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Article

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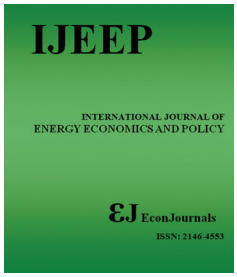

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The Role of Management Accounting Systems, Energy Efficiency and Organizational Innovation in driving Competitive Advantage and Firm Performance

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ABSTRACT

The current study analyzes the role of management accounting systems (MAS) in dealing the critical environmental problems and organizational image for fulfilling environmental and organizational objective by using the advanced and suitable empirical investigation of partial least squares structural equation modeling. In particular, the current study investigates the role of MAS systems in driving energy efficiency (EEF) and organizational reputation (ORP) in Malaysian manufacturing firms. In addition, the contribution of the present study is extended to identify the contribution of organizational energy-efficient processing and reputation in enhancing the firm's competitiveness and performance. The results of partial least square confirm that EEF and ORP have positive and significantly influenced by the MAS. Also, EEF and organization reputation have positively and significantly influenced the competitive advantage (COM) of the manufacturing firms. Finally, we found the evidence that COM has significantly and positively impact on firm performance in Malaysian manufacturing firms.

Keywords: Management Accounting System, Energy Efficiency, Firm Performance, Malaysia
JEL Classifications: M14, M41, M42

1. INTRODUCTION

The importance of management accounting system (MAS) has been identified as the critical tool of supporting organizational resource management and decision making. In this regard, the vitality of MAS is not merely confined to address organizational profitability prospects but present a broad perspective of firm's existing and futuristic goals to aid value maximization (Smith and Langfield-Smith, 2004). In addition, MAS research tends to highlight the arrangement of financial and non-financial information to the organization's leaders for decisions (Chapman et al., 2006). As opposed to money related bookkeeping, MAS produces reports that involve cost examinations and budgetary figures for the associations and organizational beneficiaries. In this regard, the effective utilization of MAS is ascribed to enhance organizational competitiveness and performance. In addition, there is an important connection among monetary resources and firms external MAS process, in light of the fact that an organization's internal environment is extensively linked with external conditions (Luft and Shields, 2006; Saudi et al., 2019). Given the deteriorating environmental conditions, the courses of MAS have been seen to amalgamate the access and processing of information in achieving organizational and environmental goals (Shields, 2015; Minor, 2015; Aimer, 2016; Dölek and Günes, 2016; Tshepo et al., 2017; Rahman et al., 2017; Boyi et al., 2017; Ozturk and Ozturk, 2018; Sinaga et al., 2019).

At present, the vitality of environmental improvement has been witnessed as the prime agenda of modern businesses. In this regard, many firms strive to reduce energy dependence and utilize

numerous innovations to bring and drive energy efficiencies (EEF) in their operations. In addition, the importance of ecological improvements is not only confined at government's level but have been dispersed across the globe to ensure environment-friendly business functions and processes and considered as the crucial element for multinational corporate practices and trades. Identifying the internationally widespread awareness regarding ecological improvements, the need for eco-friendly products and processes have become an essential demand of customers. In this regard, there exists a sharp trend and preference for the utilization of sustainable products and services by the consumers. This puts extra pressure on the organization for being environmentally responsible and adaptive to modern green practices and thus affect the firm's reputation. In this regard, the processing of companies financial and non-financial information through MAS has been incorporated with several eco-friendly aspects, such as green human capital, green structural capital, green innovation, etc. to support organizational decision making after realizing growing environmental pressures (Luft and Shields, 2014; Chenhall and Morris, 1986).

Many studies have examined the usage, alignment and importance of MAS systems in enhancing organizational performance and reducing environmental uncertainty and costs (Chapman et al., 2006). However, the existing research related to MAS is scarce in terms of grounding theory. In a similar context, Smith and Langfield-Smith (2004) also stated that theoretical foundation is vastly rare in MAS studies. Thus, there exists no particular MAS theoretical base that serves as a motivator and inspirational frameworks that can disclose how to structure and utilize the informational efficiency of MAS technologies (Malmi and Granlund, 2009). In a similar context, Chenhall and Smith (2011) asserted that since MAS analysts are compelled to depend on speculations from other research fields, they have to rely on and alter diverse management accounting features in accordance to the utilizing theory. Thus, MAS studies and their empirical implications are often criticized and discussed with doubts about the explored demonstration and the accuracy of the develop estimations (Malmi and Granlund, 2009). Therefore, it is required that MAS models should analyze several diverse associations to build authenticity of the model (Luft and Shields, 2003; Ozturk and Ozturk, 2018; Pérez-Luna et al., 2018).

Addressing the above-mentioned issues, more recently, Nitzl (2018) elaborated that the need for accurate methodology and empirical investigation play a significant role in building the confidence of MAS research. The author illustrated the need for utilizing partial least squares structural equation modeling (PLS-SEM) to counter-effect the limitation of existing MAS research. Therefore, in compliance, the current study analyzes the role of MAS systems in dealing the critical environmental problems and organizational image for fulfilling environmental and organizational objective by using the advanced and suitable empirical investigation of PLS-SEM. In particular, the current study investigates the role of MAS systems in driving EEF and organizational reputation (ORP) in Malaysian manufacturing firms. In addition, the contribution of the present study is extended to identify the contribution of organizational energy-efficient processing and reputation in enhancing the firm's competitiveness and performance (Ali and Haseeb, 2019; Haseeb et al., 2018; Suryanto et al., 2018). The current investigation contains several contributions. First, it is the pioneer attempt of identifying the crucial role of management accounting in curtaining firm's energy dependence, that is considered as the fundamental aspect in fulfilling the goals of sustainable development. Second, the uniqueness of the current study is also attributed to explore the contribution of MAS in predicting firm's reputation which is considered essential for gaining competitive advantages (COM). And lastly, the current investigation utilized suitable empirical methods to explore the identified associations that is consistent with the need of the MAS literature (Nitzl, 2018).

The remaining of study is outlined as below. Section two will highlight and review the important literature regarding MAS, environment and performance nexus. Section three will provide instrument development and data collection information. Section four will demonstrate the empirical results and interpretations. and lastly, section five will provide conclusion and recommendations.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

The absence of any grounded theory in the discipline of management accounting has enabled the researchers of the domain to borrow the theoretical knowledge of the related disciplines in analyzing and investigating the relationships of MAS with other variables. Therefore, in order to examine the impact of MAS in influencing EEF and firm's reputation to impact organizational competitiveness and growth, the conceptual learnings of resource-based view are effective to enhance firm's prospect of improved COM and organizational performance (Barney et al., 2001). The RBV conceptualizes firms as groups of capabilities and assets, heterogeneously dispersed into the firms' functioning, and that such resources are diversified, updated and altered with time (Wernerfelt, 1984). Resources that are profitable, uncommon, supreme and non-substitutable, lead to the enhance firm's competitiveness and provide the owners with the competitive edge that can't be effectively copied by others (Barney, 1991). Resources incorporate various elements that can be used to implement value-creating strategies, physical assets, information systems, customer-driven attitudes, environmental flexibility, managerial abilities etc. (Amit and Schoemaker, 1993 ; Stewart, 2007; Chen et al. 2006).

The importance of information systems in augmenting firm's efficiency and timely decision making have been highly recognized in earlier studies (Banker et al., 1990; Tatoglu et al., 2016; Wamba et al., 2017; Beasley et al., 2009). More recently, the noteworthy contribution of management accounting is considered crucial to supplement strategic environmental and organizational goals in order to ensure and support the prospect of sustainable development (Gibassier and Alcouffe, 2018; Bennett and James, 2017; Schaltegger and Burritt, 2017). The role of environmental accounting systems is vital in identifying and solving several concerns of sustainability, in the form of environmental cost (Jasch, 2003), environmental uncertainty (Agbejule, 2005) and EEF (Ang et al., 2010). Acknowledging the importance of accounting systems

in supplementing information regarding EEF, Ang et al., (2010) evaluate the link between accounting models and EEF and proposed the logarithmic mean Divisia index method to track cost-effective EEF trend across the globe to help to build energy efficient systems. Using environmental accounting to augment EEF and determine the energy cost of agriculture, Halberg et al. (2005) also evaluate the environmental indicators of farm performance by utilizing green accounting systems. The findings of the study conclude that green systems are critical to environmental performance and EEF and help to reduce farmers energy usage and cost. Likewise, also examined the link between management systems and energy culture. The outcome of the investigation identified that Energy management systems are a significant tool to create a sustainable approach to progressing EEF. Furthermore, Brunke et al. (2014) also evaluated the factors affecting energy conservation and energy management in Sweden. Analyzing the steel industry of the economy, the findings suggested that energy management, information prioritization, and environmental awareness is crucial for energy conservation. The study also concluded that cost-effective technologies and systems affluence the process of energy conservation and management systems are an imperative instrument of enhancing eco-friendly salvations to improve EEF. Hence, based on the above literature, the present study hypothesizes that;

Hypothesis 1: MAS is significant to influence EEF.

Since the notion of ORP is driven by many multifaced, public relations and resource efficiency, many studies believe that ORP is influenced by organizational technological innovation and information systems. Focusing on technologies, Williamson et al. (2010) demonstrated the importance of information technology is imperative in driving firm reputation. The study argued that usage of IT is important in attracting relevant skills and therefore helpful in future decision making and reputation building. More recently, Sroufe and Gopalakrishna-Remani, (2018) analyzed fortune 500 companies to examine the link between environmental sustainability measures and organizations' financial performance. In doing so, the study examined the role of innovative organizational resources in enhancing the firm's reputation and performance. The results of the investigation found that sustainable management is significant to influence the firm's sustainable reputation. In other words, the result suggested that improvement in environmental management systems and green policies bring positive impact on a firm's reputation and green scores. Discussing the link of innovative technologies and systems, Tetiana et al. (2018) elaborated that the strategies and information gathered to strengthen management decisions for executing EEF are significant to offer communicative efficiency of ORP and promotion for the use of eco-friendly technologies, reduction in energy & organizational competence. Hence, on the basis of the highlighted literature, the current study aims to test the following hypothesis;

Hypothesis 2: MAS is significant to influence the firm's reputation.

In order to improve the firm's competencies, many studies highlighted critical influencers to get organizational COM. In this regard, eco-friendly practices and inventions are identified as the critical driver of a firm's competitiveness. Shrivastava, (1995) studying environmental management and sustainability found that environmental technologies are critical to driving the firm's COM. Similarly, Dögl and Holtbrügge, (2010) identified that the utilization of renewable resources of energy to excel EEF and reduce the fossil fuel based environmental degradation is the important tool of enhancing the competitiveness of the firms in the modern environmental era. Moreover, Simpson et al. (2004) in examining the traditional policies to enhance firms' COM, found that EEF is considered as a critical driver of enabling cost reduction and improvements in organizational competitiveness. Highlighting the contribution of firm's image in gaining COM, Wagner and Schaltegger (2003) established that eco-friendly practices of the organizations are critical to drive firm's COM and impact organizational performance. Similarly, also claimed that ORP should be considered as a crucial driver of firms for being the comparative and significant feature of the firm's skill sets and therefore significant to influence an organization's competitive position. Moreover, Dowling (2006) also established that optimistic reputation enhances organizational image, segmentation and thus influence firm competitiveness and performance. Similarly, Russo and Fouts (1997) applying RBV model in investigating the firm's environmental and financial performance also concluded that firm reputation is vital to augment the firm's COM and performance. Thus, we hypothesize that;

Hypothesis 3: EEF is significant to influence COM.

Hypothesis 4: Firm's reputation is significant to influence COM.

As associations with compelling tasks, enhanced adaptability and cost productivity works superior to the contenders. In such manner, the benefits of firm and its superiority to its competitors improve organization's performance. In such manner, numerous examinations recognized the positive connection between the company's competitiveness and performance. Thus, firms with more prominent competitive edge and market leadership in innovative execution are identified for improved economic and environmental performance. In a similar context, Majeed (2011) while examining the link between organizational competitiveness and performance established that organization's strengths and edge over its competitors play a significant positive role in improving the firm's performance. Similarly, Agha et al. (2011) also reported the empirical evidence in favor of the positive relationship of organizational COM and performance. In particular, the study highlighted that the firm's competitiveness in terms of flexibility and responsiveness is significant to bring positivity in the firm's performance. Similar results were also documented in the studies of Zhou et al. (2009); Ma, (2000); Jennings and Beaver, (1997), that concluded the positive association between organization's COM and performance. Therefore, on the basis of the above literature, we hypothesize that;

Hypothesis 5: COM is significant to influence the Organization's performance.

Displayed in figure 1 is the hypothesized model of the current study.

Figure 1: Research model

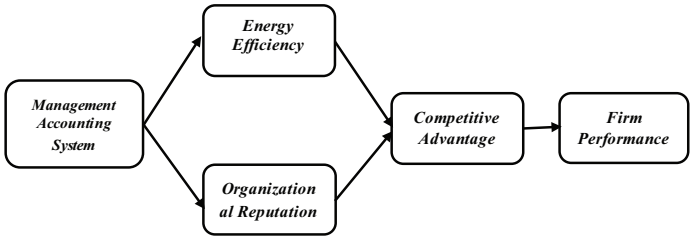

Table 1: Descriptive statistics

Valid	
Gender	**Frequency (%)**
Female	93 (34)
Male	177 (66)
Total	270 (100)
Age	
20–30 years	28 (10)
31–40 years	128 (47)
41–50 years	68 (25)
51 and above	46 (17)
Total	270 (100)
Working experience	
1–5 years	39 (14)
6–10 years	146 (54)
11–15 years	46 (17)
> 15 years	39 (14)
Total	270 (100)
Education	
Undergraduate	39 (14)
Graduate	201 (74)
Post graduate	10 (4)
Others	20 (7)
Total	270 (100)

Source: Authors estimation

Table 2: Means and pearson correlations

Variables	Mean	MAS	EEF	ORP	COM	FPR
GRC	3.772	-				
GSC	4.121	0.394**	-			
GHC	4.009	0.378**	0.302**	-		
ORR	4.324	0.334**	0.274**	0.324**	-	
ENP	3.983	0.202**	0.395**	0.377**	0.442**	-

N=270, ** Correlation is significant at the 0.01 level (2-tailed)

3. METHODOLOGY

3.1. Measures

The recent research separated the role of the MAS, organizational innovation, and EEF in explaining COM and firm performance (FPR) in Malaysian manufacturing firms. In doing to achieve this objective, we analyze the framework based on earlier studies and the model is exhibited in Figure 1. The properties of the analyzed variables are explored by utilizing the Likert scale system from 1 (strongly disagree) to 5 (strongly agree). In combination, this current research utilized five variables. The variable include in this investigation is the MAS, EEF, ORP, COM and FPR. The three items of MAS are picked from the investigation of Gordon and Narayanan, (1984). Moreover, the four items of EEF are taken from the earlier study of Worrell et al. (2003). The four items of ORP are adopted from the study of Turban, Forret and Hendrickson (1998). Also, the four items of COM are adopted from Newbert, 2008. At long last, the present examination utilized four items of FPR are adopted from the investigation of Delaney and Huselid, (1996).

3.2. Data Collection and Sample

The procedure of information collection in the current study is done by gathering data from the manufacturing firm of Malaysia. In this manner, we select 102 different manufacturing firms by passing on the study to the various firms in the majority of the 14 states of Malaysia. For rapid data collection process, we transformed our investigation instrument into English language and dispersed to the selected manufacturing firms. In this way, a total of 291 research instrument was sent using both on the soft copy and printed copy of the research survey. The procedure for data collection took a period of absolute 8 weeks and got 278 survey response with the response rate of 95.53%.

4. DATA ANALYSIS AND DISCUSSION

The data investigation of this examination is finished by using the Smart PLS Version 3.2.8 (Ringle et al. 2015) and Statistical Package for Social Sciences (V-23). A valid data utilized in the present examination is 270 by evacuating univariate and multivariate anomalies. The method for perceiving of univariate and multivariate anomalies are Z-test score and Mahalanobis evacuate (D2) by using SPSSS (V-23) and rest of information examination is done by using Smart PLS. Demonstrated Table 1 is the association and structure of the valid answers of the total information utilized in this investigation. Similarly, Table 2 light up the mean and Pearson's Correlation of the variables utilized in the current investigation. Besides, to perceive the issue of multicollinearity, the current research uses Hair et al. (2010) start that by a wide margin a large portion of the highlights in the Pearson's Correlation examination ought to under 0.90. As such, assert the absence of multicollinearity among the variables (Hair et al., 2013; Kamarudin et al., 2019).

Also, content legitimacy is asserted if the items using in the data investigation load with increasingly more prominent value in their particular factor then other items appeared in the model, while internal consistency is confirmed if the estimation of Cronbach's alpha and composite reliability quality surpasses 0.7. Factor loadings and composite reliability quality showed in Table 3 which demonstrate that a large portion of the items factor loadings is more prominent than 0.7 additionally, these loadings appear in their respective segments which affirming the internal consistency of the selected items.

Also, convergent legitimacy informs to what degree an item with respect to a specific factor solidified and loaded to a nearby factor where they assumed to be load (Mehmood and Najmi, 2017). In the current investigation, convergent legitimacy is proclaimed by using an average variance extracted (AVE) for each factor (Fornell and Larcker, 1981). They give the limit of more noteworthy than and contrasted with 0.5 for ensuring up to the convergent legitimacy. Accordingly, AVE in Table 3 is affirming the fundamental measures.

Table 3: Measurement model results

Variables	Factor loadings	Cronbach's alpha	Composite reliability	AVE
Management accounting system				
MAS1	0.994	0.811	0.802	0.593
MAS2	0.960			
MAS3	0.956			
Energy efficiency				
EEF1	0.971	0.883	0.891	0.661
EEF2	0.932			
EEF3	0.944			
EEF4	0.937			
Organizational reputation				
ORP1	0.939	0.811	0.802	0.602
ORP2	0.915			
ORP3	0.976			
ORP4	0.883			
COM				
COM1	0.951	0.827	0.729	0.616
COM2	0.905			
COM3	0.851			
COM4	0.905			
Firm performance				
FPR1	0.926	0.834	0.839	0.584
FPR2	0.916			
FPR3	0.884			
FPR4	0.862			

Source: Authors estimation, AVE: Average variance extracted

Table 4: Discriminant validity fornell-larcker criterion

Variables	MAS	EEF	ORP	COM	FPR
MAS	0.771				
EEF	0.376	0.813			
ORP	0.399	0.376	0.775		
COM	0.401	0.400	0.486	0.784	
FPR	0.332	0.432	0.375	0.396	0.764

Source: Authors estimation, MAS: Management accounting systems, EEF: Energy efficiency, ORP: Organizational reputation, COM: Competitive advantage, FPR: Firm performance.

In the following step, discriminant legitimacy is revealed as how much an item of an express factor is novel and discriminant from different factors (Frooghi et al., 2015; Carmines and Zeller, 1979). As per Fornell and Larcker (1981), the discriminant legitimacy is said to be affirmed if the AVE square root outperforms the pair-wise association of the inert variable. As seemed to be Table 4, italic values are the square root of AVE which is outperforming the off-diagonal values which are the pair-wise association of each factor (which are MAS, ORP, EEF, COM, and FPR). Table 5 demonstrates the factor loadings of various and separate elements, therefore, asserting the cut-off limit. Similarly, the discriminant legitimacy is also expressed if the Hetro Trait and Mono Trait degree are lower than 0.85 as endorsed by Henseler et al. (2015). The outcomes in Table 6 uncovered that all components have Discriminant legitimacy.

In the last step, partial least square methodology, look into theory and model system were assessed by showing way coefficients, t-stats, and hypothesis testing. As indicated by Chin's (1998) suggestions, a bootstrapping method utilizing 1000 sub-test was associated with confirming the quantifiable basic estimations of all beta coefficient. Table 7 uncovers beta coefficients, t-statistics, and their significance value.

Table 7 demonstrated the outcomes of partial least square equation modeling, regression path coefficient, t-statistics, probability values (P-values) and the comments related with the theorized path. The results of the PLS_SEM affirm that EEF (β=0.284, P<0.000) and ORP (β=0.301, P<0.000) have positive and significantly influenced by MAS hence affirming H_1 and H_2. The results of partial least square structural equation modeling also confirm that EEF (β=0.221, P<0.000) and organization reputation (β=0.384, P<0.000) have positively and significantly influenced on the COM of the manufacturing firms, therefore, confirming H_3 and H_4. The results of PLS_SEM further confirming H_5 that COM (β=0.325, P<0.000) has significantly and positively impact on FPR in Malaysian manufacturing firms.

5. DISCUSSION AND CONCLUSION

The importance of MAS has been identified as the critical tool of supporting organizational resource management and decision making. In this regard, the vitality of MAS is not merely confined to address organizational profitability prospects but present a broad perspective of firm's existing and futuristic goals to aid value maximization (Smith and Langfield-Smith 2004; Hussain et al., 2018). In addition, MAS research tends to highlight the arrangement of financial & non-financial information to the organization's leaders for decisions (Chapman et al., 2006). As opposed to money related bookkeeping, MAS produces reports that involve cost examinations and budgetary figures for the associations and organizational beneficiaries. In this regard, the effective utilization of MAS is ascribed to enhance organizational competitiveness and performance.

Addressing the above-mentioned issues, more recently, Nitzl (2018) elaborated that the need for accurate methodology

Table 5: Results of loadings and cross loadings

Variables	MAS	EEF	ORP	COM	FPR
MAS	0.994	0.348	0.485	0.236	0.493
	0.960	0.569	0.370	0.345	0.417
	0.956	0.145	0.271	0.313	0.468
EEF	0.971	0.271	0.632	0.289	0.383
	0.932	0.236	0.384	0.591	0.325
	0.944	0.145	0.280	0.518	0.363
	0.937	0.353	0.318	0.387	0.470
ORP	0.939	0.373	0.320	0.298	0.411
	0.915	0.239	0.505	0.325	0.528
	0.976	0.239	0.249	0.300	0.465
	0.883	0.570	0.463	0.207	0.404
COM	0.951	0.401	0.249	0.924	0.420
	0.905	0.508	0.503	0.831	0.594
	0.851	0.620	0.469	0.803	0.420
	0.905	0.464	0.389	0.854	0.362
FPR	0.926	0.310	0.262	0.359	0.519
	0.916	0.252	0.382	0.446	0.372
	0.884	0.370	0.573	0.414	0.435
	0.862	0.582	0.271	0.473	0.420

Source: Authors estimation, MAS: Management accounting systems, EEF: Energy efficiency, ORP: Organizational reputation, COM: Competitive advantage, FPR: Firm performance

Table 6: Results of HTMT ratio of correlations

Variables	MAS	EEF	ORP	COM	FPR
MAS					
EEF	0.653				
ORP	0.432	0.665			
COM	0.506	0.412	0.559		
FPR	0.601	0.578	0.654	0.486	

Source: Authors estimation, MAS: Management accounting systems, EEF: Energy efficiency, ORP: Organizational reputation, COM: Competitive advantage, FPR: Firm performance

Table 7: Results of path coefficients

Hypothesized path	Path coefficient	C.R	P-value	Remarks
EEF←MAS	0.284	3.453	0.000	Supported
ORP←MAS	0.301	5.674	0.000	Supported
COM←EEF	0.221	4.345	0.000	Supported
COM←ORP	0.384	4.032	0.000	Supported
FPR←COM	0.325	3.984	0.000	Supported

Level of significance (5% i.e., 0.050), Source: Authors' estimation, EEF: Energy efficiency, MAS: Management accounting systems, ORP: Organizational reputation, COM: Competitive advantage, FPR: Firm performance.

and empirical investigation play a significant role in building the confidence of MAS research. The author illustrated the need for utilizing PLS-SEM to counter-effect the limitation of existing MAS research. Therefore, in compliance, the current study analyzes the role of MAS systems in dealing the critical environmental problems and organizational image for fulfilling environmental and organizational objective by using the advanced and suitable empirical investigation of PLS-SEM. In particular, the current study investigates the role of MAS systems in driving EEF and ORP in Malaysian manufacturing firms. In addition, the contribution of the present study is extended to identify the contribution of organizational energy-efficient processing and reputation in enhancing the firm's competitiveness and performance. The results of partial least square confirm that EEF and ORP have positive and significantly influenced by the MAS. Also, EEF and organization reputation have positively and significantly influenced the COM of the manufacturing firms. Finally, we found the evidence that COM has significantly and positively impact on FPR in Malaysian manufacturing firms.

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