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Exploring the Influence of the Information and Communication Technology Dimensions on the Sustainability of Competitiveness in Small and Medium-sized Enterprises in the Hail Region

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Abstract: The main purpose of this research paper is to investigate the role of information and communication technology (ICT) in providing small and medium-sized enterprises (SMEs) with a competitive advantage. To do this, we propose five dimensions to detect ICT (human resources, equipment and devices, databases, software, and networks) and four dimensions (service quality, market control, creativity and development, and operational efficiency) to decide competitive advantage. To achieve this paper's purposes, a questionnaire was developed to collect data from respondents to a sample of 128 subjects by using the Statistical Package for Social Sciences (SPSS) for the survey data analysis. Several methods have been used in the statistical analysis of the data, including descriptive statistics tests, a normal distribution test (one-sample Kolmogorov–Smirnov test), simple linear regression coefficient (simple regression), variance analysis (one-way ANOVA), and a T-test for independent samples. This study reports a series of findings, underlined by the significant role of ICT with its various dimensions and the competitive advantage of SMEs. This study concludes with several suggestions including that SMEs must increase their investments in ICT components and take more care of creativity and development for the preemption to create new services.

Keywords: information and communication technology; competitive advantage; small and medium-sized enterprises

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1. Introduction

Today, the world is seeing great, tremendous, and accelerating transformations in various fields, especially concerning the repercussions of economic, political, and technological globalization and what is known as the ICT revolution. ICT also had a clear economic and social impact by contributing to improving business productivity and increasing its ability to penetrate new markets, bypassing geographical borders and political differences, providing new job opportunities, raising the level of services such as education and health, increasing the efficiency of administrative work, and ensuring the well-being of citizens [1–3]. In the same context, the most important characteristics of ICT can be identified as follows: first, reducing distance where technology makes places electronically contiguous; second, reducing the place as storage allows for the absorption of a huge amount of information that can be accessed easily and rapidly [4,5]; third, reducing the time given so that with every technological development, the time needed to respond to requests will decrease; fourth, increasing network systems where internal systems can be

linked with each other, in addition to the possibility of linking between diverse types of internal systems in a networked system; and fifth, developing the electronic environment intellectually, as interaction with information systems for a long time contributes to shaping the intellectual behavior of individuals. The digital revolution, fueled by ICT, radically changes our methods of thinking, behavior, communication, work, and remuneration. It opens up new perspectives for the creation of knowledge, education, and the dissemination of information. It deeply changes how the countries of the world manage their commercial and economic affairs, administer public life, and conceive their political commitment. It allows people to quickly provide humanitarian assistance and health care, and consider environmental protection. Access to information and knowledge, which is essential for achieving development objectives, can improve the standard of living of millions of people around the world. Indeed, ICTs are perceived as an increasingly important new vector of the economic growth of the company, and they have transformed the planet into a small village (the digital era). Likewise, ICTs have changed the behavior of business staff. The IT and telecommunications association has made it possible to convey and popularize information worldwide. ICTs require high skills and control for sustainable and rapid development. In addition, information sharing and partnership are essential within the organization. Faced with these requirements such as globalization, market opening, partnership alliance, etc., the company in its generality must adapt and adapt its organization with appropriate tools. In this, ICTs offer a better opportunity for the company.

To preserve its survival and supremacy in a highly competitive market and to adapt to the rapidly changing environment, an institution must have competitive advantages, by following well-studied strategies that enable it to strengthen its competitive position [6–9]. Now, competition in many fields has become a process directed by several elements, the most important of which is ICT, which has become an inevitable choice because it is one of the most important pillars in achieving institutional excellence. These technologies provide the organization with the ability to manage its internal business on the one hand, and enable it to confront various potential disturbances in its surroundings on the other hand, making it vigilant to seize opportunities and confront threats, and to keep pace with the competitive race to meet the needs of its current and potential customers. The work of [10–12] has paved the way for several studies to decide the impact of ICT on the competitiveness of companies using a contingency approach. These researchers suggest that the development of a company's strategy and its information system must be coherent through their interest in explaining the performance of the company. This research has particularly focused on SMEs, which behave differently from large enterprises. The firm's size can thus play a contingency role in the profitability of ICT. The current economic environment is dominated by intense competition based on a knowledge revolution that has changed the organization of businesses [13]. SMEs are important in most countries' economies [14,15]. They employ half of the workforce in developed and developing countries [16]. The number of SMEs in Saudi Arabia increased by about 68%, reaching 752,500 during quarter 1 of 2022, in light of the incentives supported by Vision 2030. A recent report by the Digital Transformation Program revealed that SMEs constitute 99.5% of the total companies in the Kingdom.

To survive in this world of globalization, SMEs must improve their competitiveness, and be more efficient in their relationships with suppliers and customers [17].

The Hail region has various comparative advantages that attract investment, and natural, tourism, agricultural, and industrial potential, with its diverse topography and suitable climate; it also includes sites with large areas that are capable of development and local and global economic, cultural, and social investment. SMEs have always played a crucial role in economic development in the Hail region. Likewise, in recent years, they have occupied a pivotal position in economic development in Saudi Arabia. SMEs are often seen as vital to the growth and innovation of economies. In the long term, the economic development of the Hail region depends on the performance of SMEs. Furthermore, SMEs are considered the main agents of social and economic development since they play a key role in promoting growth, creating jobs, and reducing poverty. Despite their crucial

position in the economy, SMEs are the most vulnerable to rapid technological change. Rapid technological development, which has manifested through ICT and accelerated over the past thirty years, has created opportunities and threats for SMEs. Globalization and the liberalization of economic policies have exposed SMEs to large national and multinational companies. The Kingdom of Saudi Arabia (KSA) is actively promoting technological progress, through research and development and the effective use of ICTs, which are considered important pillars of the Saudi Vision 2030 as they play a leading role in supporting the competitiveness of companies. The SMEs play a leading role in economic development, so this study was carried out to serve these companies as follows. First, there is great and continuous focus and interest in knowledge management and the exploitation of ICT to meet challenges, save time and effort, improve the quality of services, improve the company's image, increase the customer base, and remove geographical obstacles. Secondly, information technology is a major source for feeding the various operations and activities of companies with information that enables them to collect, store, classify, analyze, distribute, and profit from information, according to objective scientific bases. Third, this study acts as an invitation to development, continuity, and interaction with developments; not to wait to know the results of others' performance to imitate them, but to strive for leadership; to identify everything new, and to achieve priority, survival, growth, and continuity in doing business. To understand the reality of the contribution of ICTs in SMEs in terms of competitiveness, we have chosen to focus our study on the level of the Hail region, Saudi Arabia. The advantages presented by this region do not prevent the integration of an ICT approach if the latter allows the company to guarantee its competitiveness in the market. It is recognized that ICTs are a vector for the evolution of company competitiveness. However, the question of how to assess its impact on competitiveness is still unanswered, although the literature supplies preliminary answers. In this context, this article proposes to address this question by examining the effects of human resources, equipment and devices, databases, software, and networks as potential determinants of ICT success in SMEs. This issue is addressed through a case study based on a questionnaire for several companies in the Hail region. The results of this study will allow us the possibility to confirm that ICTs are the only tools that can have positive or negative effects on the competitiveness of SMEs. In such a context, our problem will revolve around the following central question: What is the level of use by SMEs in the Hail region for ICT? In addition to the main question, another question deserves consideration, namely, what is the level of achievement of competitive advantage by SMEs in the Hail region? The importance of the study lies in finding the reality of the use of ICT in SMEs in the Hail region, and its relationship to competitiveness. This study acts as an invitation to develop, interact with developments, save time and effort, improve the quality of services, and improve the image of companies, as ICT is the main source for feeding the various operations and activities of SMEs.

Thus, this research is articulated around five sections that we will develop following the common thread of our work, namely, the real contribution of ICT to the development of company competitiveness. In Section 2, we present the methods, procedures, and statistical treatment methods used in the study. Section 3 analyzes the general characteristics of the study sample. Then, Section 4 is devoted to the analysis of the obtained results. Finally, the last section concludes and suggests some recommendations and policy implications.

2. Research Design and Methodology

The research method and procedures are a major focus through which the applied aspect is carried out, and through which information and data necessary to conduct statistical analysis are presented. In this section, we will present and clarify the research method, describe the sample, and select it. We will also offer a description of the research tool used to collect data, its validity and reliability, and the procedures for applying it, as well as the statistical treatment that was used in data analysis. The current study belongs to the descriptive approach in the sense that descriptive studies are in line with the nature of the current study, which aims to know the role of ICT in giving SMEs a competitive

advantage. In addition, this approach goes beyond data collection and description of phenomena to the analysis and derivation of significant conclusions for the problem addressed by the research.

In the same context, the methodological approach used is the "research onion", in other words, the onion model developed by [18] which describes the 6 stages through which research must pass (namely, the philosophy, the approach, and the strategy of research, etc.). This model concerns the different decisions to be made to collect and analyze data during research. From the first layer to the core, the obligation to explain the choices and decisions undertaken is essential for the research to be taken seriously. Based on a deductive, mono-quantitative approach, this study will shed light on the hypotheses and respond to the problem. Through the questionnaire shared among SMEs, we expect that the results reached will be clear and subject to validation of the hypotheses.

2.1. Research Sample and Data Collection Sources

As part of this study, we opted for a hypothetic-deductive approach. The data collection tool used was the questionnaire. The size of our sample was decided according to the non-probabilistic method and, more precisely, convenience sampling, because in a developing country like Saudi Arabia and especially the region of Hail, it is difficult, if not impossible, to find a base of updated data bringing together all SMEs. It is therefore this situation which generally leads the researcher to opt for a non-probabilistic approach. This method is used (i) for exploratory studies; (ii) to reduce costs; (iii) for the analysis of small samples; and (iv) when it is impossible to use the random method. Furthermore, the non-probability sampling method is used when it is not possible to constitute an exhaustive list (sampling frame) of all survey units. There are several non-probability sampling methods, the best known of which are the following: the quota method, the volunteer method, the snowball method, the targeted sampling method, and the open panel method. However, it is important to note that statisticians are hesitant to use non-probability sampling methods because there is no way to measure the precision of the resulting samples [19,20].

The study population consisted of several SMEs in the Hail region, contacted through the Hail Chamber of Commerce. Certain units were also selected within each company to distribute the questionnaire to, so that it was filled out by its employees and included information systems and marketing units. Since this study deals with the subject of ICT and competitive advantage, 180 questionnaires were distributed, of which 152 were recovered and 128 were valid for statistical analysis. Defining a representative sample is a key success factor in any SME study. For SME studies in particular, the representativeness of the sample directly decides the accuracy of the results. However, a large sample size does not necessarily mean quality. A smaller but well-stratified sample size can lead to much more precise results than large randomly drawn samples.

2.2. Search Tool

The current research used the sample survey method, depending on the questionnaire as a tool for data collection, referring to the earlier literature and examining the role of the use of ICT in gaining SMEs a competitive advantage in the Hail region. A questionnaire was proposed consisting of two main sections. The first section included data about the company's employees, which are gender, age, educational level, job title, language control, and professional experience. The second section included 40 paragraphs revolving around the main topic. This section was prepared as a measure of the role of ICTs in giving small and medium enterprises a competitive advantage. This section, in turn, included two parts. The first part was about ICT in SMEs and consisted of five dimensions: human resources (individuals), hardware and equipment, databases, software, and networks. The second part dealt with the role of ICT in gaining a competitive advantage. It consisted of four dimensions: quality of services/products, market control, creativity/development, and operational efficiency. The Likert scale was used to measure the questionnaire as shown in the Table 1 below.

Table 1. The degree of the 5-dimensional Likert scale.

Likert Scale	Likert Scale Description	Likert Scale Interval
1	Strongly disagree	1.00–1.79
2	Disagree	1.80–2.59
3	Neutral/Uncertain	2.60–3.39
4	Agree	3.40–4.19
5	Strongly agree	4.20–5.00

So, the higher the degree, the greater the role of ICT in giving SMEs a competitive advantage, and vice versa.

2.3. Study Instrument Reliability

Assessing reliability and validity is an important process in the development and evaluation of any research instrument, such as surveys, questionnaires, or tests. Reliability refers to the consistency or stability of the measurement over time or between different raters, while validity refers to the extent to which the instrument measures what it is intended to measure. Overall, assessing reliability and validity is crucial to ensure that research instruments are exact and produce consistent results, which improves the quality and credibility of research. There are several methods for assessing reliability, including test–retest reliability, inter-rater reliability, and internal consistency reliability. To assess validity, diverse types of validity can be examined, such as content validity, criterion validity, and construct validity.

To test the study's instrument reliability, instrument validity was first measured. It is the process of making sure that the paragraphs contained in the questionnaire lead to correct data collection and that each dimension of the study is accurately represented by a set of questions that reflect it. Then, the questionnaire was presented to a group of unit managers in the study's sample organizations to find the extent of understanding of the phrases and words used and the degree of clarity and ease. Second, instrument reliability means the stability of the results obtained using the measuring instrument several times. In short, it shows that the results are not subject to change with the measurement conditions. This was calculated through the internal consistency coefficient Cronbach's alpha when distributing the questionnaire to the study sample, where the internal Cronbach coefficient for all the paragraphs of the questionnaire reached 87%. This is a high percentage which confirms the validity and sincerity of the questionnaire, and in fact, it is an excellent percentage as it is higher than the accepted percentage (60%). Table 2 shows the reliability coefficient for each field of the axis of study.

From the results of Table 2, we note that the stability coefficient for the terms of the ICT axis is acceptable in its entirety, which is higher than 0.60 for all the phrases of the ICT axis, and presents its highest values for the phrases of the second dimension represented by devices and equipment (0.927), followed by networks (0.914). As for the stability coefficient of the total of the axis phrases, it is considered good, as it was 0.922. This is a very acceptable percentage that reflects the consistency of the phrases set to measure the ICT axis in its various dimensions, and it confirms that the phrases measure what they were designed to measure. Furthermore, we note that the stability coefficient of the dimensions of competitive advantage is high, as most of them exceeded 87%, which is the percentage that is considered good in this measure; the terms of operational efficiency come at the rate of 90.9%, followed by phrases of service quality at 89.7%, while the weakest results were recorded concerning market control at 87.4%.

In sum, the internal consistency coefficient of the study tool is characterized by a large degree of stability and honesty, and it fulfills the conditions needed for its adoption as a field analysis method, demonstrating a strong degree of homogeneity and internal consistency between the statements chosen to measure each axis in the questionnaire.

Table 2. Test reliability and validity of the questionnaire.

Dimensions	ICT Axis				Competitive Advantage Axis			
	Categories	**Paragraph Number**	**Cronbach's Alpha**	**Honesty Coefficient**	**Categories**	**Paragraph Number**	**Cronbach's Alpha**	**Honesty Coefficient**
1	Human resources	4	0.869	0.912	Service quality	5	0.897	0.947
2	Devices and equipment	4	0.927	0.946	Market control	5	0.874	0.903
3	Databases	4	0.832	0.891	Creativity/Development	5	0.889	0.931
4	Software	4	0.889	0.939	Operational efficiency	5	0.909	0.937
5	Networks	4	0.914	0.924				
		20	**0.922**	**0.956**		**20**	**0.936**	**0.958**
Total axis								
		Paragraph Number	**Cronbach's alpha**	**Honesty Coefficient**				
		40	**0.949**	**0.976**				

Note: Results are accepted statistically starting from 0.60.

3. Analysis of the General Characteristics of the Study Sample

The description of the general characteristics of the study sample is represented by five questions aimed in their entirety to offer clarifications that will help in analyzing the results later. The following table shows the details of these characteristics.

Table 3 shows the distribution of the study sample according to personal and occupational characteristics, such as gender, age, educational qualification, automatic control, and professional experience. It is clear from the table that 58.06% of the interviewed executives are males, while female executives represent 41.94% of the sample. We note that the ratio of males and females is remarkably close, and this indicates that SMEs do not distinguish between males and females in the recruitment process. Women aspire to responsibility and confront men to work in this field. Regarding age (see Figure 1), we find that the category of young executives (from 25 to less than 35 years) represents the largest percentage at 45.17%, followed by 32.25% for the executives aged from 35 to less than 45 years. This supports the idea that SMEs look to strengthen their human capabilities with young executives capable of keeping pace with the transformations of the business world with all its developments and technological changes.

Table 3. The general characteristics of the study sample.

Variable		Number	Ratio %
Sex	Male	72	58.06%
	Female	52	41.94%
Age	Less than 25 years old	15	12.10%
	25 to 35 years old	56	45.17%
	35 to 45 years old	40	32.25%
	More than 45 years old	13	10.48%
Educational level	Diploma or less	41	33.06%
	Bachelor's	67	54.04%
	Postgraduate	16	12.90%
The extent of automatic control	Weak	4	3.22%
	Medium	19	15.32%
	Good	76	61.30%
	Very good	25	20.16%
Professional Experience	Less than 5 years	21	16.93%
	5 to 10 years	59	47.58%
	10 to 15 years	38	30.47%
	More than 15 years	6	4.84%
Total		**124**	**100%**

Source: Prepared by the researchers based on the SPSS results.

On the one hand, we find that most of the SME staff have university degrees, as the percentage of holders of a bachelor's degree came in first place (54.04%), followed by a diploma certificate or less (33.06%), while a postgraduate certificate came at a rate of 12.90% (see Figure 2). This vast number of highly educated executives shows that the SMEs focus on attracting cadres of university degree holders, a category that is often characterized by the rapid realization and keeping pace with technological developments, and this is what the current market imposes in order to achieve excellence. Moreover, if we look at the extent of automatic control, we find that the interrogated executives demonstrate good and very good control in the techniques of automatic media, with a percentage of 61.30% and 20.16%, respectively, which are high percentages that show that the institution under study considers the media component. When an institution selects its executives, automatic control is of immense importance in managing the functions of the institution and achieving excellence for it. In the aspect of professional experience, the highest percentage (47.58%) represents executives with experience ranging from 5 to less than 10 years, followed by

30.47% which represents executives with experience from 10 to less than 15 years, and this shows that the majority executives of the company have average professional experience in general.

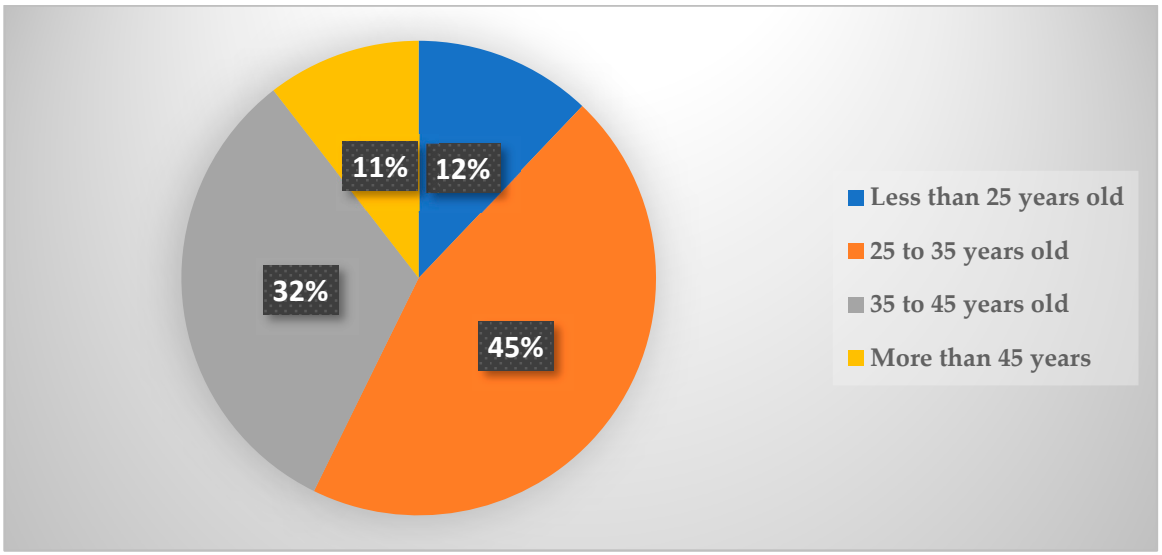

Figure 1. Distribution by age.

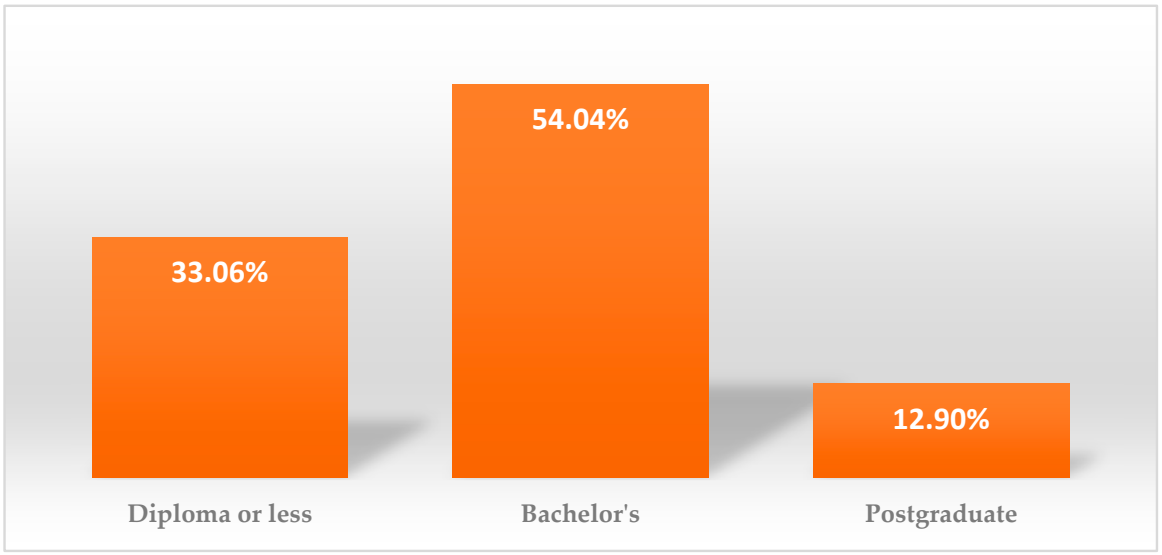

Figure 2. Distribution by educational level.

3.1. Data Distribution

The Kolmogorov–Smirnov test is used to find out whether the data are subject to a normal distribution or not. The following table shows the results that were reached.

It is clear from Table 4 that the value of the statistical significance (Kolmogorov–Smirnov test) for the dependent variable competitive advantage in its various dimensions amounted to 1.427, which is greater than the approved statistical significance level (0.05), which shows that the data of the phenomenon studied are subject to a normal distribution.

Table 4. The normal distribution test (competitive advantage).

Variable	Stat	Sig
Service quality	1.274	0.237 *
Market control	0.965	0.685 *
Creativity and development	1.483	0.329 *
Operational efficiency	1.989	0.151 *
Competitive advantage	1.427	0.350 *

Note: * indicates the lower bound of the true significance.

3.2. Analysis of the Study Axis

In this subsection, we will analyze the axis of the questionnaire to answer the questions of the study, based on statistical analysis using the SPSS program. This was performed by using descriptive statistics and extracting the arithmetic mean and standard deviation (on a scale of 1 to 5) from the answers of the study sample members to the questionnaire items. It was decided that the arithmetic mean of the respondents' answers for each paragraph from 1 to less than 2.5 is indicative of a low level of acceptance, a mean from 2.5 to less than 3.5 is indicative of a medium level, and a mean from 3.5 to 5 is indicative of an important level. This reflects the general trend of the answers of the study sample members about the degree of importance of the phrases from the point of view of the company managers.

In addition to the foregoing, this study tried to examine the Hail region in terms of the following two questions: What is the level of use of ICT by SMEs? What is the level of achievement of SMEs for competitive advantage?

To answer these questions, the ICT and competitive advantage axis, which is considered the independent variable in the model, were divided into a set of dimensions that included several statements that we will analyze by calculating the descriptive statistics measures mentioned previously (Tables 5 and 6).

From Table 5 we note that the devices and equipment came in the first order in terms of the relative importance given to them by the members of the research sample, as the arithmetic means of the answers was 4.602 with a standard deviation of 0.649. According to the scale of the study, this dimension shows a high acceptance rate. We also note that the averages of the answers of the research sample members on the terms of this dimension ranged between high and medium acceptance, as the standard deviations ranged between 0.658 and 0.852, and the arithmetic averages ranged between 4.428 and 4.736. These results confirm that most SMEs provide the latest and best computers, printers, and scanners, as well as the communication equipment necessary to perform their functions. Likewise, SMEs pay more attention to the renewal process of the physical equipment to keep good levels of performance. The networks dimension came in the second order in terms of the relative importance given to it by the members of the research sample, as the arithmetic means of the answers was 4.135 with a standard deviation of 0.536. This dimension shows a high acceptance rate, and we note that the averages of the answers of the research sample members on the terms of this dimension also indicate a high acceptance. This confirms that most SMEs have a computer network that reaches all offices and agencies. This eases the process of workflow and error reporting, in addition to the company's owning a website that would make it widely known on the one hand and increase the number of its potential customers on the other hand.

Table 5. The ICT levels.

No.	Paragraph	SMA	SD	Rank	Degree of Approval
First: Human resources		**4.015**	**0.423**	**3**	**High**
1	The company attracts specialists in the field of ICT (engineers, programmers, designers, etc.).	4.340	0.621	1	High
2	The company attracts specialists in system administration (salesmen, accountants, specialized administrators, etc.).	4.157	0.562	2	High
3	The company conducts continuous training courses to train its executives in the new and developed technologies.	3.942	0.678	4	High
4	The company provides moral and financial incentives to its workers.	3.621	0.713	3	Medium
Second: Devices and equipment		**4.602**	**0.649**	**1**	**High**
5	The company owns enough computers and devices for automated information.	4.736	0.852	1	High
6	The computers used in the company are advanced.	4.595	0.658	3	High
7	Securing enough communications equipment (telephone, fax, etc.).	4.428	0.867	4	High
8	The company is constantly updating and developing devices and equipment for ICT.	4.651	0.798	2	High
Third: Databases		**3.815**	**0.429**	**5**	**High**
9	The company has detailed databases of its customers.	3.732	0.635	3	High
10	The company has a database of its competitors.	3.987	0.698	2	High
11	The company has a database of its suppliers.	3.446	0.542	4	Medium
12	The IT used facilitates the process of accessing the required databases when needed.	4.096	0.598	1	High
Fourth: Software		**3.879**	**0.492**	**4**	**High**
13	Software is constantly being developed to keep up with what is new.	3.897	0.793	3	High
14	The company uses modern computer software in its work.	4.179	0.758	1	High
15	Providing advanced automated protection systems to protect company data.	3.956	0.692	2	High
16	The company's interfaces are easy to use.	3.487	0.632	4	Medium
Fifthly: Networks		**4.135**	**0.536**	**2**	**High**
17	Having a company website on the Internet.	4.496	0793	2	High
18	There is a modern and effective communication network to serve the system in the company.	4.596	0.652	1	High
19	The presence of one network in all the company's branches increases the speed of reporting any defect that occurs promptly.	3.698	0.578	4	High
20	There is an electronic link between the company, suppliers, and customers.	3.752	0.631	3	High
ICT axis in general		**4.089**	**0.537**		**High**

Note: SMA designates the arithmetic mean. SD indicates the standard deviation.

Table 6. Competitive advantage levels.

No.	Paragraph	SMA	SD	Rank	Degree of Approval
First: Service quality		**4.040**	**0.652**	**2**	**High**
21	The company's products and services have characteristics that correspond to the wishes and aspirations of customers.	4.337	0.647	1	High
22	The company's products and services are distinguished by reasonable prices, which distinguishes it from competitors.	4.191	0.714	2	High
23	The company is interested in reducing the time it takes to complete the transactions of its customers to achieve their satisfaction.	3.926	0.912	4	High
24	The subscriber feels special while dealing with the company's information systems.	3.712	0.983	5	High
25	There is general satisfaction with the clients promoting the company's services.	4.038	0.619	3	High
Second: Market control		**4.298**	**0.631**	**1**	**High**
26	The company can promote and distribute its products and services in the markets and customer aspirations.	4.317	0.569	3	High
27	The company is working to increase market share by opening up new markets and supporting existing ones.	4.384	0.632	2	High
28	The company's market share is a major source of customer confidence in it.	4.278	0.736	4	High
29	The company has the largest market share in the market.	4.010	0.719	5	High
30	The company offers privileges to attract new customers and gain their trust.	4.505	0.619	1	High
Third: Creativity and development		**3.776**	**0.590**	**4**	**High**
31	The company works to secure opportunities for creativity and initiative.	4.093	0.853	2	High
32	The company is working on developing and diversifying services that serve the desires of existing and new customers.	3.892	0.532	3	High
33	There are clear methodological steps that contribute to creativity and development.	4.103	0.739	1	High
34	The company takes the opinion of workers in the development process.	3.369	0.521	5	Medium
35	The company looks to devise solutions to many administrative problems.	3.427	0.616	4	Medium
Fourth: Operational efficiency		**3.915**	**0.701**	**3**	**High**
36	The company can complete all operations despite its diversity and increasing size.	3.609	0.563	4	High
37	The company offers distinct services that are different from competitors.	4.267	0.852	1	High
38	The company always strives to get rid of unnecessary operations.	3.560	0.785	5	High
39	The company offers a service to its customers quickly and at once.	4.107	0.623	2	High
40	The company can reduce the cost of operating operations.	4.032	0.698	3	High
Competitive advantage axis in general		**4.007**	**0.744**		**High**

In addition to the foregoing, the dimension of human resources came in the third rank, where the arithmetic mean was 4.015 with a standard deviation of 0.423. According to the scale of the study, this dimension shows a high acceptance rate. This dimension shows that SMEs are interested in the human element, starting with attracting scientific competencies and specialists to promote the company. SMEs also intend to hold training courses for their cadres to keep pace with what is new. SMEs also offer incentives to their employees to urge them to work better. However, SMEs do not pay much attention to moral stimuli, as the answers of the sample members concerning this phrase showed a medium level of acceptance, which requires the company to pay more attention to the moral aspect, because of its significant impact on the behavior of the individual. The software dimension was ranked fourth, where the arithmetic mean of the answers was 3.879 with a standard deviation of 0.492. This shows that SMEs have various modern computer software necessary to perform their business, as they are constantly updating this software. They also have advanced security systems to protect their data. In addition, the procedures for running the software that companies use are easy and clear, which allows them to deliver their services in the best way. The dimension of databases came in the last order with a high acceptance rate (the arithmetic mean of the answers was 3.815 with a standard deviation of 0.429). This specifies that many SMEs have especially important databases that provide managers and decision-makers with all the necessary information in the correct form and at the required time.

Based on the foregoing, we conclude that the respondents' perceptions of the level of use of ICT in SMCs in the Hail region were high according to the study scale, as the average of their answers about the dimensions of ICT combined was 4.089 with a standard deviation of 0.537. This result explains the extent to which the organization under study is interested in ICT due to its awareness of the extent of the impact of these technologies in achieving excellence.

As Table 6 depicts, the market control dimension came in the first order in terms of the relative importance given to it by the members of the research sample, as we find that the arithmetic means of the answers to this dimension reached 4.298 with a standard deviation of 0.631. According to the study scale, this dimension shows a high acceptance rate, and the highest average was 4.505 with a standard deviation of 0.619, for the statement "the company offers privileges to attract new customers and gain their trust". The lowest average for the five statements for this dimension was 4.010 with a standard deviation of 0.719, for the statement which specifies that "the company occupies the largest market share in the market". In general, and based on the respondents' answers, most SMEs can promote and distribute their services and products by adopting many promotional methods and relying on distributors and points of sale to grow their market share and get the largest number of customers. Further, the dimension of service quality came in second place with a high acceptance rate in terms of relative importance given to it by the members of the research sample. The arithmetic means of the answers for this dimension was 4.040 with a standard deviation of 0.652. In general, and based on the respondents' answers, many companies strive to offer high-quality services and products that meet the growing desires and needs of their customers, which creates a sense of satisfaction and loyalty towards their services. The dimension of operational efficiency came in the third order with an arithmetic means of 3.915 and a standard deviation of 0.701. We note from the averages of the answers of the research sample members on the terms of this dimension that they also show a high acceptance, as the arithmetic averages ranged between 3.560 and 4.267, and the standard deviations ranged between 0.785 and 0.852. The highest average was 4.267 with a standard deviation of 0.852, for the statement which designates that "the company offers distinct services that are different from what competitors". The lowest average for the fifth term for this dimension was 3.560 with a standard deviation of 0.785, for the statement which shows that "the company always strives to get rid of unnecessary operations". In general, most companies are highly efficient in performing high operations by reducing their operating costs by dropping unnecessary operations. In addition, they shorten the time in performing

these operations and strengthen consistency between all units to provide services distinct from those provided by competitors. Finally, the dimension of creativity and development came in the fourth rank in terms of the relative importance given to it by the members of the research sample. The arithmetic means of the answers for this dimension was 3.776 with a standard deviation of 0.590. According to the scale of the study, this dimension shows a high acceptance rate, as we note from the averages of the answers of the research sample members. In general, and based on the respondents' answers, most companies are interested in the element of creativity and development through the development and diversification of services that meet the desires of the subscribers on the one hand, as well as by creating solutions to administrative problems by removing restrictions and restructuring that contributes to development on the other hand.

Based on the foregoing, we conclude that the respondents' perceptions of the level of achieving competitive advantage in SMEs in the Hail region were high according to the scale of the study, as the average of their answers about the dimensions of the combined competitive advantage was 4.007 with a standard deviation of 0.744. This result explains the companies' continuous pursuit of competitive advantage.

4. Results and Discussion for Different Hypotheses

This section aims to test the relationships between the variables (ICT and competitive advantage) of our study and to detect the extent to which our hypotheses are accepted or rejected. In the following, we present this paper's theoretical implications (the practical implications will be presented in the conclusion). Regarding the first main hypothesis from Table 7, there is a statistically significant relationship at the level of 0.05 between ICT and the competitive advantage amounting to 0.513. Moreover, the calculated (t) value equal to 4.614 is greater than the tabulated (t) value, thus rejecting the null hypothesis H0 (which implies that there is no relationship) and accepting its alternative. This specifies the existence of a statistically significant relationship between ICT with its various dimensions and the competitive advantage of SMEs in the Hail region. Now moving to the first sub-hypothesis, the above table reveals that there is a positive statistical relationship between ICT and service quality amounting to 0.409. Likewise, the value of the calculated (t) equal to 3.167 is greater than the tabulated (t) value. This shows that the respondents confirm that the ICT used in companies helps to improve service quality. This is consistent with the studies of [21,22] which confirmed that the presence of competition led to work on increasing the quality of products through the development of technological devices. Regarding the second sub-hypothesis, the finding reveals that there is a statistically significant relationship between ICT and market control amounted to 0.461. The calculated value (t) is equal to 4.289, which is greater than the tabulated (t) value. This suggests that the respondents believe that ICT has a direct relationship to controlling the market. This finding lends support to the studies of [23–25] which confirmed the existence of a moderately statistically significant relationship between the roles of the availability of marketing information represented in databases about competitors to introduce new products and the control of the markets.

For the third sub-hypothesis, the result reveals that there is no statistically significant relationship between ICT and creativity/development at the level of significance (0.05). The calculated value (t) is equal to 1.915, which is less than the tabulated (t) value. The finding is contradictive with the study of [26–28] which confirmed the existence of a direct correlation between the roles of information systems in developing competitive advantage and creativity/ development. Finally, the fourth sub-hypothesis results show that there is a positive statistical relationship between ICT and operational efficiency amounting to 0.380. This reveals that SMEs are concerned with operational efficiency. This is consistent with the studies of [29,30], which showed a positive relationship between the use of ICT and operational efficiency by improving the performance of employees. ICT contributes to enhancing the performance of employees, the decrease in the number of errors committed during work, the possibility of controlling the daily operations in various

branches of companies, and the provision of the best technological services available due to the advanced computer and communication network technology.

Table 7. Analysis of the main and sub-hypotheses concerning the relationship between ICT and competitive advantage.

Hypothesis No.	Hypothesis Text	t Value	Morality *p*-Value	R
First main hypothesis	There is a statistically significant relationship between ICT in its various dimensions and competitive advantage.	4.614	0.001	0.513
First sub-hypothesis	There is a statistically significant relationship between ICT and service quality.	3.167	0.021	0.409
Second sub-hypothesis	There is a statistically significant relationship between ICT and market control.	4.289	0.002	0.461
Third sub-hypothesis	There is a statistically significant relationship between ICT and creativity/development.	1.915	0.075	0.247
Fourth sub-hypothesis	There is a statistically significant relationship between ICT and operational efficiency.	3.827	0.000	0.380

In the theory of technological change, the decision process affects the adoption of modern technologies [31]. This process is more informal in SMEs than in large companies. Theoretically, the mere adoption of modern technologies does not guarantee their potential benefits. This situation is more relevant in the case of ICTs since their adoption is a necessary but not sufficient condition for increasing productivity and performance and strengthening competitiveness [32]. The neo-Schumpeterian theory holds that a technological change in basic assumptions makes the level of knowledge of prior production obsolete. The adoption of ICT leads to changes in the management structure and production processes, which amounts to a change in the technological paradigm. In this case, the knowledge acquired through learning by doing within the company or through added technological innovations carried out within R&D units over time becomes obsolete. Modern technologies require some learning time to be used effectively. As a result, businesses become more efficient only after a certain lag. In addition to the foregoing, the continued diffusion of ICTs is an example of the dynamics of technological change and economic development [33]. Economic theory suggests that the diffusion of modern technologies can have important consequences. ICT plays a significant role in economic growth through capital accumulation and increased productivity.

In the same order, the second main hypothesis consists in studying if there is a statistically significant role for ICT in its various dimensions in achieving a competitive advantage for the SMEs under study at the level of significance (0.05). To test this hypothesis, we used simple linear regression to reveal the role of ICT in achieving competitive advantage. Considering this, the following simple regression equation was formulated:

$$Y = \beta_0 + \beta_1 X \quad (1)$$

where Y is the dependent variable and X is the independent variable. β_0 is the constant or intercept. β_1 represents the slope of the regression line. Estimates of these values and their statistical indicators were calculated at the level of the study sample of 124 people.

From Table 8, we see that the calculated F value (19.783) is greater than the tabulated F value with a significant level (0.002), and this shows that the regression curve is sufficient to describe the role that ICT plays in achieving a competitive advantage for SMEs. It is clear from the coefficient of determination (R^2) that ICT explains 27.3% of the changes in competitive advantage. Concerning the role of ICT in achieving service quality, the calculated F value (5.973) is greater than the tabulated F value with a significant level (0.029), and this reveals that the regression curve is sufficient to describe the role that ICT plays in achieving

service quality for SMEs. This is in line with the studies of [34,35] which confirmed the existence of a statistically significant relationship between software and strategies of competitive advantage. The use of advanced software helps to produce high-quality, unique, highly beneficial, and non-imitable products to obtain a competitive advantage. Now moving to study the role of ICT in achieving market control, the calculated F value (21.419) is greater than the tabulated F value with a significant level (0.001). The respondents believe that ICT has a significant role in achieving market control. This result is in accordance with the earlier findings of [36–38], which concluded that ICT enables managers to obtain valuable information about the size of the market, the strength of competitors changing consumer tastes, the cultural characteristics of society, the technological means used by competing institutions, etc., and thus market control. On the role of ICT in achieving creativity/development, the calculated F value (3.293) is smaller than the tabulated F value with an insignificant level (0.070). The finding is contradictive to the studies of [28,39], who consider creativity to be the most important source of competitive advantage because it contributes to creating innovative marketing opportunities and achieving customer satisfaction. Regarding the role of ICT in achieving operational efficiency, the calculated F value (13.908) is greater than the tabulated F value with a significant level (0.000). This is consistent with the studies of [40–42] which emphasized the role of information systems in developing competitive advantage and operational efficiency.

Table 8. Testing the role of ICT in its various dimensions in achieving a competitive advantage.

Independent Variable	Dependent Variable	β_0	β_1	F Value	Sig	R^2
ICT	Competitive advantage	1.892	0.473	19.783 *	0.002	0.273
	Service quality	1.979	0.498	5.973 *	0.029	0.289
	Market control	0.827	0.685	21.419 *	0.001	0.498
	Creativity and development	2.813	0.341	3.293	0.070	0.213
	Operational efficiency	0.396	0.513	13.908 *	0.000	0.390

Note: * significant at 5%.

In a similar vein, our third main hypothesis aims to explore if there are statistically significant differences in the average responses of the sample members to the level of ICT use in the companies under study. There are five sub-hypotheses within this main hypothesis. One-way ANOVA was chosen to find the extent to which there are statistically significant differences in the average responses of the sample members to the level of ICT use in the SMEs, which are attributed to personal variables. The first sub-hypothesis examines if there are statistically significant differences in the average responses of the sample members to the level of ICT use due to gender at the level of significance (0.05).

The independent t-test analysis was used to test the first sub-hypothesis. The results from Table 9 show that the t-value (−1.473) is statistically significant for the level of use of ICT in SMEs in the Hail region attributed to the gender variable (gender), which is in favor of males, as evidenced by the high arithmetic mean of their answers (4.961), while the mean for females was 3.261. Thus, we reject the null hypothesis and accept its alternative.

Table 9. Independent *t*-test results for differences by sex variable.

Variable	t Value	Sig	Arithmetic Means	
			Male	Female
ICT	−1.473 *	0.017	4.961	3.261

Note: * significant at 5%.

Furthermore, the second sub-hypothesis examines if there are statistically significant differences in the average responses of the sample members to the level of ICT use due to the age variable. The results presented in Table 10 reveal that for the F test, there were no statistically significant differences at the 95% confidence level. The calculated

F value was 0.816 and the statistical significance was 0.527, which shows that there is no effect of the age variable on the level of ICT use. In the same context, the third sub-hypothesis examines if there are statistically significant differences in the average responses of the sample members to the level of ICT use due to the educational level variable. The ANOVA findings from Table 10 reveal that the F test showed that there were no statistically significant differences at the 95% confidence level. The calculated F value reached 4.365 and the statistical significance was 0.034, which suggests that there is no effect of the scientific level variable on the level of ICT use. The fourth sub-hypothesis investigates if there are statistically significant differences in the average responses of the sample members to the level of using ICT due to the variable automation control level. The results showed that there were no statistically significant differences at the 95% confidence level. The calculated F value reached 2.896 and a statistical significance of 0.307, showing no effect of the scientific level variable on the level of use of ICT. Lastly, the fifth sub-hypothesis examines if there are statistically significant differences in the average responses of the sample members to the level of ICT use due to the variable of professional experience at the level of 0.05. The ANOVA results showed that there were no statistically significant differences at the 95% confidence level. The calculated F value was 0.772 and the statistical significance was 0.854, which shows that there is no effect of the variable of professional experience on the level of use of ICT.

Table 10. ANOVA results examining the level of ICT use according to various variables.

Variable		Sum of Squares	df	Mean Square	F	Sig
Age	Between groups	2.786	4	0.79	0.816	0.527
	Within groups	82.906	119	0.113		
	Total	85.692	123			
Educational level	Between groups	3.483	5	0.371	4.365	0.034 *
	Within groups	82.209	118	0.116		
	Total	85.692	123			
Automation control level	Between groups	4.180	6	0.221	2.896	0.307
	Within groups	81.512	117	0.120		
	Total	85.692	123			
Professional Experience	Between groups	4.877	7	0.070	0.772	0.854
	Within groups	80.815	116	0.127		
	Total	85.692	123			

Note: df indicates the degree of freedom. * Defines the mean difference statistically significant at a 95% confidence level.

5. Conclusions and Practical Implications

In this study, we discussed the role played by ICT in its various dimensions in achieving a competitive advantage for SMEs in the Hail region, and we reached several results and conclusions. ICT is one of the most important resources in the contemporary business environment, as we find that the institutions that achieve remarkable success in the field of business are highly dependent on these technologies. The company's acquisition of a competitive advantage would achieve its highest goal, which is to achieve customer satisfaction and thus survival and continuity in the market. The field survey led us to confirm our hypothesis that the use of ICT by the SMEs in the Hail region positively and effectively influences their performance and plays a key role in their competitiveness in the market. The respondents' perceptions on the level of ICT use were high according to the scale of the study, as the average of their answers about the dimensions of ICT combined was 4.089, with a standard deviation of 0.537. Likewise, the respondents' perceptions about the level of achieving the competitive advantage of the SMEs under study were high according to the scale of the study, as the average of their answers about the dimensions of the combined competitive advantage was 4.007, with a standard deviation of 0.744. Moreover, there is a statistically significant relationship between ICT in its various dimensions and the service

quality of service, operational efficiency, and market control in the SMEs under study at the level of significance (0.05). However, there is no statistically significant relationship between ICT in its various dimensions and the creativity/development in the SMEs under study at the level of significance (0.05).

According to the results obtained from the statistical analysis of the data, the following practical suggestions are made: first, the necessity of integrating information technology into all activities of the SMEs; second, training human resources to use modern information technology and making them aware of the importance of using it in their jobs; third, a need for SMEs to renew technological equipment to develop their human resources and improve their performance; fourth, the SMEs' conviction of the necessity of creating a competitive advantage that enables them to survive and continue in a highly competitive environment; fifth, the need for the SMEs to constantly improve and develop their competitive capabilities so that they do not fade with time; and sixth, creating a technology culture within the SMEs, by providing all conditions and means to enhance cultural behaviors that improve the organization's level of performance.

In addition to that, SMEs in the Hail region should invest well in their human resources by paying more attention to intellectual capital, by focusing on attracting and appointing highly qualified people, and by working on their continued development to keep pace with the tremendous growth seen by ICT. The SMEs must increase their investments in supporting these new services and products on the one hand, and they must intensify their efforts to create distinct services and products that differ from those offered by their competitors on the other hand. Excellence requires anticipation to create the new; it is not enough to keep up and imitate the new. Further, there is a need for the management of companies to pay more attention to controlling the markets, as this study proved that there is no role for ICT in achieving this dimension, which requires more attention to it and the study of all the factors that would affect it. Likewise, companies must encourage their workers to innovate and take initiatives effectively in order to exchange experiences and provide solutions to existing and expected problems.

Considering the aims of our current research and the results it yielded and complementing them, the following future research can be proposed: (i) the contribution of ICT to achieving organizational excellence; (ii) the role of electronic management in achieving a competitive advantage in Saudi SMEs, and (iii) the role of ICT in achieving strategic vigilance in Saudi SMEs. Despite the richness of all the data used, our results are limited by certain shortcomings which must be mentioned. First, the sample size looks exceedingly small and might not be representative due to the limited number of SMEs in the Hail region. Second, the variables used to decide competitive advantage do not accurately measure all the competitive qualities of SMEs that theory shows are an outcome of ICT. Third, an important limitation is the lack of a dynamic perspective. This question is relevant, since SMEs that decide to adopt ICT may require learning time, and the effects of ICT on performance may take a long time to materialize in the medium or long term. Even if an SME has invested in these technological and organizational changes, it must learn to manage the new system before it can fully profit from the performance gains.

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