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The Factors Affecting Technological Innovation Capabilities on Malaysian SMEs & Universities

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ABSTRACT

The study mean objectives were to investigate technological innovation skills have become a crucial component (SMEs) in the industrial and service sector to deal with fierce competition also meet consumer needs. Due to the inconsistency of previous research findings on the antecedent factors that may influence these capabilities, the study set out to empirically investigate the relationships between entrepreneurial orientation, market orientation, absorptive capacity, and technological innovation capabilities among SMEs operating in Penang. Furthermore, the leadership style influences the interaction between the EO, MO, AC, and TIC. Furthermore, the assumptions and model development for this research were based on the resource-based perspective (RBV). Self-administered questionnaires were mailed to the owners of SMEs in Penang.

The sample of the study of 432 innovative firms participated in this survey, with a response rate of 63.9 percent. This research employed partial least squares structural equation modelling to analyse the measurement model's validity and reliability and test the correlations (PLS-SEM). The results of this study reveal that EO, MO, and AC impact TIC, with the LS regulating the interaction between EO, MO, AC, and TIC. The theoretical and practical contributions of this work would assist academics and specialists.

The study's flaws were reviewed, and some helpful

suggestions for future research work were given. Furthermore, the findings have important implications for practitioners working to establish and improve their firms' competitive strategies in the hyper-competitive SMEs environment. This finding will help government departments develop new policies to support strategic plans, boost performance and contribution to GDP, which will generate jobs, and stimulate the growth of SMEs to achieve global competitiveness, all of which are primary goals of Penang's industry's strategic plan.

Keywords: entrepreneurial orientation EO, market orientation MO, absorptive capacity AC, leadership style LS, and SMEs& universities in Penang.

Background of the Study

In addition, SMEs act as an important means of delivering emerging technology that led to the growth and convergence of all other sectors of the economy (Guo & Shi, 2012). In Penang in Malaysia, there has been an increasing interest in industrial SMEs since 2012, especially in moving the wheel of industry and solving the unemployment problem (Deng, & Zhang, 2018).

Furthermore, most of these businesses are still operated by families, and the management is often characterised by a lack of contemporary management abilities. There is also a lack of research that establish domestic and international market needs, as well as poor marketing methods (iii) repeated conflicts have resulted in the collapse of the economic structure, causing the local market to be directed towards foreign products (Tas, 2012). This has undoubtedly had a detrimental impact on local industry, which seems to be particularly pronounced in Penang. According to official estimates from Penang, the area is significantly reliant on imported products, including food, medical, manufacturing, and construction materials (Chang, Zuo, Zhao, Soebarto, Zillante, & Gan, 2018). This is attributable to the service industry's important position, as well as the lack of a developed and flexible manufacturing sector. As a result of local products' failure to fulfil domestic demand, the volume of imported items rises.

Absorptive Capacity and Technological Innovation Capabilities

According to Camion and Fore (2010), absorptive capacity (ACAP) is a dynamic skill that allows businesses to generate valuable items while also learning about new markets. However, there is no clear understanding of the combined effect of ACAP and market orientation (MO). Due to a scarcity of studies that shed light on this relationship, previous research has recommended explaining it more precisely and empirically (Chang, Gong, Way, & Jia, 2013). Several studies have demonstrated that when measuring market and

customer prospective needs, SMEs often do not lay enough emphasis on market expertise and instead depend mostly on intuition (Raju, Lonial, & Crum, 2011).

In a similar vein, kao, qian, chang, and lin (2019) showed that market information may be used as an external driver for innovation and strategic planning in the transition from third- to fourth-party logistics in the Penang e-commerce ecosystem. MO also aids businesses in repurposing their current resources to provide value to their customers by investing in competitive, distinctive, and suitable marketing activities (obaid,hanan,2021). Therefore, knowledge of customers and markets is often regarded as a vital facilitator for SMEs' development in a competitive environment; it is also a significant element when SMEs deliver new products or services. Given that MO is one of the most sensitive resources on the planet. Confirm that the MO's focus is on the company's ability to adapt to changing customer needs and market conditions. Despite this, nothing is known about MO's influence on technological innovation. Consequently, previous research in this field has requested more empirical data.

Aside from the restricted educational alternatives for improving manufacturing personnel's abilities, SMEs' lack of interest in establishing curriculum at the pre-university, vocational, and higher education levels is another factor contributing to their poor innovation capacity. The ability of employees to learn new skills was also limited by these problems. It has also impacted the capacity of entrepreneurs to launch profitable firms. In essence, the government's aid in strengthening workers' talents and presenting them with new relevant knowledge in their sector is only for government employees' benefit. Government employees, for example, benefit from abroad training courses organised in collaboration with the Ministries of Humanitarian Aid and Cooperation and Planning, which are not available to private sector employees, even at the local level. Working conditions in the private sector are also defined by a lack of social and health protection, as well as low pay. The private sector, especially the industrial sector, has become a skills-deficient environment as a result of the expansion in public sector employment. Workers' capacity to gain adequate information to enhance the degree of innovation in their businesses is harmed by these variables, as is their ability to learn new knowledge from outside their organisations that would enable them to offer new goods and use creative manufacturing procedures.

Due to a lack of standardisation and control over the quality of imported and domestic goods, as well as flaws in marketing activities, importers have been importing low-quality commodities and missing out on the opportunity to uncover their customers' genuine requirements. The reveals that SMEs are exposed to traditional and recurring client needs appraisals in this regard. This is another reason why local items may be unable to compete with multinational ones. These limitations make it difficult to use customers' preferences and marketing practises as tools of innovation.

3-Entrepreneurial Orientation and Technological Innovation Capabilities

Given the foregoing, this study believes that one of the factors contributing to the current decline in innovation skills in industrial SMEs is a lack of constructive and risk-taking attitude and imagination within these firms, all of which are linked to entrepreneurship orientation, compounded by these firms' weak capacity to absorb and actively exploit externally generated knowledge, which is linked to absorptive capacity (AC). These problems have resulted in a lack of awareness of customer and market expectations, as well as a restricted ability to produce information about them, both of which are linked to the concept of MO.

The obstacles listed above, as well as finding an appropriate strategy to cope with them, are investigated. The research's basis hypothesis is the Resources-Based View (RBV). This hypothesis was selected since it has been shown to be solid, reliable, and valid in several studies.

Several researchers have used the RBV to investigate the influence of EO on SMEs' innovation. Attempts have been made in some of this research. The direct and indirect effect of EOs on technical innovation in industrial SMEs must be assessed. Boso, Cadogan, and Story (2012) used RBV data to highlight why observing EO and MO behaviours is crucial for organisations operating in dynamic situations, in order to better understand the relationship between EO, MO, and product innovation. Hong, Song, and Yoo (2013) utilised the RBV to predict the indirect effects of strategic orientation reflected in EO and MO on new product success in Korea; they found that the RBV is critical and effective in forecasting the function of these two tools in new product performance.

Mixed findings have been observed in terms of the direct and indirect influence of EO on innovation. In various studies, EO has been connected to firm performance (Ramayah,

Hafeez, & Mohamad, 2016). Others have linked EO to better profitability and corporate growth. In order to prove the presence of a relationship between EO and creativity in the SME environment, many conceptual models must be tested (Jones & Rowley, 2011). Others have found that EO has a negligible effect on innovation (Hong et al., 2013). The RBV has also been utilised in other studies to predict ACAP's impact on SMEs' innovation.

4-Market Orientation and Technological Innovation Capabilities

The purpose of this study is to prove that context variables have an influence on technical innovation capacity in industrial SMEs via proof-of-concept and scientific interpretation. This research intends to fill in the gaps in knowledge by investigating the role of critical skills and talents in enhancing technological innovation capabilities, such as entrepreneurial orientation, market orientation, and absorptive ability. The research also looks at how leadership style (LS) affects entrepreneurial orientation (EO), market orientation (MO), absorptive capacity (AC), and technical innovation capabilities (TIC).

SMEs in Penang were selected for this study. Consequently, these firms were chosen because SMEs are characterised by a wide range of low-cost capital requirements for starting a company; SMEs often depend on informal loans; and SMEs are labor-intensive, leading to the development of many job opportunities. Furthermore, SMEs' technological requirements are not too complex. Therefore, they may be based on a low level of specialisation and division of labour. Furthermore, these businesses have been at the vanguard of a wave of innovations, bridging a significant supply chain gap by providing secondary components and commodities to larger businesses.

The study's dimensions were chosen based on an extensive review of related literature on entrepreneurial orientation and absorptive capacity as a valuable resource that helps firms protect themselves from imitation and support their innovation activities (Taghian, 2010), as well as a resource-based theory that participates in new technological innovation (Ketchen, Mike, and Barney, 2013). Market orientation is regarded as an important and valuable resource for businesses because of its central role in developing appropriate knowledge about customers and competitors, as well as supporting innovation capabilities to achieve effective and efficient ways of adding value to produced products.

5-Moderating Role of Leadership Style

Kannan (2017) explored the moderating variable leadership style between framework, review, and research agenda. Furthermore, Nuseira and Aljumahb (2020) explored the moderating role of leadership style in SMEs in the United Arab Emirates, as well as its antecedents, with the influence of environmental factors.

They arrived at the conclusion that having a strong leadership style may help a company's resource-based knowledge abilities improve, resulting in better performance. Furthermore, only a few empirical research have looked at leadership style in the context of industrial customer-supplier relations (Foerstl & Kirchoff, 2016; Type & Marketing, 2016). Furthermore, numerous academics have already attempted to evaluate organisations' creativity, either to explore the connection between ACAP and corporate performance (Nagati & Rebolledo, 2012) or the relationship between ACAP and competitive advantage. The study of ACAP and its influence on technological innovation capacity is still incomplete, despite a plethora of research and literature. Previously, several of this research focused at the impact of ACAP on corporate innovation without taking into consideration other factors including firm innovativeness and risk-taking, as well as customer and competition understanding. Others have taken a cursory glance at some of these aspects and have missed some important details (Muller-Seitz & Guttel, 2013). Some researchers have emphasised some of ACAP's qualities by examining many of its aspects (Bouncken & Kraus, 2013).

6-Theoretical framework

This theory seeks to explain how entrepreneurial orientation, absorptive capacity, market orientation, and leadership style affect industrial SMEs' technical innovation capacities. Previous academic research has also shown the importance of a company's capacity to absorb information from beyond its boundaries and use it in a proactive and creative response to latent consumer requirements in boosting innovation. They also emphasized the importance of both leadership style (SL) and absorptive capacity (ACAP) in increasing innovation, particularly in low and medium technology businesses.

There is still a significant vacuum in terms of research reasons, owing to the lack of past empirical efforts and dispersed relevant studies. As a result, this study is predicted to have a substantial impact on both academic and practical levels. By establishing a framework for

the antecedents of technological innovation skills, future academic scholars will have a better grasp of the subject. Furthermore, by exposing the elements that may impact technical innovation skills, it might inspire businesses to engage in innovative activities.

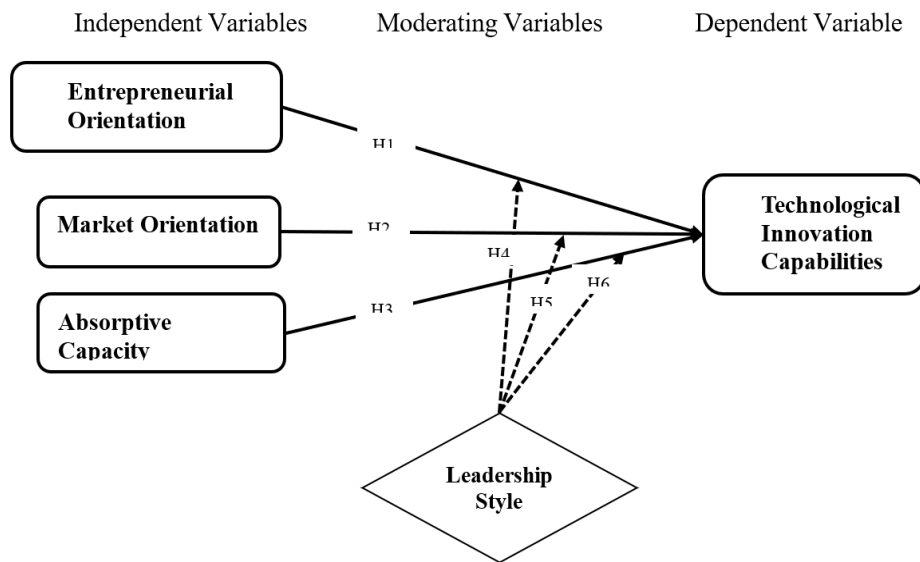


Figure 1: Research Framework

7-Hypotheses of the study

Based on the problem of the study and literature review also theoretical framework hypotheses are posited:

- H1 Entrepreneurial orientation is positively affected on technological innovation capabilities in SMEs.
- H2 Market orientation is positively affected on technological innovation capabilities in SMEs.
- H3 Absorptive capacity is positively affected on technological innovation capabilities in SMEs.
- H4 Leadership style moderating the relationships between entrepreneurial orientation and technological innovation capabilities in SMEs.
- H5 Leadership style moderating the relationships between market orientation and technological innovation capabilities in SMEs.
- H6 Leadership style moderating the relationships between absorptive capacity and technological innovation capabilities in SMEs.

8-Research Design

The research design is a set of decisions and a comprehensive mapping strategy that are chosen to symmetrically and logically coordinate and integrate the various constituent parts of the research, laying the groundwork for effectively addressing research tools, data

collection techniques, and appropriate statistical techniques for data analysis (Babbie, 2011; Singh, 2006). Therefore, research design is the work that must be done before the study can begin.

The purpose of a study design is to ensure that the data collected can be utilised to clearly identify and address the research problem, as well as to provide appropriate answers to the research questions that have been posed (Sekaran & Bougie, 2009). Furthermore, the study's philosophical assumptions have a substantial influence on research design (Creswell, 2009). Therefore, the nature of the research problem is crucial in choosing the most effective research technique. However, to fulfil their research goals, researchers have employed a variety of research designs, and it is necessary to grasp the ideological differences between them in order to suit their demands and conditions. Zikmund, Babin, Carr, and Griffin (2010) established three types of research designs: exploratory, descriptive, and causal research designs. According to Saunders, Lewis, and Thornhill (2009), there are three sorts of research designs: exploratory, descriptive, and explanatory. According to Sekaran and Bougie (2009), there are three types of research designs depending on the amount of information available about the study topic: exploratory, descriptive, and hypothesis testing design stages. An exploratory study's purpose is to collect as much data as possible in order to better comprehend new research topics. This research design does not seem to be appropriate for the current investigation. Descriptive research is also conducted to corroborate and characterise certain elements of the variables under examination (Sekaran & Bougie, 2009). Therefore, a descriptive study's purpose is to give a thorough profile of people, events, phenomena, or situations (Zikmund et al., 2010). Therefore, this is not the kind of research design that the current study intends to adopt since it is inappropriate for the study's objectives. Researchers often use hypothesis testing to explain the nature of connections or to understand the variation in dependent variables that arises as a result of other factors' impacts (Sekaran & Bougie, 2009). Therefore, it's used to investigate the direction and strength of correlations between different variables in order to enhance or support the original hypothesis. One distinctive element of hypothesis testing is that data that supports a theory is treated differently from evidence that has already been established (Newman, Prajogo, & Atherton, 2016). According to Kothari (2004), hypotheses testing design is based on inferential analysis to assess with what validity the data might indicate

specific conclusions about the relationships between variables. Therefore, the researcher agrees that this method is suitable for the present investigation. Inductive researchers, on the other hand, start with a broad observation of the phenomenon before going on to more abstract concepts and hypotheses that are built from the ground up. Quantitative research, the researcher feels, is the most suitable approach for the present study, in line with research goals and inquiries, because of its capacity to analyse facts in the form of numbers. This strategy also helps researchers to extrapolate empirical data from a small sample to the whole population (Hair, Black, Babin, & Anderson, 2010).

9-Population

The list of industrial small and medium-sized firms operating in Penang, as well as the kind of industrial activity and the amount of capital each company, were used to sample this research. The population in this study is made up of all commercial SMEs in Penang. The total number of industrial SMEs in Penang after the outbreak of coronavirus illness (covid-19). These companies are unique in terms of production, and they include (building materials, paper industry, food industry, machinery and equipment, non-metal industry, metal industry, electric industry, and textiles sector).

10-Result of testing hypotheses

The structural model's findings for direct and indirect hypotheses were reported. Five direct hypotheses linked to the study's aims are shown in Table 1: H1 is supported and significance by this finding ($\beta = 0.145$, $t=2.912$, $p 0.02$). Furthermore, H2 supported and significance ($\beta = 0.131$, $t=0.042$, $p0.21$), indicating that H2 is supported.

Furthermore, the findings confirm H3 supported and significance by this finding ($\beta = 0.179$, $t=3.730$, $p0.020$). Moreover, H4 is also not mediated and not significance ($\beta = 0.243$, $t=0.269$, $p0.016$). Moreover, H5 is also mediating and significance ($\beta = 0.192$, $t=0.014$, $p0.013$). Finally, the findings demonstrate that H6 has a substantial and favorable mediating and significance ($\beta = 0.135$, $t=2.027$, $p0.003$)

Table 1:

Summary of the Hypotheses Results.

	Relationships	Path Coefficient	Std. Error	t-values	p-values	Decisions
H1	Absorptive Capacity - > Technological Innovation	0.145**	0.054	2.912	0.002	Supported

	Capabilities					
H2	Entrepreneurial Orientation - > Technological Innovation Capabilities	0.131*	0.042	2.123	0.021	Supported
H3	Market Orientation - > Technological Innovation Capabilities	0.179***	0.030	0.719	0.020	Supported
H4	Absorptive Capacity - > Leadership Style - > Technological Innovation Capabilities	0.243 ***	0.023	0.269	0.016	Not Mediated
H5	Entrepreneurial Orientation - > Leadership Style - > Technological Innovation Capabilities	0.192 ***	0.014	2.504	0.031	Mediated
H6	Market Orientation -> Leadership Style -> Technological Innovation Capabilities	0.035**	0.014	2.027	0.004	Mediated

11-Research Contributions and Implications

Throughout this research, many insights into the difficulties of TIC in SMEs have been presented. Given the conflicting results obtained by previous investigations, the study adds to the literature on TIC and the antecedent circumstances that have the ability to alter such skills (Del Giudice, Scuotto, Garcia-Perez, & Petruzzelli, 2019). The study also gives an overview of the TIC framework, which is useful for companies in assessing prospective capabilities and putting them to use with the aid of current technology. Given the scarcity of theoretical frameworks and major gaps in the existing literature, this might be an important addition (Li, Liu, & Qian, 2019). Furthermore, this research adds to the evolution and explanation of entrepreneurial attitudes toward technical innovation in Penang's industrial sector. The importance of obtaining and benefiting from externally produced information on TIC of industrial SMEs, the application of such knowledge in responding to consumer requirements, and the growth of SMEs' TIC are all highlighted in this research. As a result, the goal of this study is to figure out what elements influence technological innovation capacities (TIC). Work contributes to the RBV by recommending a certain resource combination (EO, MO, AC, and TIC) that is estimated to be required to improve enterprises' technical innovation capabilities.

12- Limitations and Future study:

Several constraints are identified and reported on in this section. Generalization, causality, research design, and study scope are the four main restrictions of the study. More information may be found in the following paragraphs. Therefore, future study into the links between EO, ACAP, and MO and TIC should use a mixed research design (quantitative and qualitative research designs) to complement each other (Srivastava, & Gnyawali, 2011). Even though the results are insightful, this study is confined to an analysis of the internal variables influencing industrial companies' capacity. External elements affecting TIC of firms, such as competitive intensity and technological volatility, would be better understood with a more sophisticated perspective.

As stated in the limitations section of this research, data was collected using a cross-sectional design. Because this method collects data at a single moment in time, observing the interactions between EO, ACAP, and MO, as well as their impacts on TIC, is challenging. As a consequence, using a case study technique may allow for more in-depth research of the intricate connection 196 among the variables, and the results may provide fresh information about numerous success aspects. The second suggestion is to investigate the combined impact of entrepreneurship orientation (EO), absorptive capacity (ACAP), and market orientation (MO) on SMEs' technical innovation capabilities (TIC), which could be done using a longitudinal technique to get a longer-term perspective on the partnership. This technique will show how the variables have changed over time and discover the linkages between them. Third, the study focuses on manufacturing SMEs registered with the Ministry of Trade and Industry in the Penang area. It is possible to undertake further study into the correlations between the variables studied in public industrial firms or other private sectors. Fourth, the present study implies that future research should include the impacts of a wide range of additional variables. Finally, further study is required to make generalizable findings about the impacts of EO, ACAP, and MO on TIC in Penang and other developing countries with similar cultural traditions. For subsequent research, the same study model might be experimentally tested on data acquired from various nations with distinct cultural traditions.

13-Conclusion

The present competitive and tough business environment has motivated management and marketing experts to investigate the constructions of technological innovation skills. Because customers are seen as the most important partners in attaining corporate success, this study focuses on customer understanding. In other words, firms must be able to adapt to client needs. TIC has been a priority for decision makers in industrialized nations, including the Penang area. Entrepreneurial orientation (EO), absorptive capacity (ACAP), and market orientation (MO) have all been recognized as critical characteristics impacting the technological innovation capabilities of industrial SMEs (TIC). Organizations may use TIC levels to enhance their performance and introduce new goods and practises. Due to their effective involvement in economic operations, the relevance of industrial SMEs in Penang has been well acknowledged. This study employed the PLS-SEM, a relatively recent approach in the realm of marketing and management sciences. The results reveal that EO, ACAP, and MO all have a direct and significant impact on TIC. Improving these elements in industrial SMEs should aid in their innovation. Furthermore, MO's mediating function in the ACAP-TIC link is somewhat validated, however it is not proven in the EO-TIC interaction.

العوامل التي تؤثر على قدرات الابتكار التكنولوجي في الشركات الماليزية الصغيرة والمتوسطة

المستخلص:

للتعامل مع المنافسة الشديدة وتلبية طلبات العملاء، أصبحت مهارات الابتكار التكنولوجي مكوناً أساسياً للمؤسسات الصغيرة والمتوسطة في القطاع الصناعي. كانت نتائج الدراسات السابقة حول العوامل السابقة التي قد تؤثر على هذه القدرات غير متسقة، وقد وضعت هذه الدراسة للتحقيق التجريبي في العلاقات بين التوجه الريادي، والتوجه السوقي، والقدرة الاستيعابية، وقدرات الابتكار التكنولوجي بين الشركات الصغيرة والمتوسطة العاملة في بيئة غير مستقرة. علاوة على ذلك، لمعرفة ما إذا كان أسلوب القيادة له دور معتدل في العلاقة بين التوجه الريادي وتوجه السوق والقدرة الاستيعابية وقدرات الابتكار التكنولوجي أسلوب القيادة المعتدل علاوة على ذلك، تم استخدام نظرية العرض المستند إلى الموارد كأساس لافتراضات هذه الدراسة وتطوير النموذج. تم إرسال استبيانات لأصحاب الشركات الصغيرة والمتوسطة في بيانغ.

تضمنت هذه الدراسة ما مجموعه ٤٣٢ شركة مبتكرة، مما أسفر عن معدل استجابة ٦٣.٩ في المائة لتقييم صحة وموثوقية نموذج القياس، وكذلك لاختبار العلاقات، استخدمت هذه الدراسة الجزئية الصغرى لنمذجة المعادلة الهيكلية (PLS-SEM). تظهر نتائج هذا البحث أن التوجه الريادي وتوجه السوق والقدرة الاستيعابية وقدرات الابتكار التكنولوجي

أسلوب القيادة المعتدل يقوم نوع القيادة بتهيئة العلاقة بين التوجه الريادي وتوجه السوق والقدرة الاستيعابية وقدرات الابتكار التكنولوجي سيستفيد الأكاديميون والخبراء من المساهمات النظرية والعملية لهذه الدراسة.

تمت مناقشة أوجه القصور في الدراسة، وتم تقديم بعض التوصيات المفيدة للعمل البحثي المستقبلي. علاوة على ذلك، فإن البحث له عواقب كبيرة على الممارسين في تطوير وتعزيز الاستراتيجيات التنافسية لمنظماتهم في مناخ الشركات الصغيرة والمتوسطة شديدة التنافسية. ستكون هذه النتيجة مفيدة للإدارات الحكومية في تطوير سياسات جديدة لدعم الخطط الاستراتيجية، وتعزيز الأداء والمساهمة في الناتج المحلي الإجمالي، مما سيخلق فرص عمل، ويحفز نمو الشركات الصغيرة والمتوسطة لتحقيق القدرة التنافسية العالمية، وهي الأهداف الأساسية للخطة الإستراتيجية للصناعة في بيئنا.

الكلمات المفتاحية: التوجه الريادي ، اتجاه السوق ، القدرة الاستيعابية ، أسلوب القيادة ، وقدرات الابتكار التكنولوجي والشركات الصغيرة والمتوسطة في بيئنا.

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