Factors Influencing Innovation Management in Iraq's Small- and Medium-sized Enterprises

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***Abstract*—By adopting technology, enhancing productivity, and fostering economic growth in small- and medium-sized enterprises (SMEs), owners and managers can improve their innovation management (IM) methods. Owners and managers can optimize their IM approaches in small- and medium-sized firms (SMEs) by incorporating technology, improving productivity, and promoting economic growth. Despite heightened knowledge of technology, productivity, and economic growth, IM has not been adequately examined. This study presents a theoretical framework for evaluating the effects of technology, productivity, and economic growth. A quantitative methodology was utilized, and questionnaires were sent to employees in SMEs in Erbil, Iraq. This research involved 260 Iraqi workers, and 242 were analyzed in smart partial least squares. SMEs can address constraints in technology, productivity, and economic growth by implementing these strategies, as indicated by the results. Identifying opportunities for improvement, efficiently allocating resources, and fostering an innovative culture are essential for your company. Technology, productivity, and economic growth have a direct and considerable influence on IM. The technological aspect is the most crucial feature in predicting IM.**

***Keywords*—Economic growth, Innovation management, Productivity, Small- and medium-sized enterprises in Iraq, Technological progress.**

I. Introduction

Erbil's economy has seen substantial growth and progress since becoming the capital of Iraq's Kurdistan Region. Small- and medium-sized enterprises (SMEs) are vital for the local economy as they generate employment, support business owners, and promote innovation (Qadir and Yeşiltaş, 2020). Nevertheless, these enterprises encounter distinctive obstacles, such as restricted financial opportunities, inadequate institutional backing, and developing innovative networks. Understanding the nuances of innovation management (IM) within these organizations is crucial for maximizing their potential as drivers of economic growth and wealth (Massoudi et al., 2019).

Effective IM is vital for the development and sustainability of businesses, especially in Iraq, where SMEs play a key role in economic progress and competitiveness. In Iraqi SMEs, productivity, economic growth, state aid, and technological factors all have an impact on IM. To enhance productivity in SMEs, it is essential to optimize resource use, streamline processes, and foster a continuous improvement mindset (Raji et al., 2024). Competent workforce availability, efficient technology management, and investment in innovative technologies are essential variables.

Iraq's economic advancement relies on the prosperity and growth of its SMEs sector (Montiel et al., 2021). Implementing policies that promote entrepreneurship, simplify access to financial resources, and encourage collaboration between SMEs and larger businesses is essential for cultivating a conducive environment for innovation-driven growth. Government support and policies, including grants, subsidies, and regulatory frameworks, can encourage SMEs to invest resources in innovative projects.

Nwankpa et al. (2022) technological components such as artificial intelligence, data analytics, and IoT are crucial for fostering innovation and competitiveness in the modern digital age. It is essential for Iraqi SMEs to overcome technology adoption challenges by implementing targeted interventions and capacity-building activities to unleash their potential as drivers of innovation-led growth and prosperity.

Technological advancements provide numerous obstacles for IM in Iraqi enterprises (Massoudi et al., 2023). Infrastructure challenges, skills deficiencies, convoluted bureaucratic

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procedures, and ambiguous government regulations impede the implementation of new technologies (Indrawati, 2020). Cultural barriers and inadequate funding for research and development, technology acquisition, and innovation projects impede creativity and economic growth.

Iraqi enterprises face challenges in securing funds for research and development, recruiting talented labor, and navigating regulatory difficulties (Donald et al., 2023). To tackle these problems, legislators, industry executives, and other involved parties need to work together to promote innovation, enhance employee competencies, and expedite regulatory procedures.

SMEs in Iraq face challenges in adopting new technologies because of insufficient finance, limited infrastructure, skill shortages, and complex regulations. Banks may refrain from providing loans to SMEs due to risks, security concerns, or financial limitations (Agha et al., 2023).

To examine the connection between technical advancement, productivity, and economic growth in Iraqi SMEs, the study employs smart partial least squares (PLS)-structural equation modeling methodology. Unique customer data, web-based features, user-friendly systems, and innovative management are the main points. Reliable outcomes for both theoretical and applied research are guaranteed by the methodological approach's emphasis on thorough analysis.

II. Literature Review

A. Technological Progress Factor (TPF)

The Kurdistan Region of Iraq is undergoing substantial technological progress due to infrastructure growth, digital transformation, entrepreneurial initiatives, and educational efforts. Investments in telecommunications, transportation, energy, and digital infrastructure are essential for the widespread adoption of advanced technology (Younus et al., 2022). Start-up ecosystems are leveraging cutting-edge technology such as artificial intelligence, blockchain, and e-commerce, to address local challenges and expand into global markets. Education and skills development are crucial for sustaining technological progress (Agha and Massoudi, 2021). Technology plays a crucial role in shaping how innovation is managed in SMEs. Enhancing efficiency and productivity allows SMEs to concentrate on innovation and tasks that offer extra benefits. Technological progress, including automation, cloud computing, and data analytics, has lowered barriers for SMEs to access international markets. Virtual collaboration platforms, video conferencing, and project management software have simplified cooperation and networking.

B. Productivity Factor (PF)

Technological advancements have greatly influenced SMEs by encouraging innovation, enhancing competitiveness, and enabling sustainable growth. AI and digital platforms provide SMEs with new ways to improve operations, reach new markets, and create value for consumers (Ostrovska et al., 2020). Fully utilizing this potential necessitates a systematic strategy, continuous accumulation of information, and commitment to technology. Policymakers, industry stakeholders, and support organizations should dedicate resources, provide infrastructure, and provide incentives to encourage innovation and enable technological adoption. Total factor productivity, which considers all inputs, is seen as a measure of an economy's long-term technical progress or innovation.

C. Economic Growth Factor (EGF)

SMEs in Iraq have a substantial impact on economic growth, entrepreneurship, and job creation. The country's economic climate has a notable impact on the growth path due to the unique opportunities and difficulties it offers (Kuteesa et al., 2024). The success of SMEs is influenced by market dynamics, financial accessibility, infrastructure development, market entry, and the regulatory environment. High interest rates, strict collateral requirements, and restricted access to conventional financial channels might impede SMEs from obtaining money for expansion, innovation, and investment. Financing infrastructure projects is crucial for promoting growth and improving the business environment (Islam et al., 2021). To thrive in the current global economy, SMEs need to overcome trade barriers and compete with multinational firms. Collaboration between the public and private sectors is necessary to create policies and programs that support the growth of SMEs (Massoudi and Fatah, 2021). IM is critical because the economy's growth affects possibilities, dangers, and incentives for enterprises. Total factor productivity is crucial for enhancing an economy's capacity to drive economic growth by measuring its long-term technological progress, or dynamism. The economic growth of Iraq and the Kurdistan Region is impacted by oil earnings, investor inflows, and government-funded development initiatives.

D. Conceptual Model and Research Hypotheses

Growth several conceptual models have been created to aid researchers in comprehending the aspects that impact IM strategies. Recently, there has been an important increase in the creation of several models that prioritize the acceptance of IM by users. Consequently, research on company performance has become more valuable. Recent empirical research, such as Younus (2021) and Hantoush (2022), have focused on the area of IM, which first came about in 2009. The models, which are essential components of the underlying theory, are applicable to the issues encountered in the study. Therefore, the necessary factors required by Iraqi business professionals and those available to management would be incompatible. To work effectively and efficiently, managers in the industry sector must acquire sufficient capabilities in IM systems.

Based on the given assumptions, a conceptual model is presented for this study. It has four dependent and independent variables, as well as four correlating hypotheses. (Fig. 1) depicts the proposed conceptual model with its hypotheses.

H1: There is a positive significant correlation between TPF and IM.

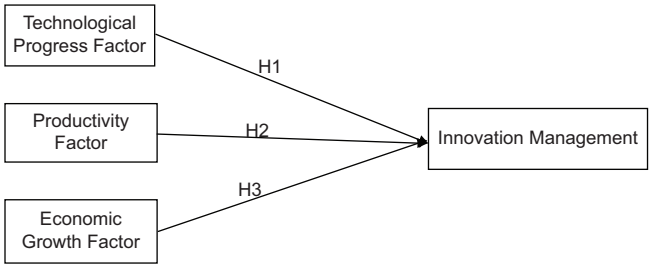

Fig. 1: Research framework.

H2: There is a positive significant correlation between PF and IM.
H3: There is a positive significant correlation between EGF and IM.

III. Methodology

Approach this study is a descriptive investigation focusing on individuals' opinions. Researchers collect data for hypothesis testing or to address the research questions after selecting a topic for their research. Generating quantifiable and dependable data that can be extended to a community is a key benefit of utilizing the quantitative technique in this research. Survey methods and experimental, laboratory, and numerical approaches are distinct forms of quantitative research. Surveys must identify the dependent and independent variables, the relationship between variables, and the study's hypothesis. We performed an experiment with a selected group of people and then generalized our findings to the entire population to test our hypotheses (Younus and Zaidan, 2022). Key research variables, including IM, technology, productivity, and economic growth, were measured using a comprehensive survey instrument that we designed. Staff and employees of SMEs in Erbil, Iraq, were asked to fill out a questionnaire that was tailored to their needs to learn more about their views on IM strategies and to guarantee the instrument's validity and reliability, our survey creation procedure adhered to accepted methodologies. The process included outlining concepts and areas of study, creating and assessing assessment tools, running preliminary tests, and making adjustments to the tool depending on results from these trials (Burton and Mazerolle, 2011).

A. Demographics of Respondents

This section serves as the initial stage of the questionnaire, designed to gather fundamental information about the participants. The survey includes specific inquiries about the participants' gender, age, educational background, income, and years of experience in the field. Most participants are male, with 189 males and 53 females. Out of the 242 participants, 189 were males, and 53 females. A total of 169 participants are between the ages of 18 and 29, 51 people are between the ages of 30 and 40, and 22 participants are older than 40. Most participants had educational backgrounds, including Primary School 81 and 40 high school graduates, 101 bachelor's degree holders, 15 individuals with master's degrees, and 5 PhD. The participant's monthly income in our survey was below 500 USD. Fifty-three individuals received less than USD monthly, while 145 individuals had monthly earnings ranging from 500 to 1000 USD. Forty-four individuals received the highest wage in our study, which was within the range of 1000–2000 USD. Participants with <2 years of experience total 65, those with 2–5 years total 163, and those with 5–10 years total 14. Table 1 shows the characteristics of respondents.

B. Measurement Scale

The researcher will conduct a survey using a Likert scale (range from 1 = strongly disagree to 5 = strongly agree) to assess the influence of the specified components in the study. The only tool mentioned for generating quantitative data is a survey. The questionnaire is suitable for gathering both primary and quantitative data. Questions are developed in accordance with the study's goals and then distributed, along with the necessary information through questionnaires. The quantitative statistics obtained from questionnaires have been previously discussed for usage in the preceding section. During this phase, a suitable data model for implementing IM is recommended based on the information obtained. According to Chan and Zhou (2023), the conceptual model for IM is suggested that takes into account technology, productivity, and economic growth in SMEs (Hair et al., 2007). A questionnaire was utilized to gather data to test the hypotheses. The survey consisted of questions about employees' perspectives on IM techniques, with a particular emphasis on technology, user-friendliness, and usefulness. Using previously published scales and questionnaires, a preliminary survey was developed. Pilot research, content validity, and construct validity were used to assess its reliability and validity. The feedback I received has been included in a redesigned survey that I have launched. There were two parts to the questionnaire. The demographic data is covered in Part A, and in Part B, we take a look at the variables that impact IM in SMEs, including technology, productivity, and economic growth. We then use IM as our dependent variable and for the non-demographic questions; there are 18 items on a 5-point Likert-type scale, with one being a strong disagreement and five being a strong agreement.

IV. Findings and Analysis

Composite reliability (CR) is used to measure internal consistency. Cronbach's alpha (CA) provides a lower estimate of internal consistency dependability due to its assumption that all indications carry equal weight. CR assesses indicators with varying weights (Fakhreddin, 2023). This study will focus on CR instead of CA (Hair et al., 2007). In addition, a researcher adhered to the recommendations provided by Hair et al. (2007) and indicated that internal consistency is deemed acceptable when the result is ≥0.70, whereas a value <0.60 suggests insufficient measurement dependability. Fig.2. indicates that the CR of each construct study falls within the range of 0.755–0.848, surpassing the recommended threshold value of 0.7. The internal consistency and reliability of the

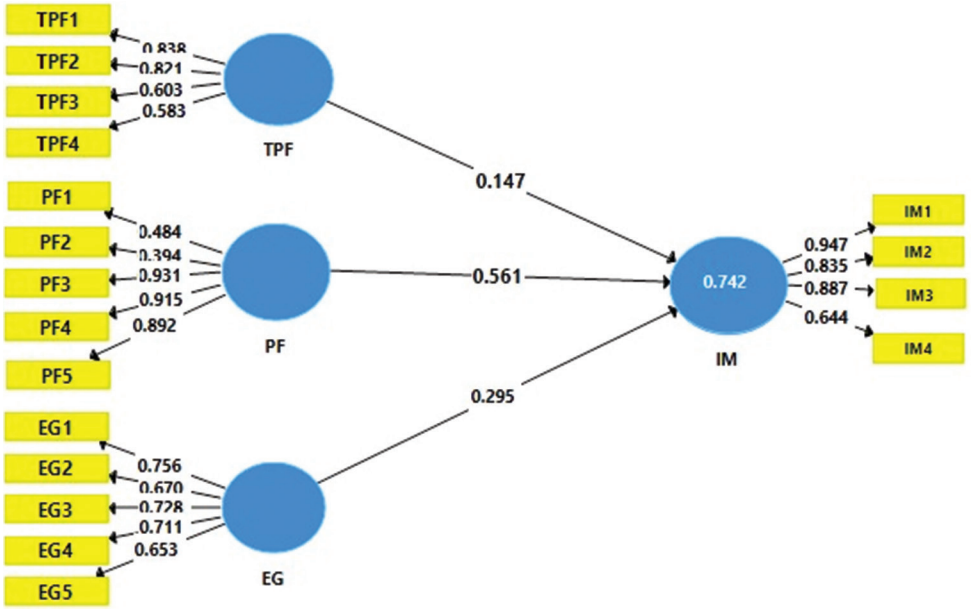

Fig. 2: Results of a measurement model.

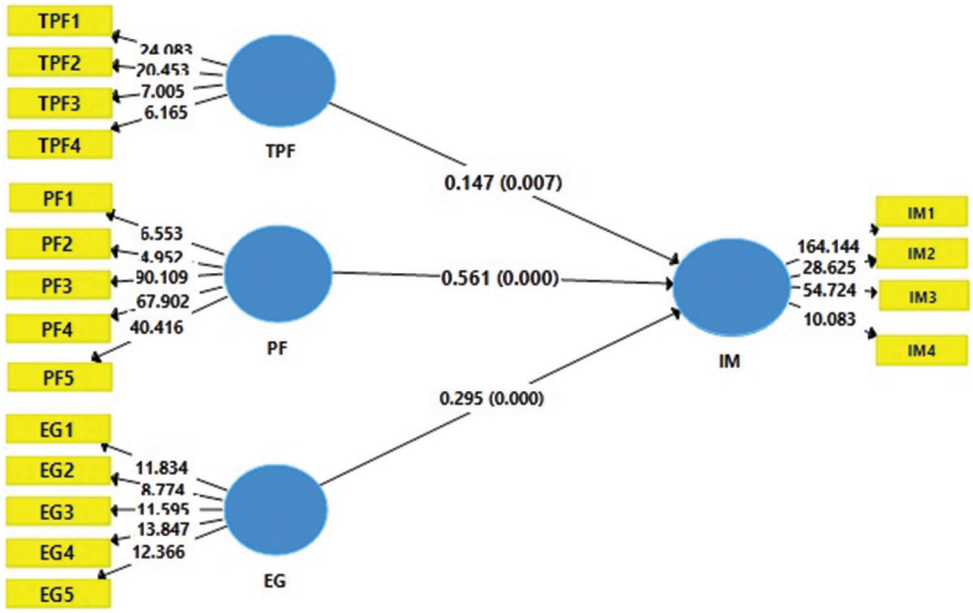

Fig. 3: Model showing path coefficient with *P*-values and *t*-values.

constructions have been verified.

Assess the collective impact of exogenous variables on endogenous latent variables in the PLS structural model. Quantify the variance in the endogenous constructs that is accounted for by all connected exogenous constructs. Liébana-Cabanillas et al. (2021) stated that PLS analysis focuses on explaining variation and determining the importance of all route estimations. The R2 value ranges from 0 to 1, with higher values suggesting greater prediction accuracy Hair et al. (2007) also mentioned that values must be sufficiently high for the model to attain a minimal degree of explanatory capability. The study utilizes the smart-PLS algorithm function to acquire the values. The picture below displays the findings of the structural model, including values and path coefficients. Results showed that the variables of technical development and economic growth accounted for 27.4% of the variation in IM strategies. Technological advancements and productivity elements contribute to 43.5% of the variation in IM.

The technique chapter states that PLS is a non-parametric approach that does not necessitate data normality. Therefore, there is a likelihood that the *t*-values may be exaggerated or reduced, resulting in a type one mistake. The bootstrapping approach is recommended by reference. During the bootstrapping procedure, numerous subsamples, such as 5,000, are randomly selected from the original sample and then replaced to calculate the standard bootstrap errors. This provides us with near *t*-values to assess the importance of the structural path. The researcher must analyze the path coefficients, which represent the proposed links connecting the constructs. The route coefficient indicates the intensity

of the connection between two latent variables. The critical values for significance in both two-tailed and one-tailed tests are examined as suggested by reference. Table II presents direct effects hypotheses with bootstrapping (5000) using smart PLS, as recommended by Hair et al. (2007). Assessing the factor loading of the data is essential within the research's measuring methodology (Ali, 2020). The minimum permissible factor loading value is 0.60, as stated by Hair et al. (2014). The factor loading values in Table II indicate that the factor loading meets the criteria; hence, this study will test CR instead of CA. The study adhered to Hodge and Gillespie (2003) guidelines, stating that an internal consistency of 0.70 is deemed satisfactory, while a value of 0.60 signifies inadequate measurement reliability. The study indicates that the CR of each building falls between 0.808 and 0.901, beyond the suggested level of 0.7. The constructs' inherent coherence and durability have been confirmed and you can retain items with smaller loadings to ensure the construct is comprehensive and covers all essential aspects. Based on the research conducted by (Nunnally and Bernstein, 1994), it is considered appropriate to keep items with loadings above 0.40 in exploratory research, especially if they enhance the overall understanding of the construct from a theoretical perspective.

A. Convergent Validity

Convergent validity in this study is evaluated by examining the extracted average variance explained (AVE) value. Urbach and Ahlemann (2010) stated that convergent validity is assessed by comparing questions that measure the same construct with those that assess individual elements. Convergent validity in PLS is assessed by examining the retrieved AVE values. A building is considered convergent if the mean-variance obtained from it is <0.50 (Fornell and Larcker, 1981). Table III indicated that the measurement model had strong convergent validity in all buildings, with values ranging from 0.520 to 0.699.

If we look at Table III, we can find out that all the value of AVE are greater than the benchmark of 0.5, which indicates that the convergent validity of the constructs is maintained. Hence, we can say that the constructs are valid.

V. Discussion

After constructing and evaluating the model as shown in Fig. 3, it was found that the TPF, PF, and EG directly influence IM. The worldwide adoption of IM relies on its technological progress and efficiency, which significantly influence global economies like Iraq. We must carefully consider the ethical implications and long-term ramifications as we navigate this ever-evolving world. The most influential part of IM is technical progress. The next step is to assess the TPF, PF, and EG. The study's conceptual framework comprises three factors. This section examines relationship variables, their outcomes, and their commonalities as identified in previous research. The aim of the debate is to examine and explain significant findings in connection to the current understanding of the research topic being studied, and to clarify any new insights or revelations that emerged from researching the subject. The discussion section will link to the introduction by addressing the research questions or hypotheses and the reviewed literature. It will not simply repeat or rearrange the paper's introductory parts. The study will explain how it advanced and enhanced the reader's understanding of the research problem beyond the previous research review. This study is significant as it investigates the factors of technical advancement (TPF), productivity (PF), and economic growth (EGF). The study proposes

Table I: The sample characteristics

Construct	Items	Number	Percentage
Gender	Male	189	78
	Female	53	21
Age	18–29	169	69
	30–40	51	21
	Over 40	22	9
Education	Primary School	81	33
	High school	40	16
	Bachelor degree	101	41
	Master degree	15	6
	PhD.	5	2
Income Experience	Less than $500	53	21
	$1,000–$2,000	145	59
	More than $2,000	44	18
	Less than 2 years	65	26
	2–5 years	163	67
	5–10 years	14	5

TABLE II: Construct items and outer loadings with hypotheses

Construct	Items	Outer Loading	CR	Hypothesis	Supported
TPF	TPF1	0.838	0.831	H1	Yes
	TPF2	0.821			
	TPF3	0.603			
	TPF4	0.583			
PF	PF1	0.484	0.901	H2	Yes
	PF2	0.394			
	PF3	0.931			
	PF4	0.915			
	PF5	0.892			
EGF	EG1	0.756	0.861	H3	Yes
	EG2	0.670			
	EG3	0.728			
	EG4	0.711			
	EG5	0.653			
IM	IM1	0.947	0.808		
	IM2	0.835			
	IM3	0.887			
	IM4	0.644			

TPF: Technological progress factor, PF: Productivity factor, EGF: Economic growth factor, IM: Innovation management, CR: Composite reliability

TABLE III: AVE

Construct	AVE
Economic growth	0.597
Innovation management	0.699
Production factor	0.578
Technology progress factor	0.520

AVE: Average variance extracted

that complex visual components provide a theoretical basis for Internet trade (Chan and Zhou, 2023). This study evaluates how these variables affect a certain e-commerce model. Establishing a conducive climate that encourages experimentation, learning from mistakes, and recognizing achievements is crucial for fostering innovation inside the Iraqi government. Leadership dedication, investment in talent enhancement and infrastructure, and strategic alignment with national development objectives are essential (Mishaal and Haw, 2022). TPF refers to an individual's opinion that technology will improve their performance or productivity. The focus is on how innovation systems may effectively help users achieve their goals, solve problems, or make informed decisions in the field of IM. PFs and EGFs are crucial aspects to consider in innovation.

VI. Conclusion

The study found that IM approaches in SMEs in Erbil, Iraq, are significantly influenced by technical advancements, productivity levels, economic expansion, and governmental assistance. Companies that adopt new technologies are more inclined to prioritize innovation. Effective IM enhances productivity, leading small- and medium-sized firms (SMEs) to prioritize investment in research and development during periods of economic prosperity. Productivity programs and government initiatives support innovation in small- and medium-sized firms (SMEs).

A. Limitations and Suggestions for Future Research

This study investigates the factors influencing IM in small- and medium-sized firms (SMEs) in Iraq, such as technological advancement, productivity, and economic development. Although it offers intriguing insights, it is crucial to recognize its constraints and pinpoint potential topics for future research.

In Iraq, limitations for innovation efforts in small- and medium-sized firms (SMEs) include challenges with data availability, cross-sectional studies, limited scope, and demonstrating causation. The study may not accurately represent the evolving nature of IM due to its narrow focus on sectors or locales. Future research should focus on the significant changes in IM within Iraqi small- and medium-sized firms (SMEs). Their operational methods are directly impacted by technological advancements, increased efficiency, and the influence of economic growth. An in-depth analysis of individual situations and meticulous comparisons can offer significant insights into the strategies and challenges related to innovation. Future research should focus on analyzing elements, such as technological advancements and public assistance initiatives, to assess how governmental policies could foster a more favorable environment for innovation in Iraqi SMEs.

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