Applying the principles of sustainable production and their role in achieving sustainable competitive advantage through the exploitation of dynamic capabilities: Case study of the Chiali plastic pipe manufacturing factory in Algeria

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Applying the principles of sustainable production and their role in achieving sustainable competitive advantage through the exploitation of dynamic capabilities: Case study of the Chiali plastic pipe manufacturing factory in Algeria

تطبيق مبادئ الإنتاج المستدام ودورها في تحقيق ميزة تنافسية مستدامة من خلال استغلال القدرات الديناميكية: دراسة حالة مصنع شيالي لصناعة الأنابيب البلاستيكية في الجزائر

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Abstract : This study aims to highlight the applicability of sustainable production principles to sustainable competitive advantage through the exploitation of dynamic capabilities. To achieve the objective of the study, the descriptive approach was adopted by designing a questionnaire form for a sample of employees of the Chiali plastic pipe factory in Algeria, The sample included 80 participants. The questionnaires were loaded and processed using the statistical program S.P.S.S, V/25, AMOS/25, The study also reached several conclusions, the most important of which is that senior management support is the key to building sustainable competitive advantage through their support for sustainable production. The study recommended that the factory should develop and support the knowledge bases of senior management, in particular those relating to strategic planning, marketing, dynamic capabilities practices, and the development and qualification of mid-level leadership in a manner appropriate to the future of the factory.

Key words: sustainable production, sustainable competitive advantage, dynamic capabilities, Chiali Factory.

JEL classification: L11, L16, H10

الملخص: تهدف هذه الدراسة إلى تسليط الضوء على إمكانية تطبيق مبادئ الإنتاج المستدام على الميزة التنافسية المستدامة من خلال استغلال القدرات الديناميكية، ولتحقيق الهدف من الدراسة تم اعتماد المنهج

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الوصفي من خلال تصميم استمارة استبيان لعينة من موظفي مصنع شيالي للأنابيب البلاستيكية في الجزائر، وشملت العينة 80 مشاركا، تم تفريغ الاستبيانات ومعالجتها باستخدام البرنامج الإحصائي S.P.S.S, V/25, AMOS/25، كما توصلت الدراسة إلى عدة استنتاجات أهمها أن دعم الإدارة العليا هو مفتاح بناء ميزة تنافسية مستدامة من خلال دعمها للإنتاج المستدام، وأوصت الدراسة بضرورة قيام المصنع بتطوير ودعم القواعد المعرفية للإدارة العليا، وخاصة تلك المتعلقة بالتخطيط الاستراتيجي والتسويق وممارسات القدرات الديناميكية، وتطوير وتأهيل القيادة متوسطة المستوى بطريقة تتناسب مع مستقبل المصنع.

الكلمات الدالة: الإنتاج المستدام ، الميزة التنافسية المستدامة ، القدرات الديناميكية ، مصنع شيالي.

تصنيف جال: L11, L16, H10

INTRODUCTION

Organizations have begun to address environmental and social issues in different ways, consistent with the concept of sustainable development, in preserving the environment from every form of pollution, specifically in chemical industries, including the plastics industry. Increased organizational requirements, such as reducing toxic gas emissions, can be seen, providing a motive for producer organizations to consider sustainable production practices in their daily operations, Manufacturers are gradually becoming more aware of the effects of their work on (individuals, the planet, and profits). By increasing pressure to take into account natural resource consumption, it became important to clarify the principles of sustainable production and understand how it can be achieved within organizations.

In general, business organizations face many challenges, particularly in the plastics industry, related to achieving sustainable market success, most notably keeping pace with accelerating changes in the environment, the difficulty and severity of forecasting threats, the ability of the organization to sense and seize opportunities for business survival and excellence, and gaining sustainable competitive advantage.

Business organizations also need to be dynamic as the means against each emergency to successfully enter the business world. For example, industrial organizations (the plastics industry) deal with many different stakeholders' expectations concerning that customers and society need more environmentally friendly production and workers need healthy and safe workplaces, while at the same time asking communities for socially

responsible behavior and activities that can address local problems as key drivers that have characterized contemporary organizations.

- **Study importance**

The importance of the study stems from the importance of its variables. At present, all factories face significant challenges as a result of rapid changes in the local and global environment, forcing them to adopt new practices, patterns, processes, and programs through taking care of clean production practices and the development of their dynamic capabilities to achieve sustainable competitive advantage, The importance of this study is reflected in the following points:

- Contribute to providing a theoretical framework of study variables by reviewing the most significant ideas of researchers and writers in this field.
- Determine the impediments to the factory's sustainable production.
- The possibility of using this study to undertake future studies of different sectors and provide information to senior management on the importance of dynamic capabilities and how to achieve sustainable competitive advantage.
- The importance of this study is highlighted by the fact that it is an intellectual proposition that focuses on novelty in contributions related to sustainable production, dynamic capabilities, and sustainable competitive advantage as one of the topics that researchers have addressed mainly, or linked to other variables.

- **Study objectives:**

Through the study, the researchers seek to achieve a range of objectives:

- Presenting theoretical frameworks and knowledge contributions associated with study variables, as well as clarifying its concepts.
- Recognizing the extent to which the study sample understands the importance of applying the variables and presenting a set of proposals based on the study's results, which would develop the current study variables in the organization understudy.
- Testing the expected impact relationship between the dimensions of sustainable production and dynamic capabilities, as well as the dimensions of sustainable competitive advantage.

- Learning about the researchers' attitudes about the extent to which the researched factory uses the principles of sustainable production by exploiting dynamic capabilities and reaching a better sustainable competitive position than competitors.

- **Study Problem:**

- Today's business environment has become more complex and dynamic, both at the local and global levels, which has posed significant challenges to organizations operating in this environment. Organizations recognized that many of the traditional concepts that had already helped them succeed could not be relied upon to manage the new changes in the competitive environment, requiring alignment between the continuity of organizations in achieving sustainable competitive advantage and adherence to the requirements of sustainable production amid internal and external challenges affecting their survival and growth. Hence, tools are needed to assist organizations in understanding the problems of current production systems, thereby setting specific targets and measuring progress towards sustainable production. Through field visits and unstructured interviews and based on exploratory studies conducted by researchers at the Chiali Plastic Pipe Manufacturing Factor to identify the problem or feasibility of applying the principles of sustainable production through the use of dynamic capabilities to gain sustainable competitive advantage, the researchers found that the study could be conducted at the factory because of its role in the country's economy. They found a desire among senior management and production workers to conduct such studies to determine the impact of applying sustainable production principles on sustainable competitive advantage amid the challenges and difficulties experienced in a dynamic environment. The main problem of the study is the following: To what extent does sustainable production affect sustainable competitive advantage through dynamic capabilities ?

To address and analyze this problem, and in order to arrive at logical and scientific results, the following sub-questions were asked:

- Is there a morally significant correlation and effect relationship between sustainable production and sustainable competitive advantage ?
- Is there a morally significant correlation and effect relationship between sustainable production and dynamic capabilities with its

dimensions (sensing, acquisition, resource reconfiguration, learning, and integration/coordination) ?

- Is there a morally significant correlation and effect between dynamic capabilities and sustainable competitive advantage ?
- Is there a statistically significant multiple effect of cleaner production on sustainable competitive advantage through dynamic capabilities?

- **Study hypotheses:**

Based on the problem of study and sub-questions, the following hypotheses have been formulated:

First hypothesis: There is a morally significant correlation and effect relationship between sustainable production and sustainable competitive advantage.

Second hypothesis: There is a morally significant correlation and effect between sustainable production and dynamic capabilities with its dimensions (sensing, acquisition, resource reconfiguration, learning, and integration/coordination).

Third hypothesis: There is a morally significant correlation and effect between dynamic capabilities and sustainable competitive advantage.

Fourth hypothesis: There is a statistically significant multiple effect relationship of cleaner production on sustainable competitive advantage through dynamic capabilities.

1. Study model

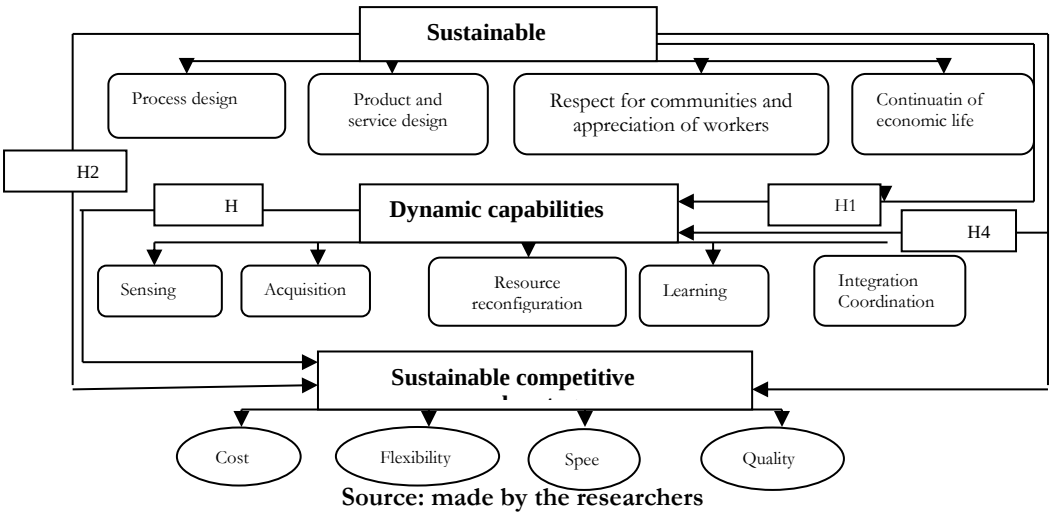
The study model aims to clarify the logical relationships of the main and subsidiary variables involved as shown in figure 01.The dimensions of variables have been selected based on intellectual surveys, previous literature on sustainable production, dynamic capabilities, and sustainable competitive advantage, and the sources provided to researchers. This plan represents a set of relationships between research variables:

1.1. Independent variable (sustainable production): represents in the following dimensions (process design, products and services design, respect for communities and appreciation of workers, and continuation of economic life).

1.2. Mediator variable (Dynamic capabilities): represents in the following dimensions (Sensing, acquisition, resource reconfiguration, learning, and integration/coordination).

1.3. Dependent variable (sustainable competitive advantage): represents in the following dimensions (Cost, flexibility, quality, and speed).

Fig 01: study model



Source: made by the researchers

2. Study limits

The limits of the study have been defined in the following key fields:

2.1. Cognitive limits: The study falls into contemporary research contributions in the field of production and process management.

2.2. Spatial limits: The spatial boundaries of the study were in Chiali's Plastic Pipe Factory, located in Sidi Bel Abbes, Algeria.

2.3. Temporal limits: From 14/12/2021 to 02/03/2022, which is the period of conducting interviews in the factory, as well as the distribution and receipt of the measurement tool.

3. Study approach

In this study, researchers have relied on the descriptive approach that aims to collect facts and information on a particular phenomenon or situation and provide a detailed description of the situation under study to reach a set of recommendations on the phenomenon or situation in

question. The nature of the study also required the use of the descriptive method according to the statistical method, which is an appropriate method for studying social and behavioral phenomena, and which helps to analyze thoroughly the various data and information obtained for testing hypotheses.

4. The concept of sustainable production

Sustainable production has its roots in the late 1960s and early 1970s when people became more aware of the dangers of environmental degradation and unsustainable resource use (Gavrilescu, 2004, p. 49), However, the concept of sustainable production emerged in 1992 at the United Nations Conference on Environment and Development (UNCED Nation), It is closely related to the concept of sustainable development. The Conference concluded that the main reason for the continued degradation of the global environment was the pattern of unsustainable consumption and production, especially in industrialized countries, while sustainable consumption targets consumers, and sustainable production was linked to organizations providing products or services (Veleva, Hart, Greiner, & Crumbley, 2001, p. 448), In addition, many organizations have begun to understand the importance of sustainable development, although they are not sure how to apply this concept to their business activities, This challenge was one of the reasons for creating the Lowell Centre for Sustainable Production (LCSP) at Massachusetts University, The Lowell Center (LCSP) began in 1996 to promote new industrial forms and safe, healthy, environmentally, and socially sound production, focusing its work on sustainable production systems. In 1999, the center began to develop a framework for sustainable production indicators (Veleva, Hart, Greiner, & Crumbley, 2001, p. 451), Organizations then showed a wide interest in addressing environmental and social issues in different ways. Increasing organizational requirements, such as reducing toxic gas emissions and the waste they cause to harm the environment, can be seen as an incentive for producer organizations to take into account sustainable production practices in their daily operations (Hąbek & Villahoz, 2017, p. 837), Based on the concept of sustainable development, many new definitions have been developed over time based on different interpretations of the true meaning of sustainable development, from which the concept of sustainable production has emerged (Berns, et al., 2009, p. 23).

Based on all the definitions mentioned on sustainable production, the latter is a preventive and integrated strategy involving productive

processes, products, and services and not just technical reforms or technological improvements, It aims to reduce pollutants and emissions from the source.

5. Sustainable production dimensions

The current study will draw on dimensions that have been reduced to four dimensions (products and services design, process design, respect for the communities around the workplace and workers' appreciation, continuing economic viability).The researchers have been fully convinced that these dimensions are in line with the current study, and will therefore be adopted as essential dimensions reflecting the independent variable (sustainable production).These dimensions are described below (Veleva, Hart, Greiner, & Crumbley, 2001, pp. 451-452):

5.1. Products and services design: they are safe and environmentally proper throughout their life cycle and are designed to be solid, repairable, and easily recyclable. Production and packaging are done using small quantities of environmentally friendly materials and energy.

5.2. Process design: through the continuous reduction, disposal, or recycling of environmentally incompatible wastes and products at the site, the continuous disposal of chemicals or physical factors and conditions that pose risks to human health or the environment, while preserving energy, materials, and energy types as well as materials used for the most appropriate purpose, and the design of workspaces to reduce or eliminate chemical risks continuously.

5.3. Respect for communities and appreciation of workers: respect and promote the communities relevant to any stage of a product's life cycle economically, socially, and culturally (from the extraction of raw materials to reach the end product, use it and dispose of it). Concerning the appreciation of employees:

- Organizing work to maintain and enhance their competence and creativity.
- The priority is their security and well-being.
- Encouraging and assisting them in developing their talents and abilities.
- Accepting their contributions and participating openly in the decision-making process.

5.4. Economic viability: Sustained economic life does not depend on ongoing (unsustainable) consumption of resources and energy.

6. The concept of dynamic capabilities

Dynamic capabilities are one of the fundamentals of understanding the sustainable competitive advantage of organizations (Tondolo & Bitencourt, 2014, p. 125), In 2006, Lavie notes that dynamic capabilities focus on explaining how organizations' capabilities over time develop to renew and adapt their resources and competencies in response to both external environmental events and internal organizational pressures, Dynamic capabilities not only allow organizations to exploit their existing resources and organizational competencies but also help them to renew and develop their resources and competencies to suit an uncertain environment. Furthermore, dynamic capabilities are strategic activities through which organizations seek and choose new ideas, mobilize resources, adjust them, create, and capture the value (Mousavi, Bossink, & van Vliet, 20018, p. 231), In addition, Teece and Pisano proposed in 1994 that the dynamic capabilities of the organization can be defined through administrative and organizational processes, the current position of technology, and customer and supplier rules, as well as available strategic paths and alternatives (Sunder & Marathe, 2019, p. 33), He referred to it (Schilke, Hu, & Helfat, 2018, p. 393) as a distinct subset of organizational capabilities, namely, those that could bring about a change in the organization's current resource base and external environment, According to (Sayem, Feldmann, & Ortega-Mier, 2018, p. 1321), they are the capabilities that enable organizations to create, deploy, and protect intangible assets that support long-term superior performance, which means that dynamic capabilitiesenable organizations to be adaptable and responsive to dynamic environments.

Thus, from previous definitions, dynamic capabilities are those that can be a source of sustainable competitive advantage by emphasizing the ability to renew competencies in order to achieve matching with the changing environment and allow for changes in the organization's resource base and external environment.

7. Dynamic capabilities dimensions

Writers and researchers differ in classifying the dimensions of dynamic capabilities, as there are many designations of them. This plurality is the result of writers' and researchers' trends in dealing with dynamic capabilities and each has a point of view in determining them. The current

study relies on dimensions reduced to five dimensions (sensing, acquisition, resource reconfiguration, learning, and integration/coordination), Both researchers have the full conviction that these dimensions are consistent with the current study, so they will be adopted as basic elements that reflect the mediator variable (dynamic capabilities),These dimensions are mentioned below:

7.1. Sensing capabilities: referred to it (Chukwuemeka & Onuoha, 2018, p. 9) as the ability to observe changes in the environment i.e. there is a relationship between sensing capabilities and the ability to identify opportunities and threats in the external environment. Thus, sensing capabilities are linked to the creation of opportunities, strategic decision-making rules, and resource allocation, mostly related to research and development or business intelligence (Adequately direct internal research and development, discover new knowledge and techniques to determine market expectations, and collaborate with external partners) (Vallaster, Maon, Lindgreen, & Vanhamme, 2019, p. 4).

7.2. Acquisition capabilities: believes (Teece, Peteraf, & Leih, 2016, p. 18) that acquisition capabilities are the mobilization of resources to meet needs and opportunities and obtain the value of doing so, as well as the opportunities for improvement that the organization should benefit from, which could include decisions on the amount of investment in improving project management capabilities (Biesenthal, Gudergan, & Ambrosini, 2019, p. 350), According to (Duarte & Kok, 2019, p. 281), acquisition is often accompanied by significant investments in tangible and intangible assets, Thus, acquisition capabilities are to mobilize resources to capture value from specific opportunities and reflect the ability to identify, filter, and calibrate opportunities and threats based on established structures, procedures, designs, and incentives to identify necessary changes.

7.3. Sources reconfiguration: according to (Mousavi, Bossink, & van Vliet, 20018, p. 233), it represents the ongoing strategic renewal of resources and competencies aimed at maintaining the organization's resource base by adapting the organization's resources and competencies to better align with the changing environment. Resources configuration capabilities, therefore, include the ability to combine, regroup and reshape assets, resources, and structures in line with strategic decisions identified by sensing and acquisition mechanisms, namely decentralized structures, joint specialization in the adaptation of structures and processes, the establishment of effective incentive and governance systems, and the use

of knowledge management to guide learning (Vallaster, Maon, Lindgreen, & Vanhamme, 2019, p. 4).

7.4. Learning capabilities: enable organizations to gain sustainable competitive advantages through their information and market orientation as an organizational culture that can promote organizational learning. The ability to build, acquire, and disseminate new knowledge throughout the organization is required for appropriate decision-making (McIlroy, 2011, p. 18), Learning capabilities focus on the use of information to generate new knowledge, and learning capacities have thus been defined as the ability to restore operational capabilities with new knowledge (Kuncoro & Suriani, 2018, p. 189).

7.5. Integration/coordination capabilities: according to (Biesenthal, Gudergan, & Ambrosini, 2019, p. 354), integration capabilities refer to the efficiency of the organization in identifying available resources, combining them, and thereby disseminating them to achieve the management vision of the organization, In order to achieve a competitive advantage, organizations must benefit from the amount of knowledge stored within their staff.

Coordination capabilities refer to the ease of ability to identify, collect, control, integrate, and restructure resources (Pavlou & Sawy, 2011, p. 276), as coordination capabilities are seen to enhance the ability to deploy functions, resources, and activities in new operational capabilities (Quinn & Dutton, 2005, p. 36).

8. The concept of sustainable competitive advantage

Barney and Clark (2007) consider that the concept of sustainable competitive advantage links two aspects; the competitive advantage with strategic advantage as meeting current market needs, taking into account the future needs. Barney argues that not all resources of the organization have a sustainable competitive advantage because different types of resources can have different competitive effects on organizations, For an organization to have this kind of potential, its resources must consist of four main features (value, scarcity, difficulty of imitation, and difficulty of replacement) (Mahdi, Nassar, & Almsafir, 2019, p. 3222), Furthermore, (Haigh & Hoffman, 2014, p. 233) has stated that sustainable competitive advantage is a long-term benefit for the organizations by applying a strategy to create the unique value that ensures the high performance of the organizations, It is built by integrating the core skills and resources

they possess in unique and durable ways that other competitors cannot imitate. Organizations gain a sustainable competitive advantage by outperforming competitors in terms of product and service quality and profitability, as well as reduced product costs, all of which contribute to the organization's overall performance compared to competitors (Guimarães, Severo, & Vasconcelos, 2018, p. 355), (Kuncoro & Suriani, 2018, p. 188) indicates that it is the ability of the organization to create and generate the value through which it seeks to innovate in order to lead the competition in the market.

9. Dimensions of sustainable competitive advantage

This term is synonymous with other terms (competitive dimensions, competitive primacy, competitive priorities, performance objectives, manufacturing tasks, production competencies, market-based success criteria). The idea of competitive priorities was first put forward by Skinner, who emphasized that organizations must make choices about which dimension of competition should take the biggest investment in terms of resources and time, These competitive dimensions have been considered to be a critical decision, which emphasizes the decision concerning the production process, dynamic capabilities, technology, and planning (Sayem, Feldmann, & Ortega-Mier, 2018, p. 1318), (Krajewski, Ritzman, & Malhotra, 2013, p. 29) stated that, regardless of these designations, their main concern was to transform market desires into target areas implemented by the organization's activities in pursuit of a sustainable competitive advantage when it is distinguished in one or more of these areas compared to its competitors, The dimensions of sustainable competitive advantage are as follows:

9.1. Cost: This dimension refers to the provision of a service or product at the lowest possible cost to the satisfaction of external or internal clients of the process or supply chain. To reduce costs, processes should be designed and operated to make them effective using thorough analysis of labor force, methods, scrap or reworked work, public expenditure, and other factors such as investments in new automated facilities or technologies to reduce unit cost (Krajewski, Ritzman, & Malhotra, 2013, p. 32).

9.2. Flexibility: it can be defined as the ability to adapt to changes in the product mix, volume of production, or design. This ability means producing a wide range of products to deliver new products, modify existing products, and respond quickly to customers' needs. Flexibility can increase the ability of operations to produce a wide range of different

products for different customers, However, high diversity often means high cost when offering different products in a way that reduces production in large quantities. Accordingly, some organizations have developed their flexibility so that the demand of each customer is met individually, however, they have been able to produce in a broad production style that has led to lower costs, This approach is referred to as a broad exclusionary approach (Slack, Brandon, & Johnston, 2013, p. 52).

9.3. Quality: a successful quality strategy begins with a quality-enhancing organizational culture, followed by an understanding of quality principles and the involvement of workers in activities needed to implement quality. When these points are done well, the organization usually satisfies its clients and gains a sustainable competitive advantage. The concept of quality refers to the ability of a product or service to meet the needs of customers (Heizer, Render, & Munson, 2017, p. 217), Furthermore, (Summers, 2010, p. 4) believes that it is systems that provide products or services well to the customer and can satisfy him at present and in the future except in times of crisis or changes, whether internal or external.

9.4. Speed: referred (Stevenson, 2015, p. 42) to the speed dimension by the quick response, which means that organizations can quickly deliver new or improved products or services to the market or can quickly deliver existing products and services to customers once ordered, in addition to dealing quickly with customers' complaints, This is done largely through rapid decision-making and the rapid movement of material and information within the organization, The benefit to the organization from the rapid delivery of products and services is that the faster they can obtain the product or service, the more likely customers are to buy or pay more for the product or service through which the organization can achieve sustainable competitive advantage.

10. Study field

The field of study is the Chiali Plastic Pipe Manufacturing Factory to test the study model for several reasons, primarily the strategic importance of the Chiali investment factory in supporting sustainable development, as well as the need of the industry for in-depth studies to improve the reality of the products and services it provides,The Chiali's factory is Africa's largest plastic pipe manufacturer and is one of the factories promoting the country's economy, The study community is determined in the following table:

Table 01: Determining the study community

Figures	Statement	Number	Percentage
01	Senior management	2	2.5%
02	Middle management	9	11%
03	Administrative officials	15	19%
04	Technicians (engineers and technicians)	24	30%
05	Skilled workers	30	37.5%
Total		**80**	100

Source: made by the researchers

11. Study sample

The study focused on the strategic and technical aspects of the factory, as well as the relationship between the requirements of the factory's operations and its output. Therefore, researchers needed to use the exploratory method using the questionnaire form as a tool for data collection and adopting its results as input for statistical analysis. This requires that the participants (the data source) be sufficiently aware of the study's aspects and the data collection tool (questionnaire form). The participants (community members) are elements that are believed to possess information that may help solve the problem on the field and are likely to answer the questions being studied. The study sample represents (senior management, middle management, administrative officials, technicians and engineers, and skilled workers).Based on what was said, researchers used a sample size table according to (Secaran & Roger, 2010, p. 297) to determine the sample size for accuracy, The researchers distributed the questionnaires in the factory to all participants (80 participants), which was sufficient to address the problem of research, The sample size was calculated as shown in the table below:

Table 02: Sample size according to Sekaran

S	N
10	10
14	15
19	20
24	25
28	30
32	35
36	40
40	45

44	50
48	55
52	60
56	65
59	70
63	75
66	80
70	85
73	90
76	95
80	100
86	110
92	120

Source: (Secaran & Roger, 2010, p. 297)

Table 03: Study sample characteristics

Statement	Variable categories	Number	%	Statement	Variable category	Number	%
Gender	Male	45	56%	**Professional position**	Administrative agent	24	30%
					Head of service	02	03%
					Engineer	24	30%
	Female	35	44%		Professional agent	30	37%
Age	18-30 years old	16	20%	**Seniority years**	Less than 5 years	11	13%
	31-40 years old	31	38%		5 to 10 years	35	43%
	41-50 years old	29	36%		More than 10 years	34	44%
	More than 50 years	04	06%				
Social status	Single	09	11%				
	Married	69	86%				
	Divorced	02	03%				
Educational level	Primary school	-					
	Middle school	-					
	High school	16	20%				
	University	64	80%				

Source: Prepared by researchers drawing on the results of the Social Science Statistical Package (S.P.S.S., V/25)

The results of the descriptive analysis of the study sample according to its demographic characteristics show convergent ratios between males (56%) and females (44%).The participants had different ages where workers between 31 and 40 years old were the largest category by 38% of the study sample, followed by workers between 41 and 50 years old with 36%, while the percentage of youth was 20% of the study sample, The rest of the sample members were over 50 years old by 06%.With regard to the social status of the sample studied, most of the sample members were married by 86%. The remaining ratio was divided for singles by 11% and divorcees by 03%. Concerning the educational level, most of the participants had a university-level by 80% and high school level by 20%. Furthermore, the professional position of the sample members was convergent, including professional workers, administrative agents, and engineers at 37%, 30%, and 30%, respectively, while the ratio of heads of services was 03%. In addition, the table data also showed that 44% of the sample studied had more than 10 years of professional experience, 43% had experience between 05 and 10 years, and 13% had a professional experience of less than 05 years.

12. Statistical analysis methods

The researchers employed several methods in analyzing the variables of the study and the causal relationships between them, including: descriptive statistical analysis methods are represented by the arithmetic mean and standard deviation, as well as statistical analysis techniques to test correlation and effect hypotheses through the SPSS V25 program and structural equation modeling (SEM) using the AMOS V25 program.

13. Research hypotheses testing

This axis aims to identify the extent to which there is a correlation and an effect between the research variables and dimensions represented in the following: the independent variable (sustainable production), the mediator variable (dynamic capabilities), and the dependent variable (sustainable competitive advantage).Pearson correlation coefficient was used to test correlation relationships, and simple and multiple regression analysis was used to test effect relationships by the statistical program(Amos-v.25).

13.1. Testing the correlation relationships between research variables

13.1.1. First hypothesis (H1): (There is a morally significant correlation and effect relationship between sustainable production and sustainable competitive advantage).

To test the relationship between the two variables, the Pearson correlation coefficient will be used, This hypothesis has been subdivided into four sub-hypotheses that reflect the correlation relationships between the dimensions of sustainable production (product and service design, process design, respect for communities and employee appreciation, economic viability) and sustainable competitive advantage, Moreover, the statistical program (SPSS V.25) was used to extract the results, Table (04) presents the matrix of relationships between sustainable production and its dimensions and sustainable competitive advantage.

Table 04: Matrix of correlations between sustainable production and sustainable competitive advantage

	Independent variable	Mediator variable	Correlation coefficient	Significance level
1	product and service design	Competitive sustainable advantage	0.37	0.000
2	process design		0.21	0.093
3	respect for communities and employee appreciation		0.11	0.013
4	economic viability		0.39	0.000
Sustainable production			**0.41**	**0.000**

Source: Prepared by researchers drawing on the results of the Social Science Statistical Package (S.P.S.S., V/25)

According to the data of table (04), there is a correlation between the economic viability and the variable sustainable competitive advantage of (0.41), which is a positive and significant relationship based on the calculated level of significance (0.000), which is less than (5%).This hypothesis is accepted at the level of this research, based on these findings.

17.1.2. Second hypothesis (H2): (There is a morally significant correlation and effect between sustainable production and dynamic capabilities).

The Pearson correlation coefficient will be used to test the relationship between the two variables, This hypothesis was branched into four sub-hypotheses that reflect the correlations between the dimensions of sustainable production (product and service design, process design,

respect for communities and employee appreciation, economic viability) and dynamic capabilities, The statistical program (SPSS V.25) was used to extract the results, Table (05) presents the matrix of relationships between sustainable production and its dimensions and dynamic capabilities.

Table 05: Matrix of correlations between sustainable production and dynamic capabilities

	Independent variable	Mediator variable	Correlation coefficient	Significance level
1	product and service design	Dynamic capabilities	0.22	0.130
2	process design		0.56	0.000
3	respect for communities and employee appreciation		0.41	0.000
4	economic viability		0.36	0.000
Sustainable production			**0.69**	**0.000**

Source: Prepared by researchers drawing on the results of the Social Science Statistical Package (S.P.S.S., V/25)

According to the data of table (05), it was noted that there is a correlation between sustainable production and the dynamic capabilities variable of (0.69), which is a positive and significant relationship based on the calculated level of significance (0.000), which is less than (5%).According to these findings, this hypothesis is accepted at the level of this research.

13.1.3. Third hypothesis (H3): (There is a morally significant correlation and effect between dynamic capabilities and sustainable competitive advantage).

The Pearson correlation coefficient will be used to test the relationship between the two variables. Four sub-hypotheses were branched out of this hypothesis that reflect the correlations between the dimensions of dynamic capabilities (Sensing, acquisition, resource reconfiguration, learning, and coordination) and sustainable competitive advantage. The statistical program (SPSS V.25) was used to extract the results, Table (06) presents the matrix of relationships between dynamic capabilities and their dimensions and sustainable competitive advantage.

Table 06: Matrix of correlations between dynamic capabilities and sustainable competitive advantage

	Independent variable	Mediator variable	Correlation coefficient	Significance level
1	Sensing capabilities	Sustainable competitive advantage	0.44	0.000
2	Acquisition capabilities		-0.09	0.961
3	Resource reconfiguration capabilities		0.36	0.000
4	Learning capabilities		0.33	0.000
5	Coordination capabilities		0.30	0.000
Dynamic capabilities			**0.55**	**0.000**

Source: Prepared by researchers drawing on the results of the Social Science Statistical Package (S.P.S.S., V/25)

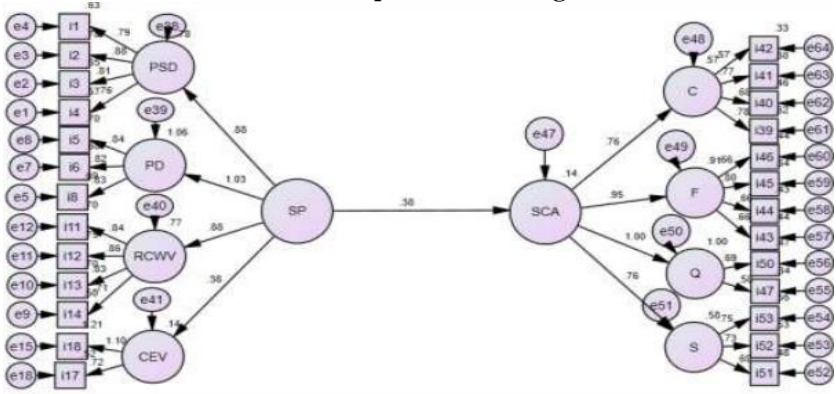
According to table (06), that there is a correlation between coordination capabilities and sustainable competitive advantage of (0.55), which is a positive and significant relationship based on the calculated level of significance (0.000), which is less than (5%).Based on these findings, this hypothesis is accepted at the level of this research.

13.2. Testing the effect relationships between research variables

13.2.1. First hypothesis (H1): (There is a morally significant correlation and effect relationship between sustainable production and sustainable competitive advantage).

It means that the sustainable competitive advantage is a real function of sustainable production, i.e., if the independent variable changes one unit, the dependent variable increases by the increase ratio, Four sub-hypotheses also emerged from this hypothesis that test the relationship between the dimensions of sustainable production (product and service design, process design, respect for communities and employee appreciation, economic viability in sustainable competitive advantage).The main hypothesis will be tested using the simple regression method, while the sub-hypotheses will be tested using the multiple regression method, as follows:

Fig 02: The regression coefficient of sustainable production on sustainable competitive advantage



Source: made by the researchers based on the outputs of Amos program V25

Table 07: Statistics to test the effect of sustainable production on sustainable competitive advantage

Independent variable	Dependent variable: sustainable competitive advantage				
	Estimates	Standard error	Criterion test	Determination coefficient R^2	Significance level
Sustainable production	0.38	0.091	4.176	0.14	0.000

Source: made by the researchers based on the outputs of Amos program V25

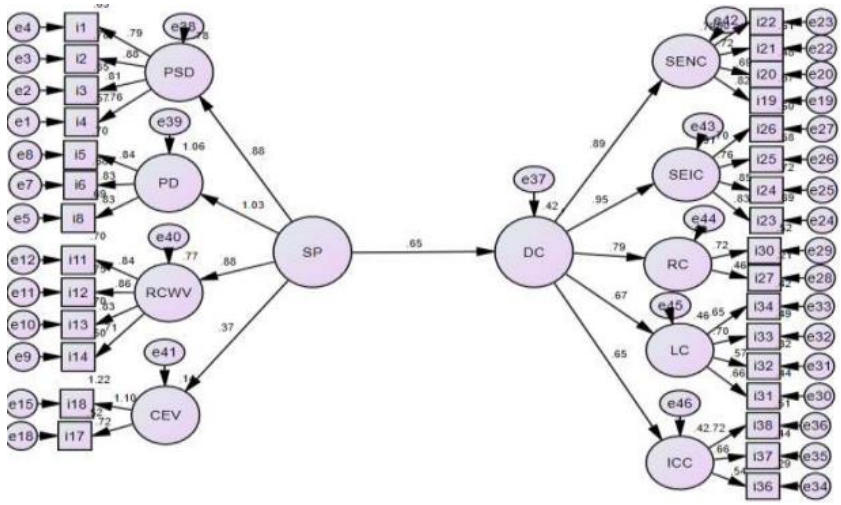
Table(07) and figure (02) show that there is an effect of the sustainable production variable on the sustainable competitive advantage variable of (0.38), It is a positive and significant relationship based on the calculated level of significance (0.000), which is less than (5%).This means that when sustainable production increases one unit, it leads to an increase in sustainable competitive advantage by (0.38), Sustainable production also explains the variation in sustainable competitive advantage according to the R^2 value (0.14), depending on which this hypothesis is accepted.

13.2.2. Second hypothesis (H2): (There is a morally significant correlation and effect relationship between sustainable production and dynamic capabilities).

It means that the sustainable competitive advantage is a real function of sustainable production, that is, if the independent variable changes one unit, the mediator variable increases by the increase ratio, This hypothesis also yielded four sub-hypotheses that investigate the relationship between the dimensions of sustainable production (product and service design, process design, respect for communities and employee

appreciation, economic viability in sustainable competitive advantage).The simple regression method will be used to test the main hypothesis, while the multiple regression method will be used to test the sub-hypotheses as follows:

Fig03: The regression coefficient of sustainable production on dynamic capabilities



Source: made by the researchers based on the outputs of Amos program V25

Table 08: Statistics to test the effect of sustainable production on dynamic capabilities

Independent variable	Dependent variable: dynamic capabilities				
	Estimates	Standard error	Criterion test	Determination coefficient R^2	Significance level
Sustainable production	0.38	0.091	4.176	0.14	0.000

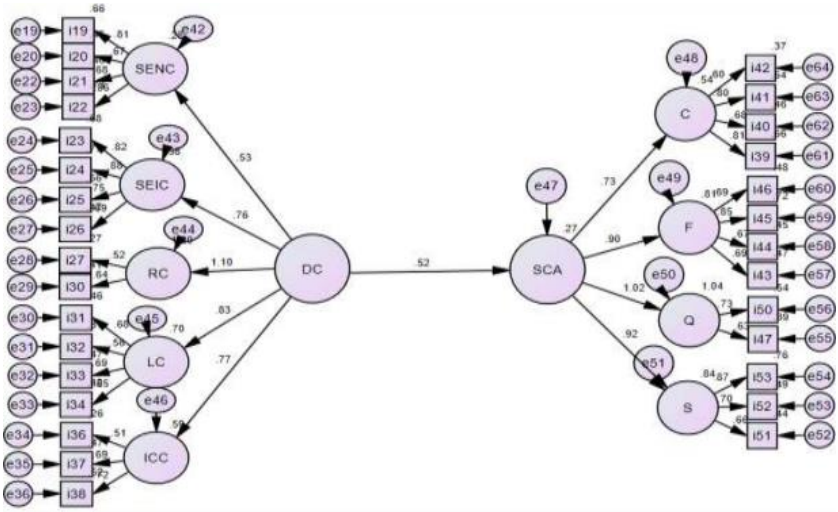
Source: made by the researchers based on the outputs of Amos program V25

It is noted from table (08) and figure (03) that there is an effect relationship between the variable of sustainable production and the variable of dynamic capabilities by(0.65), It is a positive and significant relationship based on the calculated level of significance (0.000), which is less than (5%).This means that when sustainable production increases one unit, it leads to an increase in dynamic capabilities by (0.42).Sustainable production also explains the variation in dynamic capabilities according to the R^2 value, which is acceptable because the calculated value of (F) reaching (13.75) is greater than its tabulated value of (4.00). Therefore, according to these findings, this hypothesis is accepted.

13.2.3. Third hypothesis (H3): (There is a morally significant correlation and effect between dynamic capabilities and sustainable competitive advantage).

It means that the sustainable competitive advantage is a real function of dynamic capabilities, i.e., if the mediator variable changes one unit, the dependent variable will increase by the increase ratio. Five sub-hypotheses also emerged from this hypothesis that test the relationship between the dimensions of dynamic capabilities(sensing capabilities, acquisition capabilities, resources reconfiguration capabilities, learning capabilities, and coordination capabilities in sustainable competitive advantage). The simple regression method will be used to test the main hypothesis, while the multiple regression method will be used to test the sub-hypotheses as follows:

Fig 04: The regression coefficient of sustainable production on dynamic capabilities



Source: made by the researchers based on the outputs of Amos program V25

Table 09: Statistics to test the effect of dynamic capabilities on sustainable competitive advantage

Mediator variable	Dependent variable: sustainable competitive advantage				
	Estimates	Standard error	Criterion test	Determination coefficient R^2	Significance level
Dynamic capabilities	0.52	0.038	13.720	0.27	0.000

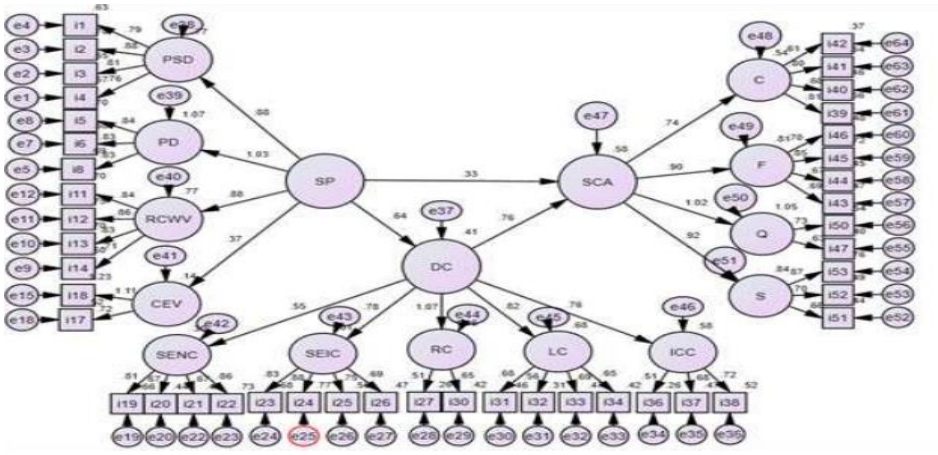
Source: made by the researchers based on the outputs of Amos program V25

According to table (09) and figure (03), the dynamic capabilities variable influences the variable of sustainable competitive advantage by (0.52).It is a positive and significant relationship based on the calculated level of significance (0.000), which is less than (5%).This indicates that when dynamic capabilities increase one unit, it leads to an increase in sustainable competitive advantage by (0.52).Furthermore, dynamic capabilities interpret the variation in sustainable competitive advantage (0.27)according to the R^2ratio, Therefore, according to these findings, this hypothesis is accepted.

13.2.4. Fourth hypothesis (H4): **(**There is a statistically significant multiple effect of sustainable production on sustainable competitive advantage through dynamic capabilities).

The direct relationship between sustainable production and sustainable competitive advantage has been tested. Also, the indirect effect of sustainable production on sustainable competitive advantage has been tested through dynamic capabilities.36 path analysis methods were mentioned, which included two steps; first: testing the indirect effect of the independent variable (sustainable production) on the dependent variable (sustainable competitive advantage) through the mediator variable(dynamic capabilities), where the indirect effect must be moral; second: the Bootstrapped Confidence Interval must be defined and does not intersect with zero, The test results are as in figure (05) and table (10):

Fig 05: The regression effect of sustainable production on sustainable competitive advantage through dynamic capabilities



Source: made by the researchers based on the outputs of Amos program V25

Table 10: The path analysis of effect relationship of sustainable production on sustainable competitive advantage through dynamic capabilities

Bootstrapped Confidence Interval		t-value	Standard deviation	Indirect Effect of the mediator variable (dynamic capabilities)	Path b (Effect of dynamic capacities on sustainable competitive advantage)	Path a (Effect of sustainable production on dynamic capabilities)
95% UL	95% LL	11.58	0.042	0.49	0.76	0.64

Source: made by the researchers based on the outputs of Amos program V25

It is noted from Table (10)that there is a direct relationship of (0.33) between sustainable production and sustainable competitive advantage, and an indirect relationship estimated at (0.49), showing the effect of the mediator variable (dynamic capabilities) that mediated the relationship between sustainable production and competitive advantage, This relationship was determined by path (a) between sustainable production and dynamic capabilities reaching (0.64), and path (b) that shows the effect relationship of dynamic capabilities on competitive advantage by(0.76).The calculated value of (T) for the indirect effect was (11.58), which is significant when compared to the tabulated(T)estimated at(1.96), Based on these results, this hypothesis is accepted at this research level.

14. CONCLUSION

In the light of all that has been presented in this study, it can be said that sustainable production is a radical shift in the logic of competition; from competition based on the economies of scales to flexibility and sustainability in products and processes, It has a vital and important impact in helping organizations to build their sustainable competitive advantage from the very outset and to carry out targeted activities and implement them with the required efficiency and effectiveness, This concept is of great interest to writers and researchers specializing in process management, as it is important in bringing organizations' activities into line with the requirements of economic, social, and environmental sustainability, We have reached several results, which represent the conclusion of this study:

- One of the studied factory's priorities was to reduce as much damage as possible to the environment (energy or waste) in the production process of sustainable products.

- The factory has not paid enough attention to market research, which is the building block for the survival and viability of the factory in the light of developments in the business environment as well as the expectations and aspirations of customers. The factory uses poor routine mechanisms to promote the products it offers, Although these products have a good reputation, they are processed on a narrow and limited scale, where most consumers are unaware of all its products.
- The results demonstrated a morally significant correlation and effect between sustainable production and dynamic capabilities at the macro-level or dimensions level. The value of the correlation between them was (0.69), and the value of the effect relationship was (0.65), which means that when sustainable production increases one unit, dynamic capabilities increase by the amount of the correlation and effect relationships above.
- At the macro- or dimensions-level, the findings revealed a morally significant positive correlation and effect between sustainable production and sustainable competitive advantage. The correlation between them was (0.41), while the effect relationship was (0.38),which means that when sustainable production increases one unit, sustainable competitive advantage increases by the amount of the correlation and effect relationships above.
- The results demonstrated a morally significant positive correlation and effect between dynamic capabilities and sustainable competitive advantage at the macro-level or dimensions level. The value of the correlation between them was (0.55), and the value of the effect relationship was (0.52), which means that when dynamic capabilities increase one unit, sustainable competitive advantage increases by the amount of the correlation and effect relationships above.
- There is a direct relationship between sustainable production and sustainable competitive advantage reached (0.33), and an indirect relationship that reached (0.49), showing the effect of the mediator variable (dynamic capabilities) that mediated the relationship between sustainable production and competitive advantage. This relationship was determined by path (a) between sustainable production and dynamic capabilities reaching (0.64), and path (b) that shows the

effect relationship of dynamic capabilities on competitive advantage by (0.76).

Based on these findings, we can make a set of recommendations that would improve the role of sustainable production in achieving sustainable competitive advantage through dynamic capabilities:

- The need for the factory in question to develop a set of criteria to assess its environmental performance in accordance with the criteria applied by successful and globally distinguished factories in support of environmental resilience.
- Provide clear measures of emission levels, eliminate environmental pollution and create a relative balance between factory activities and sustainability requirements, as well as to take into account the raising of working people's living standards and the creation of employment opportunities for the unemployed, particularly in the surrounding society, and the need for the manufacturer to do business in accordance with the principle of maximization of profits.
- In order to contribute to enhancing the position and image of the factory in question, increased attention should be paid to sustainable production by establishing ongoing training courses for working individuals and guiding them towards research and development, as well as promoting their culture of innovation in order to sensitize working individuals to adopt the concept of sustainable production through their knowledge of aspects that support the orientation towards sustainable products and processes, The senior management of the factory must clearly formulate the vision and adhere to strategic objectives towards the successful implementation of sustainable production.
- The factory must develop and support the knowledge bases of the senior management, especially those relating to strategic planning, marketing, dynamic capabilities practices, as well as developing and rehabilitating middle management in a manner appropriate to the future of the factory, as this has a direct impact on its performance, This is achieved through the establishment of communication channels with academic institutions, whether universities or research centers, to learn what is new, as well as by opening more of those channels with competitors, stakeholders, and clients to gain more opportunities and share information.

- The manufacturer should concentrate on market research, ongoing competitive analysis, and competition readiness, for example, through field studies and the distribution of regular questionnaires to clients to obtain their feedback on the products provided to them, Then, the factory should study these views, develop positive aspects, and address existing shortcomings according to their views, as well as organize periodic meetings with clients to strengthen their relationship, identify and ensure the future needs and expectations of customers, which will have an impact on their satisfaction and achieve value for the products they offer, thus placing the factory in the most distinctive market position.
- Form a specialized unit or center to undertake an integrated study of looming risks and threats, as well as monitor changes affecting its activities and then assist managers in making appropriate decisions about those risks and changes in order to achieve stability and enhance the flexibility needed to restructure assets and processes in a strategic manner that is adapted to the changes required, and finally focus on building a supportive organizational culture for timely change.

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