

Goaill, Majid M.; Al-Hakimi, Mohammed

## Article

# Does absorptive capacity moderate the relationship between entrepreneurial orientation and supply chain resilience?

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\*Corresponding author: Mohammed, A. Al-Hakimi, Department of Management, Faculty of Management & Commerce, B.A.M. University, Aurangabad, 431004, India  
E-mail: [alhakimi111@gmail.com](mailto:alhakimi111@gmail.com)

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Albert W. K. Tan, Asia Pacific Graduate Institute, Shanghai Jiao Tong University, SINGAPORE

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## OPERATIONS, INFORMATION & TECHNOLOGY | RESEARCH ARTICLE

# Does absorptive capacity moderate the relationship between entrepreneurial orientation and supply chain resilience?

Majid M. Goaill<sup>1</sup> and Mohammed, A. Al-Hakimi<sup>2\*</sup>

**Abstract:** Supply chain resilience (SCR) is often seen as a dynamic capability that enables firms to effectively cope with disruptions and unforeseen events in the business environment. However, empirical research focusing on influencing factors on SCR is still limited. Based on the resource-based view (RBV) and the dynamic capabilities theory (DCT), we examine if absorptive capacity (AC) does in fact moderate the relationship between entrepreneurial orientation (EO) and SCR. Drawing upon a sample of 171 Yemeni manufacturing SMEs, we tested the relationships in the proposed model. The findings of the data analysis using SmartPLS show that EO positively affects SCR, further, AC positively moderates the relationship between EO and SCR. With this outcome, it is expected that SME managers in Yemen demonstrate significant interest in developing the AC of their firms. This has implications that with the development of AC, it is expected that SMEs will be able to utilize the full potential of EO to improve SCR.

**Subjects:** Operations Management; Supply Chain Management; Strategic Management; Entrepreneurship and Small Business Management

### ABOUT THE AUTHOR

Majid M. Goaill is currently an assistant professor at Tamar University (Yemen) in the Faculty of Administrative Sciences, Department of Marketing and Production. He gained his PhD Degree (Marketing) in 2014 from the University Utara Malaysia (UUM). He has published articles in professional journals such as *Journal of Relationship Marketing*, *International Review of Management and Marketing*, and *Asian Social Science*. His research interests are relationship marketing, supply chains, consumer behavior, production & operations management, and brand marketing.

Mohammed, A. Al-Hakimi is currently a PhD scholar at Department of Management Sciences, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, India. He is working as a senior lecturer in the department of Marketing & Production of Tamar University, Yemen. His research interests include supply chain management, production & operations management, innovation, entrepreneurial orientation, and strategic management.

### PUBLIC INTEREST STATEMENT

EO is revealed as a primary enabler of SCR for SMEs in turbulent environments. This is evident from the study conducted in SMEs in Yemen. SMEs that adopt EO's practices can improve their SCR significantly. However, entrepreneurial-oriented SMEs should develop their ability to acquire, assimilate, transform and exploit new knowledge from various sources. As supply chain disruptions increase, AC becomes critical. This suggests that the EO and AC should be important parts of designing SMEs' strategies to promote their SCR.

**Keywords: Entrepreneurial Orientation; Absorptive Capacity; Supply Chain Resilience; SMEs; PLS-SEM**

## 1. Introduction

Over the past two decades, a large part of interest in the literature of supply chain management has concentrated on the disturbances management related to unpredicted events that obstruct the materials and goods flow within a supply chain (e.g., Bier et al., 2020; Gualandris & Kalchschmidt, 2015; Jabbarzadeh et al., 2016; Lee, 2004; Oke & Gopalakrishnan, 2009; Tang, 2006; Wagner et al., 2012), where the disturbances make a supply chain more vulnerable and may affect a firm's performance not only in terms of direct financial losses but also in terms of the firm's bad reputation and loss of demand (Bier et al., 2020; Lucker & Seifert, 2017). In line with this, firms have tried to follow best practices that allow them to mitigate the implications of these disturbances (Jüttner & Maklan, 2011) while making them more resilient versus supply chain disruptions (Polyviou et al., 2019). Thus, supply chain resilience (SCR) is crucial to the success of businesses and supply chains (Liu et al., 2017), where it provides a supportive response to disturbances and sustains processes (Hohenstein et al., 2015; Mandal, 2020; Rajesh, 2016).

Entrepreneurial orientation (EO) is among the themes that have been studied widely in recent times due to its major influence on business performance (Al-Hakimi et al., 2020; Hernandez-Perlines, 2018; Ibarra-Cisneros & Hernandez-Perlines, 2019; Sarsah et al., 2020). Entrepreneurial-oriented firms can respond to changes, disruptions, and environmental uncertainty by providing opportunities and allocating resources to invest for sustainment and expansion (Hisrich et al., 2016; Hitt et al., 2001). Although the belief in the importance of the EO of SMEs in reducing environmental disturbances by improving the ability of resilience, especially in the constantly changing business environment (Coleman & Adim, 2019), others found the relationship to be insignificant (Mandal & Saravanan, 2019).

These inconclusive results have driven some researchers to have made a call for further study of the relationship between EO and SCR (Al-Hakimi et al., 2020; Mandal & Saravanan, 2019), focusing on intervening or moderating factors. This paper focuses on dynamic capabilities (absorptive capacity (AC) in this case) as a moderator factor for the relation. In response to a call by Engelen et al. (2014), we argue that AC has an outstanding contribution to enhancing the EO–SCR relation, especially in dynamic environments, based on the presumption that dynamic capabilities (like AC) are most important in the case of business environment disturbance (Zahra et al., 2006). Dynamic capabilities differ from normal capabilities or resources in terms of they enable a company to reallocate its present resources and capacity base (Teece et al., 1997). As such, the smooth implementation of inherently uncertain entrepreneurial practices requires a reallocate of the present resources or capabilities that can be offered by dynamic capabilities, where the inertia of steady normal resources and capabilities cannot enable the full potential of the EO to be realized (Eisenhardt & Martin, 2000). AC refers to the firm's capability to recognize, ingest, and apply external knowledge for commercial purposes meaningfully (Cohen & Levinthal, 1990). AC represents a decisive prerequisite for renewing the information base of the firm (Zahra & George, 2002), which in turn drives higher flexibility in the resource base reconfiguration (Miroshnichenko et al., 2020). According to Rojo et al. (2018), AC is one of the core dynamic capabilities, which makes firms more resilient against disruption. Similarly, Liao et al. (2003) indicated that SMEs' responsiveness in the turbulent environment raises if they possess sophisticated capabilities in acquiring outward knowledge and disseminating it within the firm. AC takes advantage of essential resources inherent in the firm's relationships with supply chain partners and allows deploying those resources effectively to attain a sustainable competitive advantage (Gölgeci & Kuivalainen, 2020). Moreover, previous literature has confirmed that AC effectively moderates the relation between EO and other factors as performance (Engelen et al., 2014), technological innovation capabilities (Mohd Noor & Aljanabi, 2016), international performance of family firms (Hernandez-Perlines, 2018), innovation performance (Zhai et al., 2018), and business performance (Ibarra-

Cisneros & Hernandez-Perlines, 2019). Therefore, the current study expands research in terms of how a firm's AC interacts with EO so as to improve SCR by arguing that AC plays a core role in boosting the effect of EO on SCR.

The firms studied are the SMEs located in Yemen that, despite their dominance in the manufacturing sector, their contribution to the country's GDP is negligible (AlQershi et al., 2020). A major issue for its poor performance is the supply chain disruptions resulting from the conflict and the political crisis in the country, including close inspection at seaports that have restricted imports, and delayed arrival of raw materials in addition to high costs of insurance and shipping (Morris et al., 2019; Tandon & Vishwanath, 2020). Moreover, empirical research on SMEs remains limited for large firms (Didonet & Diaz-Villavicencio, 2020; Maldonado-Guzman et al., 2018), particularly in the context of developing countries (Scholten & Schilder, 2015), although SMEs are an important part of universal supply chains and suffer from adverse implications of the disturbances of supply chains as well (Tukamuhabwa et al., 2017). Therefore, the current study seeks to address this empirical research gap by analyzing the moderating effect of AC on the EO–SCR relationship in the context of Yemeni SMEs. This study seeks, thence, to complement previous research (Al-Hakimi et al., 2020; Mandal & Saravanan, 2019) and widens the realization of the dynamic capabilities' impact (in this case, AC) to involve SCR.

## 2. Theoretical framework and hypotheses development

Over time, SCR has been emphasized as a critical capability in dealing with uncertainties because of the capability to recover operations during turbulent times. A disturbance may be any unforeseen event with the potential of introducing the relevant firm's negative outcomes (Mandal, 2017). As such, resilience reflects the response capability to disruptions and coming back to the natural position (Mallak, 1998). Relating to that, SCR defined by Ponomarov and Holcomb (2009) as *"the adaptive capability of the supply chain to prepare for unexpected events, responds to disruptions, and recover from them by maintaining continuity of operations at the desired level of connectedness and control over structure and function"* (p. 131).

EO is defined as *"the ability of the firms to show entrepreneurial practices and behaviors"* (Chaudhary & Batra, 2018, p. 1203). Whereas, an entrepreneurial firm is defined as *"the firm that engages in product market innovation, undertakes somewhat risky ventures and is first to come up with 'proactive' innovations, beating competitors to the punch"* (Miller, 1983, p. 771). Numerous studies conceptualize EO as a strategic orientation focused on a collection of practices and decision-making processes that facilitate the responsiveness of the firm to external changes and disruptions by exploring new opportunities and delivering creative solutions that characterize the firm from its rivals in the industry (Ibarra-Cisneros & Hernandez-Perlines, 2019; Kropp et al., 2006). According to Miller (1983), EO has three dimensions, which are innovativeness, proactiveness, and risk-taking. Lumpkin and Dess (1996) define innovativeness as a firm's tendency to experiment and be creative that leads to introduce new products or technological processes. While risk-taking refers to the proclivity to indulge in bold practices whose consequences are difficult to foresee (Baker & Sinkula, 2009; Mandongwe et al., 2020; Vaznyte & Andries, 2019). Proactiveness is defined as *"seeking new opportunities which may or may not be related to the present line of operations, introduction of new products and brands ahead of competition, strategically eliminating operations which are in the mature or declining stages of their life cycle"* (Venkatraman, 1989, p. 949). In this sense, Lumpkin and Dess (1996) indicate that being proactive means taking the initiative to anticipate and take advantage of new opportunities ahead of rivals.

Lately, inner resources and capacities have received great interest in the literature of EO, which is consistent with the view of Kreiser (2011, p. 1026) that entrepreneurial firms *"are more dependent on their ability to fully utilize resources than other types of firms"*. The argument on the importance of inner resources and capacities for the EO–SCR relation depends on both RBV and DCT. EO is seen by RBV as a strategically important resource since it indicates the level of firms' indulging in risky projects through proactive activities and a propensity towards innovation (Covin

& Slevin, 1989). Being proactive allows the firm to “*rebuild internal and external competencies to deal with rapidly changing environments*” (Teece et al., 1997, p. 516). Risk-taking behavior on the other side enhances the strategies of risk reduction that present in turn a fast response for the disturbances (Mandal & Saravanan, 2019).

Besides, while RBV is not useful in identifying appropriate capabilities in the event of dynamic changes taking place in unpredictable environmental contexts, DCT has appeared, as considered an extension of the RBV, to overcome the deficiencies by appropriate planning of resources and capacities, thus respond effectively to any circumstance (Chowdhury & Quaddus, 2017). According to Grant (1991), resources constitute the foundation for developing the organization’s capabilities, while capabilities represent the competence of the organization to employ resources in line with business environment fluctuations (Barreto, 2010). In the same vein, many of the literature related to dynamic capabilities emphasize the importance of these capabilities in a volatile business environment in terms of allowing firms to respond to the circumstances of the disruption through redistributing their current resources according to environmental scenarios (Buccieri et al., 2020; Ponomarov, 2012; Sabahi & Parast, 2019; Teece, 2007). Therefore, resilience is a core capability for a firm, particularly in light of disruptions to the business environment, and the need for it can be justified through the DCT’s lens (Al-Hakimi et al., 2020; Chowdhury & Quaddus, 2017). According to that, it is necessary for firms and supply chains to seek to develop their dynamic capabilities, especially resilience capability in order to reduce disturbances that may face.

Firms can adopt EO to improve SCR in an environment undergo dynamic changes that are increasingly rapid and deep (Al-Hakimi et al., 2020). When the impact of EO on SCR is analyzed, it is necessary to take into consideration different contingency factors, which may facilitate or inhibit this impact. The argument underlying this study is that there are dynamic capabilities (in this case, AC) which aid to leverage the full potential of EO based on the assumption that AC plays a prominent role especially in turbulent environments that require firms to adapt constantly to new circumstances (Eisenhardt & Martin, 2000). This is in line with the view of Covin and Lumpkin (2011) that dynamic capabilities are the mechanism that enables entrepreneurial-oriented firms to take advantage of the opportunities they discover in the context of response to environmental changes. In this research, AC represents an internal contingency factor that moderates the EO-SCR relationship.

AC has been getting expanding interest among specialists after the valuable contributions of scientist Cohen and Levinthal (1990), as they have defined it as the “*ability to recognize the value of new information, assimilate it, and apply it to commercial ends*” (p. 128). Later, Zahra and George (2002, p. 186) extend this definition to add that AC is “a set of organizational routines and processes by which firms acquire, assimilate, transform, and exploit knowledge to produce a dynamic organizational capability”. The AC literature indicates that the relationship between the two companies may affect the level and quality of knowledge transfer (Aljanabi, 2017; Andersen & Kask, 2012). Although the concept requires the acquisition and absorption of knowledge from the outer environment (especially relations between the firms), it also emphasizes the internal process of learning from previous experience and current behavior (Nagati & Rebolledo, 2012). Therefore, a firm’s AC is affected by the other firms in terms of supply chain collaboration and the way the learning process is conducted (Aljanabi, 2017).

### **2.1. Entrepreneurial orientation**

In the past few years, the relationship between EO and SCR has received considerable attention from researchers (Al-Hakimi et al. (2020, 2019). Improving a firm’s capability to deal with disruptions in SC is directly related to its resilience (Sheffi & Rice, 2005), which results from its proactive practices and propensity to innovate (Coleman & Adim, 2019). Hence, EO enhances firm resilience.

Most studies have confirmed a positive association between EO and SCR, e.g., Li et al. (2008) concluded that EO in fact enables firms to gain dynamic capabilities (in our case, resilience) in the

face of environmental uncertainty. After that, depending on 125 medium enterprises, Eshegheri and Korgba (2017) emphasized the importance of EO to boost organizational resilience. In the context of SMEs also, Branicki et al. (2018) argued that entrepreneurship-oriented firms are more resilient to environmental fluctuations than others are. Al-Hakimi et al. (2020) confirmed this in their recent study, which revealed that EO positively influences SCR of SMEs. Therefore, depending on the above arguments, we assume the following:

**Hypothesis 1.** EO positively affects SCR.

## 2.2. Absorptive capacity

AC is essential to promote learning and capability dynamics between organizations (Cheng & Lu, 2017; Cohen & Levinthal, 1990; Zahra & George, 2002). In addition to its relevance to a wide range of phenomena, AC has been explored also in connection with supply chain risk and uncertainty (Ambulkar et al., 2016; Gölgeci & Kuivalainen, 2020). This stream of literature demonstrates that the acquainting, assimilating, and exploiting of external knowledge is particularly important when firms face a torrent of negative changes and their existence is on the line (Gölgeci & Kuivalainen, 2020; Miroshnychenko et al., 2020), where AC has a core role in decreasing uncertainty to effectively deal with supply chain risks (Ambulkar et al., 2016).

Previous research has found that entrepreneurial-oriented firms benefit from a broad scope of capabilities (Kohtamäki et al., 2019). Besides, theoretical claims in the literature of strategic management indicate that dynamic capabilities contribute significantly to disruptive environments, which require the firms to continuously respond to new circumstances (Eisenhardt & Martin, 2000). Therefore, the current study focused on exploring the effect of AC in the EO-SCR relationship.

Entrepreneurial-oriented firms usually achieve success compared with non-entrepreneurial firms because they possess the ability to find out the best opportunities in the market (Lumpkin & Dess, 1996). AC gives firms with EO continual access to new information and knowledge related to opportunities through various channels, which increases the opportunities those firms may find out (Engelen et al., 2014), and enhances their resilience in the face of environmental disruptions. In line with that, Anderson and Eshima (2013) report that a firm with EO achieves a high level of success if the available opportunities increase, as the availability of many opportunities raises the likelihood of valuable opportunities with great potential. Moreover, firms with AC can analyze information related to new opportunities based on their present knowledge base (Cassiman & Veugelers, 2006; Cohen & Levinthal, 1990), where AC assures that the recently obtained information is properly clarified and analyzed, helping to exploit those opportunities effectively (Zahra & George, 2002). In other words, AC assures the availability of a large number of high-quality opportunities, a broad knowledge base, and a correct interpretation of the information gained about those opportunities, enabling a firm to successfully select and pursue opportunities. Conversely, entrepreneurial-oriented firms' lack of the AC may lead to fewer opportunities available to them, and evaluate them inappropriately due to the missing of a knowledge base from previous experience, all that may prevent the relationship between EO and SCR.

Similarly, when entrepreneurial-oriented firms experience supply chain disruptions, it tends to innovate through focusing on new and original ideas that drive the introduction of new products or processes or improving present products and processes (Al-Hakimi et al., 2020). A high level of AC helps those firms to assess the new ideas down to successful innovations, wherein a firm's innovation based on relevant prior knowledge is more successful than if there was no prior knowledge (Asogwa et al., 2020; Engelen et al., 2014). As such, firms that own a wide information base spend fewer costs in order to innovate (Sorescu et al., 2003). On the contrary, the cost of

applying innovation processes is likely to be higher in case of no previous knowledge is available, which may negatively affect the relationship between EO and SCR.

In the same vein, and in order to respond and adapt to disruptions in the supply chains, entrepreneurial-oriented firms seek to engage in risky ventures (Al-Hakimi et al., 2020). The high degree of AC allows those firms to evaluate the risk rationally by interpreting the present and new knowledge to reduce the risk or deal with it at least (Jansen et al., 2005), thus enhancing the resilience of those firms. Otherwise, if firms do not own that knowledge and the capability to explain and operate on it during carrying out risky ventures, they may exaggerate the risk and abstain from following these operations, which may prevent them to leverage the EO potential (Barringer & Bluedorn, 1999; Zhai et al., 2018).

Additionally, entrepreneurial firms excel non-entrepreneurial firms in terms of they can achieve first-mover advantages, which include creating a monopoly-like condition with big returns for a term of time ahead the rivals follow (Lumpkin & Dess, 2001). Mostly, first movers work in unpredictable environments where previous experiences do not offer no knowledge that may be useful (Kerin et al., 1992). In this case, AC can be mitigate the latent risk through rapidly creates insights from varied sources relevance the new environment, and interprets them correctly by a large information base that may also provide information on analogous market inputs into relevant environments (Escribano et al., 2009). Further, the whole potential for the practices of first-mover can be reinforced through AC's contribution to resilient, fast response before opportunities lose their appeal (Rothaermel & Alexandre, 2009). Entrepreneurial-oriented firms also fulfill outstanding performance because they target with their innovative products promising market segments before the rivals and earn good profits from them (Lumpkin & Dess, 1996). Regarding that, AC may backing those firms through getting external knowledge related to promising marketplace segments and how they can be dealt with in the best (Engelen et al., 2014; Zahra & George, 2002). Opposite of that, if an entrepreneurial-oriented firm does not possess AC, it may not be able to distinguish promised segments or respond to existing directions in the industry, which may limit the benefit of the EO's potential (Covin et al., 2006).

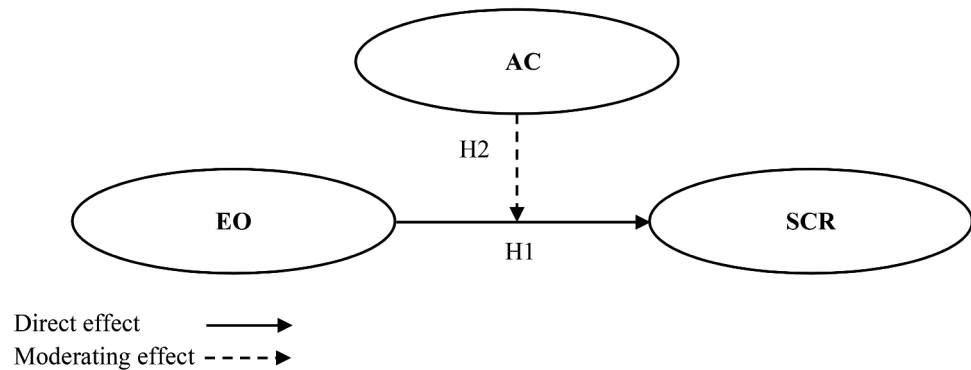
Lastly, entrepreneurial-oriented firms are usually good at carrying out trial-and-error processes. Relating to this, AC ensures that entrepreneurial firms are aware of any error that may occur early on, making immediate rectification potentially (Liao et al., 2003). For example, AC gives the firm the ability to assimilate and interpret knowledge related to an innovative product failure fast to make the necessary adjustments (whether in the product's characters, marketing activities, or target markets), thus raising the contribution of EO (Cohen & Levinthal, 1990; Engelen et al., 2014). In addition, firms with a high degree of AC learn from trial-and-error processes or failures, which make them stronger for the later trial-and-error process. With regard to that, McGrath (1995) view that entrepreneurial activities may be accompanied by errors and disappointments that can reinforce the entrepreneurial processes in the future when deriving the correct learning effects.

Without AC, entrepreneurial-oriented firms might neglect necessary rectifications or might not be able to understand and interpret problems that they encountered correctly or act upon them in time, thus not fully exploiting EO's positive potential (Engelen et al., 2014). In light of the above contentions, it can be said that the capacity to obtain, assimilate, transfer, investing new knowledge, can enhance the positive effect of EO on SCR. Therefore, we suggest the following:

## **Hypothesis 2.** AC moderates the effect of EO on SCR.

Depending on the theoretical framework and the hypotheses derived previously, the conceptual model can be presented as in Figure 1.

**Figure 1. Conceptual model.**



### 3. Methodology and results

#### 3.1. Research population and sample

This study relies on primary data collected from SMEs in Sana'a city (capital of Yemen), specifically in the manufacturing sector because the purpose of the study is to examine the SCR, which is considered more important for manufacturers, in order to deal with disruptions in supply chains, compared to service firms. This study adopted the definition of SMEs published in Yemen Ministry of industry and trade's (2014) report in terms of "employee number" criteria. Whereby firms with 4–9 employees were identified as small-sized, while firms with 10–50 employees were identified as medium-sized.

As per Yemen Ministry of industry and trade's (2014) report, there are 1058 Yemeni manufacturing SMEs in Sana'a city. Given the absence of recent data on the number of SMEs, 384 SMEs were adopted according to the researchers' potentials. Moreover, 384 represents the appropriate sample size, as recommended by Krejcie and Morgan (1970). A self-administered questionnaire was employed to gather the appropriate data from SMEs' managers. Out of 384 questionnaires, 188 were received, with an average response of 49% of the overall sample size. However, after preparing data for processing and analysis, 17 incomplete questionnaire surveys were excluded. Thus, the response rate reduced to 44.5%. Table 1 shows a description of the sample.

**Table 1. Description of the sample**

Category	Frequency	Percentage
<i>Job status:</i>		
Owner	111	64.9
Manager	60	35.1
<i>Gender:</i>		
Male	157	91.8
Female	14	8.20
<i>Education:</i>		
Secondary and below	35	20.5
Diploma	9	5.30
Bachelor	95	55.5
Master and above	32	18.7
<i>Years of working:</i>		
Under 3 years	7	4.10
4–6 years	12	7.00
7–9 years	133	77.8
10 years and above	19	11.1

**Table 2. Loadings and cross loadings**

Construct	Items	EO	AC	SCR
EO	INN1	<b>0.778</b>	0.532	0.472
	INN2	<b>0.809</b>	0.504	0.470
	INN3	<b>0.781</b>	0.545	0.440
	RT1	<b>0.748</b>	0.452	0.411
	RT2	<b>0.778</b>	0.491	0.457
	RT3	<b>0.726</b>	0.515	0.433
	PRO1	<b>0.752</b>	0.400	0.335
	PRO2	<b>0.722</b>	0.370	0.221
	PRO3	<b>0.774</b>	0.459	0.395
AC	ACC1	0.476	<b>0.781</b>	0.494
	ACC2	0.501	<b>0.834</b>	0.651
	ACC3	0.494	<b>0.728</b>	0.508
	ASC1	0.452	<b>0.745</b>	0.508
	ASC2	0.472	<b>0.816</b>	0.649
	ASC3	0.601	<b>0.802</b>	0.609
	TRC1	0.530	<b>0.861</b>	0.685
	TRC2	0.510	<b>0.830</b>	0.541
	TRC3	0.535	<b>0.730</b>	0.534
SCR	EXC2	0.467	<b>0.834</b>	0.603
	SCR1	0.607	0.503	<b>0.854</b>
	SCR2	0.662	0.472	<b>0.872</b>
	SCR3	0.597	0.428	<b>0.840</b>
	SCR4	0.540	0.396	<b>0.798</b>
	SCR5	0.531	0.374	<b>0.755</b>
	SCR6	0.695	0.529	<b>0.868</b>

### 3.2. Measures

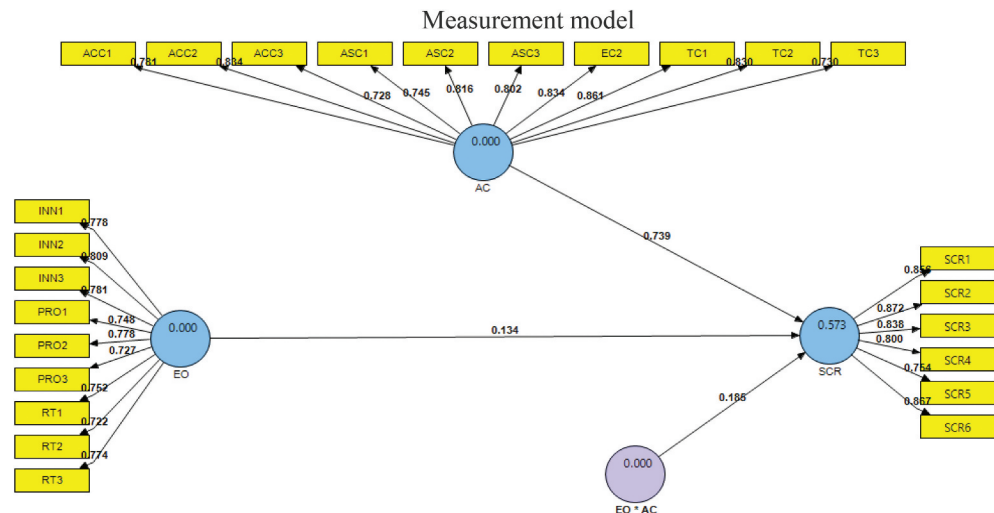
In order to get the required data for measuring the relationships in the proposed model, we used a questionnaire tool. According to the literature, all measures were developed in the questionnaire. Relating to that, EO was measured through nine items that assessed proactiveness, innovativeness, and risk-taking adapted from Chang et al. (2007) and Saha et al. (2017). While SCR was measured by six items overall that adapted from Al-Hakimi et al. (2020), Dubey et al. (2019), Gölgeci and Ponomarov (2014), and Mandal (2017). Finally, AC (the moderator variable) was measured through twelve items that evaluated acquisition, assimilation, transformation, and exploitation capacities adapted from Hernandez-Perlines et al. (2017), as shown in Table 2.

**Table 3. Convergent validity analysis**

Construct	$\alpha$	CR	AVE
EO	0.911	0.926	0.583
AC	0.935	0.945	0.635
SCR	0.910	0.930	0.692

CR =  $\alpha$  = Cronbach's Alpha, Composite Reliability, AVE = Average Variance Extracted

**Figure 2. Measurement model.**



### 3.3. Statistical analysis and results

A partial least squares (PLS) method was used for data analysis by SmartPLS version 2.0 3 M, as suggested by Ringle et al. (2005). PLS-SEM has many characteristics that lead to its extensive use in management research (Goaill et al., 2014). It is considered a suitable method for small samples (Henseler et al., 2009) because when used on complicated models of limited sample sizes, it demonstrates greater statistical power than the covariance-based SEM (Reinartz et al., 2009). This is highly appropriate in the current analysis, where the sample size was 171 cases.

In this study, the proposed PLS model is tested in two steps (Valerie, 2012). First, a reliability test was done to measure the internal consistency among scale items, in addition to testing the construct validity- including convergent validity and discriminant validity- through confirmatory factor analysis (CFA). The consistency reliability (CR) and Cronbach's alpha ( $\alpha$ ) must be over 0.70 (Hair et al., 2011); while convergent validity is achieved when all items are statistically significant, with loadings 0.70 or above (Hair et al., 2011). Furthermore, the average variance extracted (AVE) must be greater than the commonly accepted cut-off point of 0.50 (Hair et al., 2011). Second,  $R^2$ , effect size, and predictive relevance of the model were evaluated by analyzing the structural model, further, bootstrapping was used to validate the research hypothesis.

As shown in Table 2, after excluding two items with loading below 0.70 (EC1 = .66 & EC3 = .69), all the rest items were loaded for a specific construct when the loading on this construct higher than the other constructs (as depicted in Figure 2), thus confirming the validity of the construct.

Furthermore, the results in Table 3 obtained from the convergent validity analysis show good convergent validity, as all the CRs values ranged between 0.926 and 0.945, and Cronbach's alpha

**Table 4. Discriminant validity analysis**

Construct	EO	AC	SCR
EO	<b>0.763</b>		
AC	0.631	<b>0.808</b>	
SCR	0.545	0.732	<b>0.832</b>

**Table 5. Effect sizes of the latent variables**

Construct	R <sup>2</sup>	f <sup>2</sup>	Effect size rating
SCR	0.573		
EO	-	0.087	Small effect
AC	-	0.642	Large effect
EO*AC	-	0.059	Small effect

$$f^2 = (R^2 \text{ included} - R^2 \text{ excluded}) / (1 - R^2 \text{ included})$$

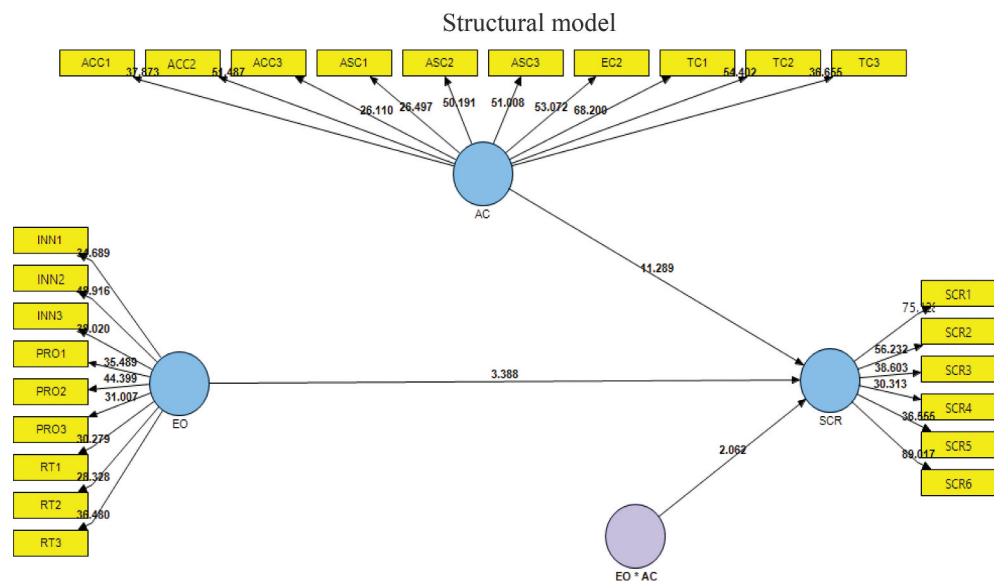
values ranged from 0.910 to 0.935. As well, the AVEs ranged between 0.583 and 0.692, which were all within the suggested limits.

To examine the discrimination of the latent factors, the discriminant validity was done. As shown in Table 4, the discriminant validity of the measurement model is high, since the values of  $\sqrt{AVE}$  outweigh the correspondent correlations of all factors (Fornell & Larcker, 1981). This means that the correlation of the indicators with their factors is greater than other factors.

In order to validate the study hypotheses and figure out if the proposed model is appropriate, the coefficient of determination (R<sup>2</sup>) was computed overall, which shows three degrees of predictability, as per Chin (1998) (0.10 = weak; 0.33 = moderate; 0.67 = substantial). The outcome denotes that EO and AC can account for 57.3% of the variance in the SCR, which falls within the moderate range.

Additionally, effect size has calculated for the latent variables upon the dependent variable using f<sup>2</sup> analysis that complements R<sup>2</sup> (Chin, 2010). Since f<sup>2</sup> is not available in PLS automatically, it is calculated manually as per the formula shown in Table 5. According to Cohen (2013), the f<sup>2</sup> values of (0.35, 0.15, and 0.02) respectively are used to illustrate the effect sizes (large, medium, and small) for the predictive variables. Hence the showing a small effect size of EO and EO\*AC (0.087, 0.059) respectively, and a large effect size of AC (0.642) on SCR.

**Figure 3. Structural model.**



**Table 6. Predictive quality of the model**

Total	SSO	SSE	Q <sup>2</sup>
SCR	1026.000000	635.770469	0.380341

$Q^2 = 1 - SSE/SSO$

**Table 7. Hypotheses testing**

H	Relationship	Path coefficient	Standard error	T-value	Result
H1	EO → SCR	0.134	0.039	3.388**	Supported
H2	EO*AC → SCR	0.185	0.089	2.062*	Supported

*t-values > 1.96\* (p < 0.05); t-values > 2.58\*\* (p < 0.01); Bootstrapping based on n = 600 subsamples*

Besides, the model predictive power was tested, as the model has predictive quality when the value of crossed-redundancy (Q<sup>2</sup>) is higher than zero as suggested by Hair et al. (2011). Q<sup>2</sup> is calculated by the formula shown in Table 6, where the outcomes display that the Q<sup>2</sup> value of SCR is 0.380, confirming that the model has an appropriate prediction quality.

Finally, the hypothesized relationships of the model were tested as shown in Figure 3 and Table 7.

#### 4. Discussion

In response to a call by Engelen et al. (2014), to conduct more investigations on AC relevance in the EO context. Based on the RBV and DCT, this paper introduced valuable results on the importance of the EO of SMEs with a high level of AC in improving SCR. Although some studies show that EO does not significantly affect SCR (e.g., Mandal & Saravanan, 2019), our research reveals the contrary, as the evidence offered herein emphasizes that EO positively affects SCR of SMEs. This supports the results of Al-Hakimi et al. (2020) study, which found that EO enhances SCR in turbulent environments, and supports the traditional view of resilience as considered a reactive response to environmental fluctuations (Gerwin, 1993), as well as reflects the longitudinal effect of EO on SCR in the context of Yemeni SMEs, which would generalize the results. This finding supports the argument that entrepreneurial firms inherently have a stronger and more significant alignment with their market and environment. This is because EO reflects a set of behaviors that are directed towards achieving unique product improvements, improving the competitive position within the environment. By firm-environment fit, firms can remain in contact and conform to their environment. This trait reinforces their resilience and is a powerful indicator of resilient behavior (Coleman & Adim, 2019). This outcome implies that when SME entrepreneurs seek to innovate, indulge in risky projects, and are more aggressive in identifying and seizing market opportunities, they can enhance their firms' resilience and the supply chains as a whole. This result provides an insight to the argument in the prior studies about the important contribution of EO in improving SMEs' SCR, particularly in making decisions related to reducing the adverse effects of supply chain disturbances. Entrepreneurial-oriented firms are likely to benefit from disturbances in spotting pioneering opportunities early and exploiting them by adopting innovation as a coping strategy for those disruptions. With regard to Yemen, it seems that EO of SMEs represents an effective tool for improving SCR, and this can be attributed to the precarious situation in the country due to the political and security unrest.

In addition to the above, the results revealed that AC moderates the EO–SCR relation, so the link between EO and SCR is not positive when AC is low. That is, the EO–SCR relation is not positive in all

**Table A1. The measure of the study**

Construct	Items
Entrepreneurial orientation	Innovativeness
	INN1. There is a great orientation to introduce and experiment with new ideas.
	INN2. Our firm encourages and stimulates innovation.
	INN3. We continuously experiment with unique new processes and methods of production to seek novel solutions.
	Risk-taking
	RT1. Our firm, in general, tends to invest in high-risk projects (with chances of high returns).
	RT2. "Risk-taker" is considered a positive feature for employees in our firm.
	RT3. Our business strategy is characterized by the inclination to allocate resources into projects with uncertain results.
	Proactiveness
	PRO1. We continuously strive to take the initiative in every situation (e.g., in projects, against competitors, and when working with others).
	PRO2. We always seek new opportunities (such as new markets, new customers. etc).
	PRO3. We seek to exploit expected changes in future market conditions ahead of our competitors.
Absorptive capacity	Acquisition capacity
	ACC1. Searching for information regarding our industry is a daily business in our firm.
	ACC2. Our management motivates the employees to use information sources within our industry.
	ACC3. Our management expects the employees to handle information beyond our industry.
	Assimilation capacity
	ASC1. In our firm, ideas and concepts are communicated cross-departmentally.
	ASC2. Our management emphasizes cross-departmental support to solve problems.
	ASC3. In our firm, there is a quick information flow.
	Transformation capacity
	TRC1. Our employees have the ability to structure and use collected knowledge.
	TRC2. Our employees are used to absorbing new knowledge as well as to prepare it for further purposes and making it available.
	TRC3. Our employees successfully link existing knowledge with new insights.
	Exploitation capacity
	EC1. Our management supports the development of prototypes.
	EC2. Our company regularly reconsiders technologies and adapts them in accordance with new knowledge.
	EC3. Our firm has the ability to work more effectively by adopting new technologies.

(Continued)

Construct	Items
Supply chain resilience	SCR1. Our firm's supply chain is able to appropriately respond to unforeseen disruptions through quickly restoring its product flow.
	SCR2. Our firm's supply chain is well prepared to deal with the financial outcomes of supply chain disruptions through alternative plans.
	SCR3. Our firm's supply chain is able to maintain a desired level of control over structure and function at the time of disruption.
	SCR4. Our firm's supply chain can fast return to its original state after being disrupted.
	SCR5. Our firm's supply chain can move to a new, more desirable state after being disrupted.
	SCR6. Our firm's supply chain has the ability to extract useful knowledge from unexpected disturbances, and utilization.

cases, where the internal and external components of AC enhance the potential of an entrepreneurial-oriented firm to search out and seize opportunities by using the trial-and-error technique (Engelen et al., 2014), notably under the disruptions of its supply chain. Therefore, the existing study provides a valuable new theoretical lens (AC) as a moderator to understand and interpret the EO–SCR relation. Our results are generally harmonious with other studies, which consider dynamic capabilities important in the research context of EO (e.g., Covin & Lumpkin, 2011). Although studies have begun to explore dynamic capabilities (like AC) as drivers of the EO–firm performance relation in the turbulent market environment (e.g., Engelen et al., 2014), we have concluded that AC is pertinent for entrepreneurial-oriented firms in face the disruptions along the supply chain. Relating to that, the findings obtained reveal us that the Yemeni SMEs select the suitable strategies to face the disruptions in their supply chains, by leveraging their dynamic capabilities to acquire, assimilate, transfer, and exploit the new knowledge that they pursue constantly striving to develop. However, these results can be generalized to other firms operating within similar environments.

## 5. Theoretical and practical implications

RBV and DCT represent the basis for our present study to examine the EO–SCR relationship in the context of SMEs. EO is considered according to RBV a strategic resource that offers firms the core competencies (Barney, 1991). In this way, entrepreneurial-oriented SMEs may be able to respond effectively to the disturbances of the supply chains, in contrast to firms that do not adopt EO. The findings provided in the current research generally emphasize previous findings related to the important role of EO in enhancing dynamic capabilities, particularly, in turbulent environments (Engelen et al., 2014), thus giving more support to the literature on EO and dynamic capabilities. Although entrepreneurial-oriented firms are resilient in coping with disturbances in their supply chains, nevertheless, the studies that have researched in this area are still very limited (Al-Hakimi et al., 2020). Hence, the current study contributes to the literature by confirming that relationship. However, limiting our research to examining the EO–SCR relationship may not reflect the nature of the relationship accurately, which was confirmed by the contradictory results of previous studies. Therefore, in response to a call of Engelen et al. (2014), we have developed an argument that, in SMEs, AC is indispensable to take full advantage of EO. The findings support the study's assumptions. Particularly, the analysis showed that AC positively moderates the EO–SCR relationship. In this sense, the EO–SCR relation is positive only for a high level of AC, where EO becomes more effective when a firm's AC mechanisms are well developed that represent knowledge acquisition,

assimilation, transformation, and exploitation. Thus, our study also contributes to the literature by examining the moderating effect of AC in the EO–SCR relationship.

In addition, the findings of this research have interesting implications for SMEs' decision-makers and practitioners. This work demonstrates the importance of creating a management philosophy oriented to entrepreneurship to improve the SMEs' SCR of firms to face environmental disruptions. Accordingly, it is important to enhance the proactiveness, risk-taking, and innovativeness inward the firm, and encouraging the managers and practitioners to strive hard to discover new opportunities with sensible risks, enabling the firm to respond and adapt to disturbances in their supply chains. Moreover, as SMEs' managers pursue to improve the SCR of their firms by EO, it must be taken into account that AC enhances the relationship between them. Hence, managers should also invest in AC development, as this helps to leverage the full potential of EO in improving SCR in the context of similar turbulent environments.

## 6. Conclusions, limitations and future research

In this study, by using a survey of 171 manufacturing SMEs in Yemen, we theoretically suggested and empirically tested a framework of the effects of EO and AC on SCR in SMEs. The findings emphasized that EO has a significant positive effect on SCR and that AC positively moderates the EO–SCR relation in SMEs in Yemen. This result provides insights for managers of SMEs to understand how to properly use AC to promote the effect of EO on SCR. Our study results are only firmly applicable to Yemeni SMEs. However, some earlier studies denoted that the results can be applied in similar settings too. This study, nonetheless, assumes that future research is necessary to ensure generalization.

Like any other study, this study has some limitations, which make it important to confirm the findings and extend the research scope in the future. First, the sample scope was restricted to SMEs in the manufacturing sector, therefore, researchers in the future could carry out the same study on other sectors. Second, the study measured SCR as a one-dimensional concept, and thus it may be better to address it as a multi-dimensional concept in future studies. Likewise, while the present study has addressed AC as a composite construct, it may be important in future studies to analyze the individual effects of both potential AC and realized AC, which constitute the AC construct, as considered distinct dimensions, and differ in their roles (Sarsah et al., 2020). Additionally, there is a need to study more intervening variables in order to interpret the EO–SCR relationship more accurately. Moreover, the study framework proposed in developing countries can be tested in the context of developed countries. Finally, the current study targeted only SMEs, so future research could focus on large firms or even MSMEs.

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### Author details

Majid M. Goaill<sup>1</sup>

Mohammed, A. Al-Hakimi<sup>2</sup>

E-mail: [alhakimi111@gmail.com](mailto:alhakimi111@gmail.com)

ORCID ID: <http://orcid.org/0000-0001-9923-1439>

<sup>1</sup> Department of Marketing & Production, Faculty of Administrative Sciences, Tamar University, Yemen.

<sup>2</sup> Department of Management, Faculty of Management & Commerce, B.A.M. University, Aurangabad 431004, India.

### Disclosure statement

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