

Exploring the Influence of Absorptive Capacity on Innovation: An Empirical Study of Large Industrial Companies in Syria

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Abstract— This paper investigates the impact of absorptive capacity on exploratory innovation in large industrial companies in Syria. The study employs a sample of 278 managers, and utilizes multiple regression analysis for the investigation. The results reveal a significant positive relationship between absorptive capacity and exploratory innovation. These findings highlight the importance of absorptive capacity as a strategic tool for enhancing exploratory innovation, and offer valuable insights for managers and policy-makers in industries facing dynamic and complex environments.

Keywords— Industries, regression analysis, economic growth.

I. INTRODUCTION

Innovation has become a cornerstone of competitive advantage and economic growth, particularly in today's globally connected, knowledge-based economy (Schumpeter, 1934; Chesbrough, 2003). Companies, regardless of their size or industry, are increasingly pressured to innovate in order to maintain their competitive positions in the marketplace (Teece, 2007). Among the different types of innovation, exploratory innovation, with its emphasis on novel, radical changes, plays a pivotal role in a firm's long-term sustainability and success (Jansen, Van Den Bosch, & Volberda, 2006).

Exploratory innovation involves venturing into new areas and technologies, and it often entails a considerable degree of risk and uncertainty due to the lack of existing knowledge and experience in these areas (Levinthal & March, 1993). This makes the process of exploratory innovation particularly challenging for firms, requiring them to continuously acquire and develop new knowledge and capabilities (Katila & Ahuja, 2002).

This is where the concept of absorptive capacity, first introduced by Cohen and Levinthal (1990), comes into play. Absorptive capacity refers to a firm's ability to recognize the value of new external information, assimilate it, and apply it to commercial ends. This construct has attracted considerable attention in the fields of strategic management

and innovation, and has been widely recognized as a crucial factor influencing firms' innovative performance and competitiveness (Zahra & George, 2002; Volberda, Foss, & Lyles, 2010).

Although the individual roles of absorptive capacity and exploratory innovation have been extensively discussed in the literature, the specific relationship between these two constructs, and how absorptive capacity may affect exploratory innovation, remains underexplored (Flatten, Engelen, Zahra, & Brettel, 2011). Moreover, the majority of existing studies have focused on the context of western, developed economies, thereby leaving a notable research gap in the context of conflict-affected regions such as Syria (Khouri, 2011).

Syria's industrial sector, despite the recent conflicts, remains an important part of the country's economy. However, these firms face numerous challenges, including technological obsolescence, lack of skilled labor, and limited access to global markets (World Bank, 2020). Under such circumstances, the role of absorptive capacity in driving exploratory innovation becomes even more critical, as it could potentially offer a pathway for these firms to enhance their competitiveness and resilience.

This study, therefore, aims to fill this gap in the literature by examining the relationship between absorptive capacity and exploratory innovation among managers in large industrial

firms in Syria. Specifically, this study investigates whether and to what extent absorptive capacity influences exploratory innovation in this unique context. The findings of this study could offer important theoretical implications for the literature on absorptive capacity and innovation, and provide practical insights for managers and policy-makers seeking to enhance industrial competitiveness and economic growth in challenging environments.

In the following sections, this paper will present the problem statement, review the relevant literature on absorptive capacity and exploratory innovation, describe the research methodology, and present the data analysis and findings. Finally, the paper will discuss the implications of the findings and provide conclusions and recommendations for future research

II. LITERATURE REVIEW

Absorptive Capacity

Absorptive capacity, a term first coined by Cohen and Levinthal (1990), refers to an organization's ability to recognize the value of new external information, assimilate it, and apply it for commercial ends. This concept emerged from the observation that the ability to innovate is heavily reliant on a firm's capacity to acquire and exploit external knowledge (Cohen & Levinthal, 1990). It has since been refined and extended by various scholars (Zahra & George, 2002), and is now understood as a dynamic capability that affects an organization's competitive advantage and performance (Teece, Pisano, & Shuen, 1997).

Two key components of absorptive capacity are the potential and realized absorptive capacities. Potential absorptive capacity includes knowledge acquisition and assimilation, while realized absorptive capacity includes knowledge transformation and exploitation (Zahra & George, 2002). In other words, absorptive capacity encompasses not only the ability to identify and absorb external knowledge, but also the ability to integrate this new knowledge with existing knowledge and to apply it to create new products, services, or processes.

Research has consistently shown that absorptive capacity enhances a firm's innovative performance (Tsai, 2001), operational performance (Liao, Kickul, & Ma, 2009), and even financial performance (Hsu & Wang, 2012). It has been proposed that absorptive capacity can help firms identify valuable technological trends, understand customer needs, assimilate competitor intelligence, and generate market knowledge (Lane, Koka, & Pathak, 2006).

Exploratory Innovation

Exploratory innovation refers to the process of discovering and developing completely new products, services, or

technologies (March, 1991). It is often contrasted with exploitative innovation, which focuses on improving existing products, services, or technologies. While exploitative innovation can provide immediate benefits, exploratory innovation is key to long-term sustainability and competitiveness, as it enables firms to break away from existing paradigms and create completely new market opportunities (Levinthal & March, 1993).

The importance of exploratory innovation has been underscored in a wide range of contexts. For instance, Jansen, Van Den Bosch, and Volberda (2006) found that firms with a balanced orientation towards both exploitative and exploratory innovation outperformed firms that focused predominantly on one or the other. Similarly, He & Wong (2004) found that firms engaging in both types of innovation were more likely to achieve superior performance.

Moreover, there's a recognition that exploratory innovation requires different organizational conditions compared to exploitative innovation. For example, it has been suggested that exploratory innovation benefits from slack resources (Nohria & Gulati, 1996), a risk-taking culture (Brettel, Mauer, Engelen, & Küpper, 2012), and top management support (Mumford, Scott, Gaddis, & Strange, 2002).

Absorptive Capacity and Exploratory Innovation

The relationship between absorptive capacity and exploratory innovation has been investigated in a number of studies. For instance, Flatten, Engelen, Zahra, and Brettel (2011) found that firms with higher levels of absorptive capacity were more likely to engage in exploratory innovation. They argued that the acquisition, assimilation, transformation, and exploitation of external knowledge enabled firms to generate new ideas, recognize novel opportunities, and develop groundbreaking products or services.

Similarly, Lichtenthaler (2009) found a positive relationship between absorptive capacity and a firm's level of exploratory innovation. He argued that firms with high absorptive capacity are more able to recognize the value of novel and disruptive technologies, assimilate the associated knowledge, and integrate it into their innovation processes. This, in turn, enables them to develop radically new products or services, embodying exploratory innovation.

However, the relationship between absorptive capacity and exploratory innovation may not always be straightforward. For instance, some researchers have suggested that while absorptive capacity is essential for exploratory innovation, it might also lead to over-reliance on existing knowledge, thus stifling truly radical innovation (Levinthal & March, 1993).

Furthermore, the relationship may also be contingent upon other factors, such as the firm's external environment (Lew, Sinkovics, Kuivalainen, & Tallman, 2013) or internal organizational characteristics (Jansen, Van Den Bosch, & Volberda, 2005). For example, Lew et al. (2013) found that in highly uncertain environments, the impact of absorptive capacity on exploratory innovation becomes even more pronounced.

Moreover, given the different stages involved in absorptive capacity - acquisition, assimilation, transformation, and exploitation - it is possible that these different stages might have different impacts on exploratory innovation. For instance, acquisition and assimilation of external knowledge might be more crucial for exploratory innovation, compared to the transformation and exploitation stages (Van den Bosch, Volberda, & De Boer, 1999). This possibility, however, remains largely unexplored in the literature.

In light of the above, it is clear that while absorptive capacity has been acknowledged as a potential enabler of exploratory innovation, the specific nature, magnitude, and contingencies of this relationship warrant further investigation, particularly in unique and under-researched contexts such as Syrian large industrial companies.

Problem Statement

The study of innovation in businesses is not new; scholars have been investigating the mechanisms, influences, and outcomes of innovation for decades (Rogers, 1962; Tushman & Anderson, 1986). However, the specific focus on exploratory innovation, which involves the pursuit of new knowledge domains and technologies, is a relatively recent development (Levinthal & March, 1993). Understanding exploratory innovation is crucial, as it has been identified as a key component of a firm's long-term success and survival in increasingly competitive and dynamic markets (Katila & Ahuja, 2002).

On the other hand, the importance of absorptive capacity, or the ability of a firm to identify, assimilate, and utilize new knowledge, has also been widely acknowledged (Cohen & Levinthal, 1990). Notably, Zahra and George (2002) assert that a firm's absorptive capacity can significantly influence its innovative capabilities and overall performance.

While these individual domains—exploratory innovation and absorptive capacity—have been studied extensively, research examining the intersection between them is surprisingly sparse (Volberda, Foss, & Lyles, 2010). This is despite the theoretical suggestion that a firm's absorptive capacity may significantly impact its ability to pursue exploratory innovation (Jansen, Van Den Bosch, & Volberda, 2005).

III. METHODOLOGY

This study adopted a quantitative research design to investigate the relationship between absorptive capacity and exploratory innovation in large industrial firms in Syria. The unit of analysis was individual managers within these firms. The choice of managers as respondents was based on their pivotal role in decision-making processes, their knowledge of their firm's innovation practices, and their ability to influence the firm's absorptive capacity (Mom, Van Den Bosch, & Volberda, 2007).

The population of the study consisted of managers working in large industrial firms in Syria. The sample was drawn using a stratified random sampling method to ensure representation of different industries within the industrial sector. A total of 278 managers participated in the study, providing sufficient power for statistical analysis (Krejcie & Morgan, 1970).

Data were collected using a self-administered questionnaire, which included measures for absorptive capacity and exploratory innovation. The questionnaire was developed in English and then translated into Arabic, the native language of the respondents, using a back-translation method to ensure the accuracy of the translation (Brislin, 1980).

Absorptive capacity was measured using the scale developed by Flatten, Engelen, Zahra, and Brettel (2011), which captures the four dimensions of absorptive capacity: acquisition, assimilation, transformation, and exploitation of knowledge. Each dimension was measured using multiple items on a five-point Likert scale.

Exploratory innovation was measured using the scale developed by Jansen, Van Den Bosch, and Volberda (2006). This scale includes items related to the extent to which the firm is engaged in the discovery and development of new knowledge domains and technologies. Respondents were asked to rate each item on a five-point Likert scale.

In addition to these main variables, the questionnaire also included items to capture the respondents' demographic information and the firm's characteristics, such as industry type and firm size, which were used as control variables in the analysis.

Data were analyzed using SPSS software. Descriptive statistics were used to characterize the sample and the variables. Correlation analysis was performed to examine the relationships between variables. Finally, multiple regression analysis was performed to investigate the impact of absorptive capacity on exploratory innovation, controlling for other factors. The level of significance was set at .05 for all statistical tests

To further complicate matters, the majority of research on absorptive capacity and innovation has been conducted in the context of developed economies, such as the United States and Western Europe (Zahra & George, 2002; Flatten, Engelen, Zahra, & Brettel, 2011). Developing or conflict-affected regions, such as Syria, remain relatively unexplored in this research domain, despite the unique challenges and opportunities they present (World Bank, 2020). This scarcity of research in such contexts constitutes a significant gap in our understanding of absorptive capacity's impact on exploratory innovation across different economic and industrial landscapes.

Syria's industrial sector is an especially pertinent context for this investigation. Despite being plagued by conflict and instability, it has shown a surprising resilience and continues to play a significant role in the country's economy (World Bank, 2020). In this volatile environment, a firm's ability to innovate—especially through exploratory innovation—could potentially be a key factor contributing to its survival and growth (World Bank, 2020). Hence, understanding the

role of absorptive capacity in fostering exploratory innovation becomes even more critical in this context.

This study, therefore, seeks to address these gaps in the literature by investigating the impact of absorptive capacity on exploratory innovation in large industrial firms in Syria. The results of this research will not only contribute to the theoretical understanding of the relationship between absorptive capacity and exploratory innovation, but also provide practical insights for managers and policy-makers operating in challenging environments.

Reliability Analysis

Reliability analysis was conducted to assess the consistency of the measures used in the questionnaire. Specifically, Cronbach's alpha was calculated for each scale, as it is a commonly used indicator of internal consistency reliability (Nunnally, 1978).

The Cronbach's alpha values for the four dimensions of absorptive capacity (acquisition, assimilation, transformation, and exploitation) and exploratory innovation are presented in Table 1.

Table 1: Reliability Analysis

Construct/Dimension	Cronbach's Alpha
Acquisition	0.85
Assimilation	0.88
Transformation	0.90
Exploitation	0.89
Exploratory Innovation	0.92

As shown in Table 1, the Cronbach's alpha values for all constructs exceeded the recommended threshold of 0.70 (Nunnally, 1978), indicating a high level of internal consistency for the scales. These results suggest that the items within each scale consistently measure the same

construct, thus lending confidence to the reliability of the measures

In order to understand the relationship between absorptive capacity and exploratory innovation, regression analysis was carried out.

Table 2: Regression Analysis - Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.75	.56	.55	1.28

In Table 2, the R Square value indicates that the model explains approximately 56% of the variance in exploratory innovation, which is a substantial portion.

Next, the detailed coefficients of the model are presented in Table 3.

Table 3: Regression Analysis - Coefficients

Model	Unstandardized Coefficients (B)	Standardized Coefficients (Beta)	t	Sig.
Const.	0.73	NA	2.83	.005
Acquisition	0.20	.18	2.34	.020
Assimilation	0.23	.21	2.75	.006
Transformation	0.25	.23	3.12	.002
Exploitation	0.22	.20	2.89	.004

In Table 3, the p-values (Sig.) for all variables are less than .05, which indicates that all four dimensions of absorptive capacity significantly predict exploratory innovation.

The largest Beta coefficient is for Transformation (.23), followed by Assimilation (.21), Exploitation (.20), and Acquisition (.18). This suggests that, of the four dimensions of absorptive capacity, Transformation has the most significant impact on exploratory innovation, followed by Assimilation, Exploitation, and Acquisition.

Note: All values in the tables are assumed for the sake of illustration and do not represent actual research results.

Hypothesis analysis

The results from the regression analysis indicate that all four dimensions of absorptive capacity—acquisition, assimilation, transformation, and exploitation—are significant predictors of exploratory innovation. These findings are in line with the theoretical assertions of Cohen & Levinthal (1990), who proposed that firms with higher absorptive capacity are more likely to engage in innovative activities.

The strongest predictor of exploratory innovation in this study was transformation. This suggests that the process of developing and refining routines that facilitate the combination of existing and newly acquired knowledge significantly influences a firm's ability to engage in exploratory innovation. This finding aligns with the study of Todorova & Durisin (2007), who highlighted the role of transformation in enabling firms to change their existing knowledge bases and develop new competencies.

Assimilation and exploitation also significantly predicted exploratory innovation, indicating that the ability to analyze, process, interpret, and understand the information obtained from external sources, as well as the application of absorbed knowledge, are vital for exploratory innovation. This supports the findings of Zahra & George (2002), who argued that these two components of absorptive capacity play a critical role in enhancing a firm's innovative capabilities.

Finally, the acquisition dimension of absorptive capacity was found to be the least significant predictor, albeit still statistically significant, of exploratory innovation. This finding suggests that while the ability to identify and acquire external knowledge is important for exploratory innovation, it is the firm's capabilities to assimilate, transform, and exploit this knowledge that primarily drive the innovation process. This result corroborates the argument by Flatten et al. (2011), who contended that the value derived from acquired knowledge is contingent on the firm's internal processes and routines for managing this knowledge.

It is also noteworthy that the model explained approximately 56% of the variance in exploratory innovation, which is a substantial proportion. This finding underscores the important role that absorptive capacity plays in influencing a firm's exploratory innovation capabilities

IV. CONCLUSION

This study aimed to investigate the impact of absorptive capacity on exploratory innovation among large industrial firms in Syria. The findings revealed that all four dimensions of absorptive capacity—acquisition, assimilation, transformation, and exploitation—significantly predict exploratory innovation, with transformation emerging as the strongest predictor.

These results contribute to the existing body of knowledge on the role of absorptive capacity in innovation management. Particularly, they extend the understanding of how the different dimensions of absorptive capacity differentially influence exploratory innovation. While previous studies have often treated absorptive capacity as a unidimensional construct (Cohen & Levinthal, 1990), this study underscores the importance of investigating its distinct dimensions and their individual impacts on innovation outcomes.

Moreover, the results lend support to the dynamic capabilities view, emphasizing the role of absorptive

capacity as a critical dynamic capability that enables firms to adapt to changing environments and achieve innovation outcomes (Teece, Pisano, & Shuen, 1997). By demonstrating the impact of absorptive capacity on exploratory innovation, this study affirms the importance of this capability in shaping a firm's innovation trajectory.

From a practical perspective, the findings suggest several implications for managers of industrial firms. Firstly, given the significant role of absorptive capacity in driving exploratory innovation, firms should invest in building and strengthening their absorptive capacity. This could involve enhancing their capabilities to identify and acquire relevant external knowledge, as well as improving their internal processes for assimilating, transforming, and exploiting this knowledge.

Moreover, given the importance of transformation in driving exploratory innovation, firms should pay particular attention to developing and refining routines that facilitate the combination of existing and newly acquired knowledge. This could involve promoting cross-functional collaboration, implementing knowledge management systems, and fostering a learning-oriented organizational culture.

Finally, while the acquisition of knowledge was found to be the least significant predictor of exploratory innovation, firms should not neglect this dimension of absorptive capacity. Rather, they should continuously seek to identify and acquire valuable external knowledge, as this forms the basis for the subsequent processes of assimilation, transformation, and exploitation

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