds in the emotion of control.</td>
</tr>
<tr>
<td>Hippocampus</td>
<td>The Hippocampus belongs to the Limbic System, it played an extremely important role on the brain function of the memory and the learning.</td>
</tr>
<tr>
<td>Basal ganglia</td>
<td>The Basal ganglia includes those parts such as the globus pallidus, caudate nucleus, subthalamic nucleus, putamen, and the substantia nigra…etc., it plays a important role in the exercising moderately.</td>
</tr>
<tr>
<td>Midbrain</td>
<td>The Medium include to those parts such as the superior colliculi, inferior colliculi, and the red nucleus…etc., the main functions are 1. Vision  2. Audition  3. The eyeball exercises  4. The body exercises</td>
</tr>
</tbody>
</table>

Source: http://life.nthu.edu.tw/~g864264/Neuroscience/neuron/brain.htm
In general speaking, the operation of every part in the human brain structure relates to human behavior, its difference is only its main influence content and range size difference; However, the majority relevant parts influence to policymaker's decision including cerebral cortaxes, thalamus, hypothalamus, limbic systems, especially cerebral cortex and limbic system are the most influential part; The limbic system includes the amygdala, hippocampus mammillary bodies, and cingulate gyrus…etc.,, it is very important to the emotional responses control and influence to policymaker’s irrational behavior, it is also the important theoretical foundation of Neuroeconomics.

3.4 .Construction of Knowledge Management

Wisdom is knowledge, understanding, experience, discretion, and intuitive understanding, along with a capacity to apply these qualities well towards finding solutions to problems. It is the judicious and purposeful application of knowledge that is valued in society. To some extent the terms wisdom and intelligence have similar and overlapping meanings. The status of wisdom or prudence as a virtue is recognized in cultural, philosophical and religious sources.(Wikipedia)

Wisdom arises when one understands the foundational principles responsible for the patterns representing knowledge being what they are. And wisdom, even more so than knowledge, tends to create its own context, so the wisdom embodies principle, insight, moral, or archetype (why). So, in summary the above associations can reasonably be made and figure out as below(see Figure 3). (Hsieh, 2009)

![Figure 3 Construction of KM. Source: Neil Fleming (1996)](image-url)
3.5. The Process of Human Resource Development

According to the definition by the Jakarta Plan of Action on Human Resources Development in the ESCAP Region, the process of human resource development (HRD) as a virtuous cycle of:

(1) Investment in human resources to enhance productive capacities;
(2) Utilization of those human resources to produce increased/higher quality output;
(3) Consumption by those human resources of the benefits arising out of that increased/higher quality output, thereby leading to an enhanced quality of life.

So the process is shown below in a figure 4.

![Figure 4: The process of HRD.](source: ESCAP (1947))

Generally speaking, in the brain structure of mankind, the operation of each part relates to the decision behavior and the difference lays only in the content and degree of the influences. However, if one considers the influence of brain in the operation and management decision of human beings, the relevant fractions on the brain include the Cerebral Cortex, Thalamus, Hyporhalamus, Limbic System, and the Hippocampus…etc. The Cerebral Cortex and Limbic System are especially influential to the emotion changes. This system is very important for the control of emotional reaction and for the irrational
behavior of human beings, the fractions on the Cerebral Cortex is therefore a crucial theoretical foundation in the establishment of Neuroeconomics. Besides that, the process of human resource development (HRD) as a virtuous cycle of provision, investment and utilization of human resources.

4. Theories and Application of HRU through Neuroeconomics

The development and application of human brain are increasingly valued in the Human Resource Utilization and Economic sciences. This section provides a synthesis review on the theories and applications of HRU through Neuroeconomics.

4.1 The Theoretical Foundation of Neuroeconomics

According to the research of scholars in the field of Neurology and Neuroeconomics, the nerve reactions on the Prefrontal Cortex and the Amygdale are the main influential factors for people’s impression on products and consumption behaviors. In order to explain the theoretical foundation of Neuroeconomics, one has to look at aspects such as the CEO of brain and the application of scanning technology.

4.1.1 The CEO of Brain

In the structure of the brain, the Prefrontal Cortex is in charge of the decision behavior of mankind and is responsible for moderating brain thinking, emotion adjustment and self-image control, it is therefore named the CEO of brain. Consequently, the Cerebral Cortex have a great influence in human beings’ decision behavior. Whether it is the operation of the Prefrontal Cortex or the Amygdale, it influences sufficiently the economic decision behavior of mankind.

4.1.2 Application of the Scanning Technology

In measuring neuron reaction, Magnetic Resonance Imaging (MRI) is the main measurement tool. MRI examines with imagining technology whether there are abnormalities within human frame and blood streams. The technology and application of MRI has gradually gained its status in Neuroeconomics. Owing to fact that the loops between emotion and rationality in the brain are different, the behaviors of long-term
decision making (e.g. investment or saving) and that of short-term decision-making (e.g. buying a cake or eating a chocolate) are within two completely different operation systems. In order to prove that the human beings’ operation and management behavior can be influenced by the brain, one can rely on the application of scientific scanning instruments such as MRI, fMRI, CT scanner, and PET…etc. The scanning of test-receiver's brain activity will enable further understanding of the reaction and operation of brain nerves in a decision making situation.

4.2 The Application of Neuroeconomics

Through the progress in medical research, a gradually tightened relationship is found between the development of brain and people’s behavior decision in economics. In practice, human beings have to invest before any profit can be gained. However, how human beings combine rationality and irrationality in decision making in deciding the modes of decision behavior cannot be measured by tradition economics. Neuroeconomics therefore apply instruments such as MRI, SPECT, PET…etc., to observe the internal activity within the brain. This enables us to understand how the HRU and neuron activity influences the decision making behaviors.

4.2.1 The Human Resource Utilization and Bounded Rational Decisions

Generally speaking, the rational decision does not exist in the human society. Scholars like Herbert Simon, Veron Smith, and Kaniel Kahneman, replace 'complete rationality' with 'bounded rationality', and further propose replacing 'best' with 'satisfactory'. The basic concept behind this theoretical decision model has to do with factors relating to inappropriate behaviors, these include the limit in policymaker's ability, the incompletion in the information possessed, inclination to simplify question and situation, easy to be influenced by knowledge or experience in the past, influenced by priority order of resulting information, often replaced correct information by similar to the semi-information, and often do decision with the intuition. (Hsieh, 2008), and only the good Human Resource Utilization can deal with bounded decision well, so the HRU is a major factor to influence the development of human beings.
4.2.2. Measurement of the Brain Activity

The measurement of Neuroeconomics on brain activity is through utilizing scanning technologies such as the MRI, CT, PET, etc. The brain activity is measured by sweeping the image of the brain, and observe the changes within when the subject faces the decision. Comparing the operation of the human brain and the various economic activities, one can analyze the reason of economic behavior and perceptual aspects by the HRU, and further examines how human beings’ brain functions during making-decision process from a scientific approach.

5. Conclusion and Findings

According to the above descriptions, the conclusions and findings are as follows:

5.1. Conclusion

1. The HRU includes courses taught in the fields of Business Administration, Information systems, Management, and Library and Information sciences etc., and the Neuroeconomics further combines Behavioral Economics and Neurology, and explains the decision behavior of the human beings in a more thorough way.

2. The structure of human brain can be divided into cerebral cortex, cerebellum, brain stem, thalamus, hypothalamus, limbic system, hippocampus, basal ganglia, and midbrain and so on, each area has its own function and influences the various human behaviors.

3. The cerebral organs that influence human beings' decision emotion including cerebral cortexes, thalamus, hypothalamus, limbic systems, and the hippocampus etc., and the limbic system is also the most important cerebral organ that causes the irrationality in human beings’ decision making. It is an important theory in the establishment of HRU of Neuroeconomics.

4. Neuroeconomics is a science that combines the HRU such as neurology, economics, and psychology. It explores how the brain influences the decision behavior of Economic Man and allows the human beings to further understand how to evaluate the return and risk in operation and managements.
5.2. Findings

According to conclusion mentioned above, the findings and discussion for this research are as follow:

1. In a dynamic economic society, many large companies and non-profit organisations have resources dedicated to internal HRU efforts, so the human beings should understand the theories and practices of HRU, Behavioral Economics and Neuroeconomics to achieve more beneficial results in his/her operation and managements.

2. In order to reduce the risk of operation and management, human beings should gain more understanding the theory and practice of HRU from the cerebral functions to enable the best decision making behavior.

3. The cerebral cortex and limbic system are the important cerebral organ that causes the irrationality of human beings and are core in Neuroeconomics. Therefore, it is important to provide those Human Resource Utilization information on this topic in the relevant literature to reduce risk taking and mistakes in the operation and management decision.

4. In the Human Resource Utilization operation process, if the human beings can have more insights on how decisions are made and their relation to the uncontrollable Neurological factors, decisions can be amended accordingly. It is then more likely for the human beings to avoid risk-taking behaviors and increases the profit.

References


3. Daniel Simons & Christopher Chabris, Robert Roy Brirr Aumann, R.J.,(1997), Rationality and bounded rationality, Game and Economic Behavior, 21,2-14
4. ESCAP(1947), the Jakarta Plan of Action on Human Resources Development in the ESCAP region, the United Nations for economic and social development in Asia and the Pacific.
12. Wikipedia, the free encyclopedia.