

**EXPLORATION OR EXPLOITATION: STRATEGIC DECISION MAKING
FOR ORGANIZATIONAL PROFITABILITY THROUGH THE LENS
OF GAME THEORY**

**Muhammad Adnan Sial^{1§}, Zeeshan Rafiq¹,
Muhammad Irfan¹ and Bushra Sani²**

¹ Division of Management and Administrative Science,
University of Education, Lahore, Pakistan

Email: zeeshan.rafiq@ue.edu.pk

irfan.ch@ue.edu.pk

bushra.sani@ue.edu.pk

² University of Education, Bank Road Campus
Lahore, Pakistan

[§] Corresponding author Email: adnan.sial@ue.edu.pk

ABSTRACT

The study was conducted to understand the rationale behind the decision to opt whether exploration or exploitation as strategy for gaining competitive advantage. The game theory as one of the most appropriate and guiding method was implied as a theoretical framework of rationale decision making. The study was conducted based on the secondary data about organizations of corporate sector of Pakistan obtained from the official websites / financial statements / new letters etc. The information regarding exploration as strategy of spending resources for creation of new knowledge and taking risk of wastage of resources as a strategy was asked. The possible strategy was to get information about the exploitation strategy as strategy to opt the method of adopting the existing knowledge / understanding rather creating new knowledge. The positivism approach of methodology was used to conduct this study. Moreover, secondary data led to increase the level of confidence towards ensuring that the data used is a brute data. The data was analysed by using Microsoft Excel sheet and a matrix was developed as a principal method of applying game theory in deciding which of aforementioned strategy will be the most appropriate. Based on matrix algebra as an instrument to apply game theory, it is concluded that exploration strategy is the most appropriate for organizational profitability in the competitive business market and can be observed through rise in ROA and ROS.

KEYWORDS

Game Theory; Exploration; Exploitation; Knowledge Management; Organizational Outcome

INTRODUCTION

Due to rapid advancement in information and communication technology the communication channels are being upgraded and coordination at individual, group, and organization level is increasing. Resultantly, competition is increasing and organizations

are trying to adapt strategies to attain and retain the core competency. In order to ensure the core competency and retaining the more and more market share, organizations are adapting strategies depending upon the vision, mission, goals, and resources to achieve these. For selecting the best possible strategy the game theory given by Von Neumann and Morgenstern (1944) with the capacity to use mathematical equation to resolve social / business / management / marketing / strategic issues helps in empirical decision making.

March (1991) studied the relationship between exploration of new ideas and exploitation of old certainties in the light of organizational learning and stated that exploration encompasses discovery, experimentation, flexibility, innovation, risk taking, search, play, and variation. However, exploitation takes account of; choice, efficiency, execution, production, refinement, selection, and implementation (March, 1991). Whereas Lavie, Stettner, and Tushman (2013) analyzed the work of March (1991) and referred it to the main domain of organizational behavior, where exploration is engaging individuals and organizations in experimentation, search, and variation, and exploitation means rise in efficiency and productivity through execution, choice, and reduction in variance. The phenomenon of exploration and exploitation has become a vital lens for understanding different behaviors and outcomes within as well as across different organizations (Lavie, et al., 2013).

Selecting the most appropriate strategy remained the challenge for the management and improving Organizational Performance (OP) is the central point to indicate the effective strategic planning and its implementation. The present study is being conducted to develop guidelines in selecting the most suitable and contributing strategy to ensure the OP. In connection to this, the study is an attempt to fill the gap so that academia, practitioners, and decision makers can have the sufficient empirical reasons to select and implement the policies as per their dire needs and requirements.

Problem Statement and Research Questions

In economy different organizations adopt different strategies to perform and compete with each other. In result of the competition between organizations some of the organizations perform better and play a leading role whereas rest of the organizations used to follow the trends set by these leaders. This research will be conducted to answer the problem which type of strategy leads to better organizational performance? The problem is also highlighted by Lavie et al. (2013) and explained through different questions.

For instance, Lavie et al. (2013) raised a question about performance implications and stated that “Do organizations benefit from balancing exploration and exploitation or from specialization in either activity (p. 142)?” Lavie et al. (2013) proposed a question about the notion of balance i.e. “should organizations seek equal proportions of exploration and exploitation or some other optimal mix” (p. 142)?

Motivation of the Study

Based on thorough literature review published during 1965-2013 Lavie et al. (2013) highlighted that there is dire need to conduct a research for studying the implication of exploration and exploitation and their effects on OP. According to Guisado-González, González-Blanco, Coca-Pérez (2017), Lavie et al. (2013), and Muhr, Pedersen, and Alvesson (2012) there is dire need to study focusing on finding the best strategy rather

trying to find ways for ambidexterity. Bidwell, Briscoe, Fernandez-Mateo, and Sterling (2013) proposed that research conducted for differentiating traditional corporations, entrepreneurial firms, and family-owned companies will be helpful for developing better understanding about these organizations. According to Kunieda and Takashima (2020), relaying on one of the exploration and exploitation kind of strategy can't lead to organizational performance and rather working on finding the ways to balance the strategies there is dire need to find out the best strategy to allocate the resources. This research will also help understanding how these different types of organizations inclined toward exploration and/ or exploitation types of strategies. Same research will also contribute for understanding the difference between these organizations through the lens of organization learning. Robbins and Coulter (2020) stated that organizational performance (OP) is a complex concept and there is need to explore and study the factors impacting the OP. These points highlighted by Lavie et al. (2013), Bidwell et al. (2013), Kunieda and Takashima (2020), and Robbins and Coulter (2020) were the main motivators for conducting this very research. Large number of studies have been conducted to create balance between the two approaches whereas this study considered exploration and exploitation as dichotomy or two sides of a seesaw where both can't be implemented at the same time.

Significance of the Study

The study is significantly important for its contribution in developing an empirically developed mathematical model which can be used by corporate executives to select the optimum strategy from various available options. For this a mathematical model is formed as a guiding principle of profit and loss function for each player to decide about best possible strategy as a tool to manage the OP. The study will also help in contributing to the BoK to develop clear understanding about which of the strategies has more capacity to enhance the performance of the organizations. The findings will also contribute in using game theory in the area of organizational learning, knowledge management, and strategic management.

In order to ensure the rigor and to avoid any possibility of spurious relationship or specification error, thorough literature review has been performed and hypotheses have been developed in the upcoming section of the manuscript.

LITERATURE REVIEW

Game Theory

The game theory is an effective instrument for empirical decision making to select the most appropriate strategy (Abedin, Amindoust, Maddahi, & Jouzdani, 2022) where success of one depends upon the action of others (Sohrabi & Azgomi, 2020). Each decision of the game theory through mathematical equation or deterministic function is applicable to different fields of study including economics (Mendoza-Alonzo, Zayas-Castro, & Charkhgard, 2020; Zameer et al., 2018) social sciences (Wang, Schuetz, & Cai, 2020) engineering, mathematics (Ahmadi-Javid & Hoseinpour, 2018; Mendoza-Alonzo et al., 2020) organizations (Mendoza-Alonzo et al., 2020; Barari et al., 2012; Prasad, Shankar, & Roy, 2019), management, politics (Prasad et al., 2019) financial institutions (Dahlstrom,

Nygaard, Kimasheva, & Ulvnes, 2014; Khanizad & Montazer, 2018) marketing and consumer behaviour (Abedin, et al., 2022; Oreagba, Ogunnaike, & Kehinde, 2021).

Exploration and Exploitation

March (1991) studied the relationship amid exploration of new opportunities and exploitation of old certainties and observed that this dilemma leads to complications for efficient and effective distribution of resources between these two approaches. The evidence show that exploration and exploitation types of strategies required different kinds of organizational arrangement (Berard & Fréchet, 2020). For instance, formalization leads to exploitation but it neither support nor impede the exploration (Berard & Fréchet, 2020). March (1991) linked costs and benefits across time and space, and effects of ecological interaction with distribution of resources between exploration and exploitation types of approaches. Muhr et al. (2013) studied that there is trade-off between these two strategies.

According to March (1991) developed an argument that adaptive process based on exploitation type of approach is effective in short run but in the long run such types of approaches leads to self-destruction and found a large number of organizations' intention toward this strategy. Whereas Kunieda and Takashima (2020) studied that these strategies contributes for the long term performance of an organization.

Exploration revolves around; discovery, experimentation, flexibility, innovation, risk taking, search, play, and variation. However, exploitation is all about choice, efficiency, execution, production, refinement, selection, and implementation (March, 1991). The exploration type strategy means searching new knowledge (Vermeulen & Barkema, 2001). Adaptive systems employing exploration while excluding exploitation have to face costs associated with experiments without achieving reasonable benefits. Under such circumstances, organizations come up with undeveloped but new ideas which hardly give benefits to the organization. On the other hand, organizations engaged in exploitation to the elimination of exploration can fall in the trap of suboptimal stable equilibrium (March, 1991).

March (1991) studied some of the features of such problems with respect to organizational setting and found that exploration and exploitation types of strategies are vital for an organization and organizations compete for distribution of scarce resources. For instance, according to Berard and Fréchet (2020), formalization leads to exploitation but does not affect the exploration, structural empowerment and financial slack support exploration and exploitation, and human resource slack supports the exploration only. Resultantly, decisions about these strategies are based on explicit as well as implicit choices (March, 1991). Where, explicit choices are made based on empirical evidence regarding alternative investments and competitive approaches (March, 1991). Whereas implicit choices are submerged with many of the organizational dynamics and traditions, for instance, it resides in procedures drawn and followed by organizations for accumulating and removing slack, in procedures and actual practices, in ways for setting and changing targets, and in incentive management systems.

Processes related to decision making about allocation of resources between exploration and exploitation is embodied in inter-temporal, inter-institutional, and inter-personal comparisons accompanied with risk preferences (March, 1991). According to March

(1991) such comparisons are linked with difficulties for identifying best suitable trade-offs, and in attaining them.

March (1991) stated that the exploration is more vulnerable as compare to exploitation. Moreover, as compare to exploitation, exploration is associated with less certain results, more remote in time, and at organizational level more difficult for adaption and locus of action. Organizations distribute resources between these two approaches depending upon the lessons learnt during different time periods (March, 1991). According to March (1991), precise and quicker response in the form of certainty, proximity, speed, and clarity of feedback is linked with exploitation and these characteristics differentiate it from exploration. Basic research (exploration) has following characteristics; its outcomes are less certain, it is based on longer time horizon, and its effects are more diffused (March, 1991) radical innovative (Cui, Walsh, & Zou, 2014; Skarmeas, Lisboa, & Saridakis, 2016). Contrarily, product development (exploitation) has following characteristics; outcomes are more certain, based on shorter time horizon, and have less diffuse effects (March, 1991), incremental innovation (Gatti, Volpe, & Vagnani, 2015), and reduce the innovative capabilities (Shi & Cui, 2020). For instance, probing for novel ideas, relations, or markets is linked with outcomes which are less certain, based on longer time horizons, and are having more diffuse effects as compared to further development of existing ideas, relations, or markets (March, 1991). Exploitation means use of firm's ongoing knowledge (Vermeulen & Barkema, 2001).

Organizational Performance

According to Robbins and Coulter (2020) organizational performance (OP) is the sum total of end results of all activities and processes of an organization. Measuring OP leads to better asset management, leave positive impact on organizational reputation, helps enhancing ability to capture customer value, and improving measuring of organizational knowledge (Robbins & Coulter, 2020). Robbins and Coulter (2020) purported three indicators of OP, which are; productivity, effectiveness, and ranking of the organization in the same industry. The OP can be measured through subjective or objective ways (Shi & Cui, 2020). Where, productivity is the total amount produced in the form of goods or services divided by total input used to produce that output; organizational effectiveness is indicated through appropriateness of organizational goals and how well organization is achieving these goals (Robbins & Coulter, 2020); industry ranking is performed by organizations including chamber of commerce and industry, securities and exchange commission, Ministry of finance, and Bureau of Statistics. As per Robbins and Coulter (2020) manager can improve OP by monitoring and controlling organizational performance, while using one of these, which include different approaches related to balance scorecard, benchmarking best practices, financial controls, and/ or information control.

The arguments of Arthur (1984) support the implementation of exploitation type of strategy. As he stated that performance of an organization is a combined function of potential return from an activity and present competence of the organization at it. Whereas March (1991) stated that organizations adopting exploitation type of approach will lead to self-destruction in the long run. The organizations need to maintain a reasonable level of

exploration for achieving and maintaining the higher level of performance in the long run. Many risks and costs are associated with experimentations and exploration leads to creating variation in performance but these variations in performance leads to increase in knowledge and competencies (March, 1991). According to Shahzad, Ahmad, Hassan, and Rafiq (2021), information and knowledge sharing can enhance the performance. Whereas organizations can avoid variations in performance through exploitation and can avoid risks, costs, uncertainties, and diffusion but this in the long run it will lead to self-destruction through inferior knowledge, lower less of competency, power product quality and variety, which will lead to fall in performance. Resultantly, organization will lose its position in the market and competitors will be able to grab the more and more of the market and will be able to show their primacy (March, 1991).

According to Robbins and Coulter (2020); Shi and Cui (2020); and Kunieda and Takashima (2020), performance of the organization can be measured and observed through different ratios related to financial statements. Another way to measure performance is to analyze its position / rank in the sector, effectiveness, and competency (Robbins & Coulter, 2019; Kunieda & Takashima, 2020).

Exploration, Exploitation, and Organizational Performance

Exploitation leads to fall in the dilemma of sub-optimal equilibria and obsolescence of organizational performance (Chanda et al., 2018). According to March (1991) it is much difficult to comprehend about the options and improving equilibrium in the middle of exploration and exploitation because the return against these strategies is based on different factors, including, expected values, their variability, timing, and spread within and across the organization. Adoption of exploration strategy leads to better OP whereas exploitation approach can badly impact the OP (Li, Lin, Cui, & Qian, 2018). In this contemporary world exploration kind of strategy / approach leads to better performance and output (Muhur et al., 2013). The OP is affected by the strategy adopted by the organization and cost associated to select and implement the strategy (Kunieda & Takashima, 2020). Both of the strategies lead to better OP (Shi & Cui, 2020).

Hypotheses

Following hypotheses will be tested based on data analysis.

H₁: The exploration type of strategy is more appropriate than exploitation to attain the optimum level of organizational performance.

H₂: Organizations inclined toward exploitation type of strategy can give better performance as compare to organizations opted exploration type of strategy.

MATERIAL AND METHOD

The target population consists of all organizations related to production and service sector of Pakistan. The list was obtained from Securities and Exchange Commission of Pakistan (SECP) which was consisting of 96230 organizations. For sampling purpose, probability sampling technique was used and 250 organizations were selected through simple random sampling technique. The sample was comprised of variety of organizations listed on SECP based on the recommendations of Kunieda and Takashima (2020). Having

R&D capacities can be the indicator of inclination towards exploration type of strategy and otherwise (Guisado-González et al., 2017; Shi & Cui, 2020).

Unit of analysis was the organization and comparison from organization-to-organization help finding answers to the research questions. The OP was measured through different ratios which were calculated by using financial statements of these organizations. Other indicators include ranking of organizations in that sector, effectiveness, and competency was used for measuring OP. However, in order to understand the inclination of an organization towards exploration and exploitation secondary data based on balance sheet, income statement, press release, and official website.

There were total 75 organizations having R&D departments or allocated funds for it and were considered following exploration type of strategy. Whereas rest 180 organizations were not having R&D departments or were not allocating funds for any R&D activities. Most of the organizations allocating funds for R&D were from pharmaceutical, diagnostic labs, and other health related institutions. Kunieda and Takashima (2020) studied that ROA, ROS, and Tobin's Q are the indicators of OP, where ROA and ROS are the ratios of return with respect to assets and sales. The Tobin's Q is the indicator of market performance but for present study such indicator was not used just because of political instability, financial turbulence of the economy, and other such factors. According to Zhao, Xia, Yu, and Liu (2020), quantitative methods are appropriate to get in-depth and clear understanding about modeling analysis along with getting knowledge about game theory related parameters. The upcoming coming part of the manuscript is related to statistical testing of the inferences drawn based on past literature and theoretical understanding.

ANALYSIS

Keeping in view the guidelines given by Kunieda and Takashima (2020), for data analysis the organizational performance was measured through ROA and ROS. Where ROA = Return on asset, indicating the profitability of the firm with respect to assets invested in the organization and can be calculated by dividing net income by total assets. Whereas ROS = Return on sales which can be calculated by dividing net income by net sales.

For data analysis excel sheet was used to calculate the ratios and different values obtained from balance sheet, income statement, website, or press release. The ROA calculated for organizations having R&D departments and allocating 2 to 3% of total assets were having ROA between 5–11 percent. Whereas organizations with no funds for R&D were having ROA between 2–4 percent. This indicates that exploitation - exploration type of strategy will have option of managing performance from 2–6 percent. Whereas absolute measure of dispersion range was used, meaning that $11-5 = 6$ for exploration and $4-2 = 2$ for exploitation type of strategy.

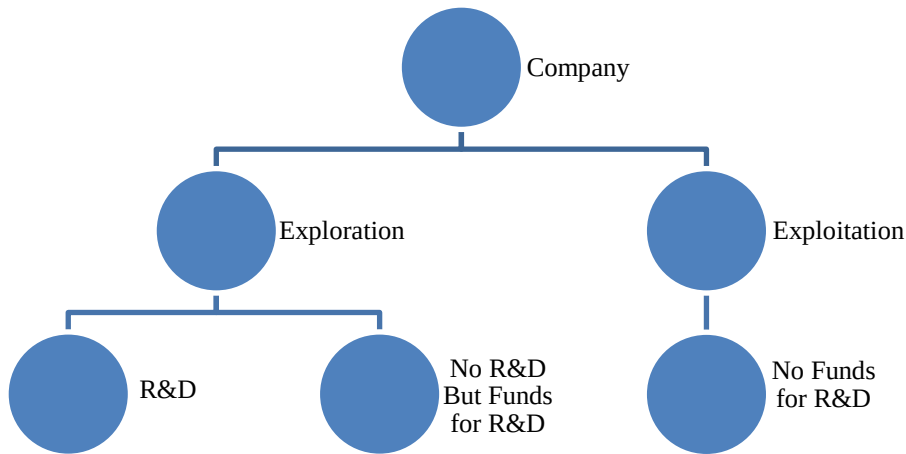


Figure 1: Possible Options and Theoretical Understanding Pertaining to Studied Possibilities based on Game Theory

Figure 1 indicates the theoretical layout to analyze the data points to evaluate the adopted strategies to attain the desired level of organizational performance. Thus, keeping in view the Figure 1, the studied data was analyzed to understand which of the strategy cum game theory parameter is linked to what strategy to achieve the desired level of organizational performance.

The ROS calculated for organizations having R&D departments and allocating 2 to 3% of total assets were having ROS between 10-22 percent. Whereas organizations with no funds for R&D were having ROA between 5–10 percent. This indicates that exploitation - exploration type of strategy will have option of managing performance from 5–12 percent. Whereas absolute measure of dispersion range was used, meaning that $22-10 = 12$ for exploration and $10-5 = 5$ for exploitation type of strategy.

Thus, keeping in view the foregoing facts and figures it is concluded that adopting exploration type of strategy can lead to attain the optimum level of organizational performance. Moreover, by adopting such approaches the environment of knowledge creation and innovation can be generated which can lead to better ROA and ROS indicating that organization can have better image in front of consumers as well as investors.

The forthcoming section of the manuscript is to discuss the findings of the study in the light of the past literature.

DISCUSSION

Based on these arguments March (1991) reached to the point that a suitable balance between these two strategies is required for prosperity in addition to existence of the organization. In the same course of line, Berard and Fréchet (2020) studied that there are some organizational level factors which support to both of the strategies, e.g. structural

empowerment has significant and positive relationship with exploration and exploitation and contributes to organizational outcome. The focus of the study was to find out the best possible strategy to increase the OP which was contradicting to some studies, e.g. Berard and Frechest (2020) and March (1991) and is supported by Kunieda and Takashima (2020) who empirically concluded that there is need to adopt one of the two rather than trying to balancing.

There were two possible strategies and exploration type of strategy is recommended for the organizations targeting to improve their performance based on ROA and ROS and this finding is in line with the past studies (e.g. Kunieda & Takashima, 2020; Muhr et al., 2013; Li et al., 2018; and Shi & Cui, 2020). The decision to adopt exploitation type of strategy leads to perform better but lower than exploration. The decision is in line with the studies (e.g. Chanda et al., 2018; Gatti et al., 2015; Li et al., 2018 and Shi & Cui, 2020). For adopting exploration kind of strategy organizations have to face the addition cost (Kunieda & Takashima, 2020) but based on game theory analysis it is concluded that the cost associated with exploration kind of strategy can lead to increase the OP which can be seen through ROS. It is the cost of innovation or creating new knowledge to perform better either through improving quality or adding features to the existing product.

CONCLUSION

The exploration kind of strategy adopted by the organization is the better option with high rate of return indicated through ROA and ROS. It is also concluded that organizations can adopt the exploration kind of strategy for creating more and more knowledge and playing the leading role in the market. Resultantly, ROS will increase and organization will be able to enjoy the benefits of better performance as compared to the organizations which do not allocate resources for exploration type of strategy.

LIMITATIONS AND SUGGESTIONS

The research was conducted based on the data obtained from various sectors of the economy there is dire need to understand whether there are differences in adoption of exploration or exploitation kind of strategy in various sectors. It led to conduct a comparative study which can give better understanding about the outcome of the strategies for difference sectors. The study was conducted based on the cross-sectional research design. A longitudinal study or a study with time series analysis can give better understanding for the decision makers to decide about which kind of strategy can contribute to higher organizational performance.

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