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| RESEARCH ARTICLE

Advanced Systems of Planning and Scheduling and the Limitations of their Implementation: A Study Case of Al kufa Old Cement Factory

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| ABSTRACT
The present study is based on research and investigation into planning and scheduling systems as a basic variable and the limitations of applying planning and scheduling systems as a dependent variable to investigate the most important obstacles that prevent their application due to the development of the technology in planning and scheduling systems in addition to the advances in the algorithms of optimization by using a computer to make most of the routine decisions and using interactivity to send the information and the real understanding of the efficiency of the planners. And by changing the competition between the manufacturing companies around the world, as well as the relationships between these companies, suppliers, and customers. Supply chain management has greatly reduced the planning problem, and the concepts of flexible production have contributed to changing the relationship between suppliers and consumers at every link in the supply chain. This was done through a questionnaire that was distributed to the company's management to investigate the extent to which this factory benefits from these modern systems, the obstacles that curb applying these systems in this factory, and the extent to which this industrial factory seeks to obtain modern systems, to cope with development, and be able to improve their performance, which will contribute to increasing their efficiency and ability to compete in the labor market.

| KEYWORDS

Systems of planning and Scheduling, Obstacles of Implementation.

| ARTICLE INFORMATION

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1. Introduction

1.1 Advanced Planning and Scheduling Systems

Nowadays, the environment of business is extremely competitive, and manufacturing companies are starting to recognize the importance of manufacturing strategy in their business (Amin-Naseri & Afshari, 2012) (Wen et al., 2022) and are increasingly facing external pressures to improve customer response time. (Patrick Esquirol et al., 1999) Increasing product offers and managing the fluctuations of demand at competitive prices in order to meet these challenges. This factory often finds itself in situations of severe shortages of some products and, in return, has surplus stocks of other products (Madhi, 1999). This, in turn, raises the issue of finding the right balance between reducing costs and maintaining responsiveness to customers and the factory, which faces internal pressures to increase profitability through improved manufacturing efficiency and reduction in operational costs. (Ramin et al., 2022; Khaleel, Adzman, Zali, et al., 2021). Production planning and scheduling are considered significant factors in reducing operating costs, improving customer service, and making optimal use of resources. Significant savings have been achieved using production planning and scheduling in the high operational costs incurred by companies through the application of optimization based on the production planning system Abduesslam. et al., 2014). In this context, advanced planning and scheduling can be defined as a system and methodology for decision-making and simultaneous coordination between different departments within a single laboratory or between laboratories as a group to achieve optimal independence (Li-Chih et al., 2021). Michel Pinedo also believes that scheduling is concerned with allocating a group of limited resources from activities or work during a specific period

of time. He also believes that it expresses a decision-making process aimed at achieving one or more goals within the facility, and it is present in most productive organizations, just as in other fields and service domains such as transportation, automated information and others. (Michel Pinedo, 2000). Dr. Farid Abdel Fattah Zein Al-Din also defined scheduling as deciding when and where each of the operations necessary to produce the good or complete the service is performed and specifying the times in which each activity or each required process begins or is completed (Farid Abdel Fattah, 1997)

***1.2 Significance of Scheduling**:*

Control is considered the basic activity for running the management of operations because it deals with the timing of production activity and various activities in industrial organizations. Scheduling usually focuses on the time allocation of production resources, including human resources, warehouse assets, production and service capacities, and others. The kinds and sorts of operations directly affect the different scheduling activities. (Mohamed Al-Ezzawi, 2006). Scheduling activities are based on planning activities and production processes in the medium and short range, which support the decision-making process related to both strategic planning and interim planning in the production factory. (Abdel Sattar, 2007) states that scheduling is nothing but a set of phased plans for operations that are interconnected with each other and directed at identifying the production and service activities that support these operations in workshops and production stations. Therefore, scheduling determines precisely what work and operations must be completed by workers, stations, and production workshops to achieve the goal of the detailed plan at that production stage. (Ali Hadi Jibreen, 2006) It is known that production management seeks to achieve the highest level of production efficiency, which is a goal that can be achieved through several factors such as good organization of the production method, precise definition and good definition of the products to be produced, etc. (Mohamed Saleh, 1999).

1.3 Objectives of Scheduling:

Scheduling objectives differ based on the various objectives of organizations, whether industrial or service and also vary according to the production systems they adopt for efficient scheduling organizations to achieve the following (Ibrahim Hamimi, 1975; Ahmed Sayed Mustafa, 1998):

a) Product development

b) Developing production methods

c) Increase production

d) Improving workers' performance

While (Ikram Chakra, 1973, Bougherra Rabeh, 2009, Jamil Ahmed Tawfiq, 1978) agreed on the above mentioned goals.

***1.4 Research Methodology**:*

The general framework of the methodology used in the field study includes a set of steps represented in the study hypotheses, defining the study population and sample, means of obtaining data, and statistical approaches employed in analyzing the data and examining the hypotheses.

1.5 Research Hypotheses:

The study is based on testing the following hypothesis:

-Industrial laboratories are not interested in applying advanced planning and scheduling systems.

- Advanced planning and scheduling systems are applied in the laboratory to a limited extent.

-There is a technical gap (obstacles) in terms of using technologies for advanced planning and scheduling systems.

***1.6 Research Community and Sample**:*

The study community consists of leaderships in senior management, departments, and units at the old Kufa Cement Factory. They were chosen because they are concerned with decision-making and implementation. As for the study sample, it is a stratified random sample from all departments in the laboratory under study, which is related to the variables of the study, which are represented by the departments (senior management - production department - planning and follow-up department - purchasing department - technical affairs department - marketing (commercial) department - warehouse management - management) Training - Documentation and Information Management - Contracts Management).

2. The Tool of Search:

The questionnaire was prepared (a copy of the questionnaire is attached in the appendix) to be a tool through which to survey the opinions of officials in the departments of the laboratory under study regarding advanced planning systems and the obstacles to

their application as a case study. In formulating the questionnaire, care was taken to avoid ambiguity as much as possible to make it easier for the sample members to fill out. The questionnaire was divided into two main parts:

The first part of the questionnaire includes general data about the study sample members, which are: (practical experience, academic qualification, job, workplace in the laboratory, job relationship to planning), and it consists of 11 items.

The second part of the questionnaire includes the basic variables of the study and consists of 31 items divided into two axes. Table (1) shows the axes of the questionnaire in its final form and the number of statements for each axis. 55 questionnaires were distributed to the sample members, and 50 of them were relied upon.

Table (1): Questionnaire axes and number of statements for each axis

Axis	Number of Items
The interest of laboratory in advanced planning and scheduling systems	**14**
Implementing planning systems and their effectiveness in the laboratory	**17**
Total	**31**

A three-response Likert scale was adopted, as the three-response Likert scale was used to measure the degree of agreement of the respondents on certain items. The three-response scale is: Agree (Neutral) Disagree (1) (2) (3) *, and the value that "Agree" takes is (3).) The value taken by "neutral" is (2), and the value taken by "disagree" is (1).

2.1 Statistical Methods Employed in the Study:

The responses of the sample members to the questionnaire items were analyzed using the statistical program (SPSS). The following statistical methods were used:

a). Frequency tables and percentages.

b) Cronbach's alpha correlation coefficient was used to verify the stability of the study tool.

c). Calculating the total and average of each axis of the questionnaire.

d). Calculating the weighted average of the sample's answers to the questions.

e). T-test to test the sample members' answers to the study items.

f). One-way analysis of variance to reveal the significance of the differences between the responses of sample members. g). A three-point Likert scale was adopted to determine the importance of each item in the questionnaire. An ordinal scale was also developed for these scores to give the arithmetic mean a meaning using the ordinal scale of importance in order to benefit from it later when analyzing the results, as shown in the table.

Table (2) shows the Likert scale and degrees of importance for each item in the questionnaire.

Phrase	Disagree	Agree to Some Extent	Agree
Degree	**1**	**2**	**3**
Estimated average	**1.66-1**	**2.33- 1.67**	**3.00- 2.34**

Data Analysis and Testing of Research Hypotheses:

This part of the study deals with the analysis of data obtained from the study participants, using statistical methods and hypothesis tests necessary to achieve the objectives of the study.

2.2 Characteristics of the research sample*:*

To know the characteristics of the study population, the frequency distribution of the study sample members was obtained according to some personal characteristics of the members of the sample.

Qualification:

Table (3) Frequency distribution of members of the sample according to academic qualification:

Qualification	Number	Percentage %
Bachelors	**3**	**6.0**
Diploma	**44**	**88.0**
Masters	**3**	**6.0**
Total	**50**	**100**

In Table 3, one observes that (88.0%) are bachelor's holders, and the rest of the percentage is equally divided between master's and higher diploma holders, and they are the closest to understanding and applying modern systems, both in their field of work, and this gives the laboratory room to benefit from modern technologies.

2.3 Years of Experience:

Table (4) Frequency distribution of sample members according to experience

Experience in Years	Number	Percentage %
Lesser than 5 Years	**0**	**0**
5-9 Years	**3**	**6.0**
10-14	**9**	**18.0**
More than 15	**38**	**76.0**
Total	**50**	**100%**

In Table (4) one observes that (76.0%) are those who have more than (15) years of experience, and (18%) are those who have more than (10) years of experience, and this is an indicator that indicates that the highest percentage of the sample has Experience is a good support to increase the strength of the information obtained.

2.4 The Current Occupation

Table (5): Frequency distribution of sample members based on job.

Occupation	Number	Percentage %
Management Council	**2**	**4**
General Manager	**12**	**24**
Department Manager	**27**	**54**
Head of Department	**7**	**14**
Head of Unit	**2**	**4**
Total	**50**	**100**

Table (5) shows that the highest percentage of the study sample (54.0%) are department managers, and this is an indication that those targeted by the sample are those who make decisions in the laboratory under study and are influential in the laboratory, and this job is considered a link between the upper level the lower level of management.

***2.5 Laboratory workplace**:*

Table (6) Frequency distribution of sample members by place of work

Place of Works	Number	Percentage %
The higher management	3	6
Planning Management	4	8
Production Management	14	28
Purchases Management	3	6
Technical Affairs Management	7	14
Marketing Management	10	20
Storages Management	2	4
Training management	2	4
Documentation Management	2	4
Contracts Management	3	6
Total	50	100

From Table (6), we notice that the largest percentage (28.0%) who are employees of Production management, followed by the percentage (20.0%) of employees in Marketing management, then (14.0%) who are employees of Technical Affairs Management, followed by Planning management with a percentage of 8.0%). These managements have a direct relationship with the application of advanced planning and scheduling systems.

2.6 Validity and reliability of the tool:

1- Validity of the tool:

What is meant is that the scale measures what it was designed to measure, and to verify the level of validity of the content of the study tool, it was presented to a number of experienced and specialized arbitrators. Then, take their notes until they reach their final form.

2-Stability of the tool

It means that the scale is stable and does not contradict itself, meaning that the scale gives the same results with a probability equal to the laboratory value if it is re-applied to the same sample. Accordingly, to verify the stability of the tool, a reliability test was conducted using Cronbach's alpha coefficient for internal consistency, the value of which ranges between zero and the correct one. The greater its value and the closer it is to the correct one, the greater the reliability of the data in reflecting the results of the sample on the study population.

3 - Cronbach's Alpha Coefficient:

It is a measuring coefficient or indicator of the reliability of the test and the questionnaire. Credibility and stability are considered among the most important topics of interest to researchers in terms of their significant impact on the importance of the research results and their ability to generalize the results. Credibility and stability are related to the tools used in the research, their ability to measure what is being measured, and the accuracy of the readings taken from those tools. In order to detail this, we explain below what is meant by these expressions. The reliability coefficient for the total number of items in the questionnaire reached (0.89), which is an appropriate value that confirms that the questionnaire has a very high degree of reliability that can be relied upon in the field application of the study. The following table summarizes the results of the stability study for each axis of the questionnaire:

Table (7) Cronbach's alpha coefficient:

Axis	**Number of Phrases**	**Stability**	**credibility**
Attention to using Planning Systems and Advanced Scheduling	**14**	**0.69**	**0.83**
The Impact of using Planning Systems on the Effectiveness of the factory	**17**	**0.85**	**0.92**
Total of Items	**31**	**0.88**	**0.94**

3. Analysis of Opinions of the Study Sample

3.1 The extent of interest of the laboratory in the advanced systems of planning and scheduling.

To determine the results of the answers of the study sample members about the extent of the laboratory's interest in advanced planning and scheduling systems, percentages, arithmetic averages, and standard deviations were extracted for the items related to this aspect.

Items	I don't agree to some extent	Agree	Totally Agree	Estimated Average	Deviation Coefficient	Direction
	No.	No.	No.			
	%	%	%			
1-The Higher management is well aware of the importance of the planning systems	**10**	**01**	**02**	**2.20**	**0.76**	**Agree to some extent.**
	20.0	**.040**	**.400**			
2-The organizational structure and staffing of the laboratory take into account the requirements of modern planning systems applications	**15**	**8**	**27**	**2.27**	**0.76**	**Agree to some extent.**
	30.0	**16.0**	**54.0**			
3- Improving the information system is considered an important support for the planning system.	**4**	**2**	**44**	**2.80**	**0.57**	Totally Agree
	8.0	**4.0**	**88.0**			
4-For Specialized training and education it is considered supportive of the planning system.	**5**	**3**	**42**	**2.74**	**0.63**	Totally Agree
	10.0	**6.0**	**84.0**			
5-The factory provides financial support for planning systems.	**3**	**9**	**38**	**2.70**	**0.58**	Totally Agree
	6.0	**18.0**	**76.0**			
6-The laboratory provides the appropriate infrastructure for the planning system to operate	**5**	**13**	**32**	**2.54**	**0.68**	Totally Agree
	10.0	**26.0**	**64.0**			
7-The factory tries through applying the advanced	**3**	**5**	**42**	**2.78**	**0.55**	Totally Agree
	6.0	**10.0**	**84.0**			

systems of planning and scheduling to increase its competitive ability						
8-The factory cares for customers' desires to support its financial status in market	**3**	**7**	**40**	**2.74**	**0.56**	Totally Agree
	6.0	**14.0**	**80.0**			
9-The factory collect information about the competitors and study the power and weakness in them.	**12**	**9**	**29**	**2.18**	**0.77**	Totally Agree
	24.0	**18.0**	**58.0**			
10-The factory adheres to the specified dates for delivering products to customers.	**8**	**6**	**36**	**2.56**	**0.76**	Totally Agree
	16.0	**12.0**	**72.0**			
11-The factory uses systems to determine material requirements	**3**	**21**	**26**	**2.46**	**0.61**	Totally Agree
	6.0	**42.0**	**52.0**			
12-The factory uses project resource identification systems	**6**	**22**	**22**	**2.06**	**0.77**	Agree to some extent.
	12.0	**44.0**	**44.0**			
13-The factory uses just-in-time systems	**10**	**24**	**16**	**2.12**	**0.72**	Agree to some extent.
	20.0	**48.0**	**32.0**			
14-The factory is successful in managing supply chains.	**22**	**9**	**19**	**1.94**	**0.91**	Agree to some extent.
	44.0	**18.0**	**38.0**			
Total (The extent of interest in Planning and scheduling Systems by the Factory)				**2.07**	**0.5**	Agree to some extent.

It is noted from the table that the overall average of the items related to the extent of interest of the factory under study in applying advanced planning and scheduling systems was (2.07), which is a limited degree of agreement, indicating that there is not sufficient interest on the part of the factory under study in applying advanced planning and scheduling systems. When looking at the paragraphs related to the extent of interest of the laboratory under study in applying advanced planning and scheduling systems in the laboratory, each paragraph separately, we find that their arithmetic averages for the responses of the sample members to these paragraphs range between (1.94 - 2.80). There was complete agreement on paragraphs (3 - 7 - 4 - 8 - 5 - 10 - 6 - 11 - 9), in order of importance with arithmetic averages (2.8 - 2.78 - 2.74 - 2.74 - 2.70 - 2.58 - 2.54 - 2.46 - 2.18) on respectively, which confirms that these aspects receive great attention from this factory under study, while there was limited agreement on items (14 - 2 - 1 - 13 - 12), respectively, in order of importance, with arithmetic averages (2.24 - 2.20 - 2.07 - 2.06 - 1.94).) Respectively, which requires the factory to pay more attention to these aspects of information - training - financial support - infrastructure -

attention to customers' desires - collecting information on strengths and weaknesses - and delivering products to customers on specific dates).

It also uses systems for determining material needs, which are modern systems and are considered a step towards using advanced planning and scheduling systems. It is noted in Table No. (8) that in items 1 and 2, which are related to the extent of the laboratory's awareness of advanced planning and scheduling systems and the extent of their use, we find that approval is limited on the questions under study require the factory to pay more attention to these systems. Also, in items (13.12), which were about using enterprises resource identification systems and just-in-time systems, we find that they came with limited approval, and this indicates that the organization does not pay enough attention to these modern systems, and in item (14), which aims to know the extent of the factory's success in managing chains. Supply also came with limited approval, and this is an indication that the factory should pay more attention to supply chain management.

3.1 The Extent of the Impact of Planning Systems on the Activity of the Factory:

To determine the results of the answers of the study sample members about the extent of the impact of planning systems on the activity of the factory, the arithmetic means and standard deviations were extracted for the items related to this aspect, as shown in the following table:

(Table 9) Sample responses about the extent of the impact of planning systems on the effectiveness of the factory, shown by arithmetic means and standard deviations:

Items	I don't agree to some extent	Agree	Totally Agree	Estimated Average	Deviation Coefficient	Direction
	No.	No.	No.			
	%	%	%			
1-The laboratory has a special department for logistical support.	**26**	**3**	**21**	**1.90**	**0.97**	**Agree to some extent.**
	52.0	**6.0**	**42.0**			
2-Senior management carefully deals with recurring variables in planning	**25**	**8**	**17**	**2.16**	**0.91**	**Agree to some extent**
	50.0	**16.0**	**34.0**			
3-Senior management supports the Planning management to have a prominent role in managing all production and distribution centers.	**17**	**8**	**25**	**2.16**	**0.91**	**Agree to some extent.**
	34.0	**16.0**	**34.0**			
4-The laboratory obtains comprehensive and accurate information as a result of applying advanced planning and scheduling systems.	**22**	**9**	**19**	**1.94**	**0.91**	**Totally Agree**
	44.0	**18.0**	**38.0**			

5-The factory obtains better flexibility by applying advanced planning and scheduling systems.	**19**	**10**	**21**	**2.04**	**0.90**	**Agree to some extent.**
	38.0	**20.0**	**42.0**			
6-The laboratory adopts an effective strategy to control the implementation of advanced planning and scheduling systems	**14**	**13**	**23**	**2.18**	**0.85**	**Agree to some extent.**
	28.0	**26.0**	**64.0**			
7-Implementing advanced planning and scheduling systems in the laboratory reduces stopping and waiting times.	**12**	**12**	**26**	**2.28**	**0.83**	**Agree to some extent.**
	52.0	**24.0**	**24.0**			
8-Implementing advanced planning and scheduling systems in the laboratory results in better resource planning.	**13**	**11**	**26**	**2.26**	**0.85**	**Agree to some extent.**
	26.0	**22.0**	**52.0**			
9-Applying the systems of planning and scheduling enables the factory to reduce the storage.	**17**	**17**	**16**	**1.98**	**0.82**	**Agree to some extent.**
	34.0	**34.0**	**32.0**			
10-Applying the systems of planning and scheduling results in increase in sales.	**19**	**13**	**18**	**1.98**	**0.87**	**Agree to some extent.**
	38.0	**26.0**	**36.0**			
11- Applying the systems of planning and scheduling results in a better prediction of future.	**17**	**13**	**20**	**2.06**	**0.87**	**Agree to some extent.**
	34.0	**26.0**	**40.0**			
12-Applying advanced planning and scheduling systems gives the factory a competitive advantage	**4**	**3**	**43**	**2.78**	**0.58**	**Totally Agree**
	8.0	**6.0**	**86.0**			
13-Implementing advanced planning and scheduling systems helps the factory coordinate between units.	**4**	**0**	**46**	**2.84**	**0.55**	**Totally Agree**
	8	**0**	**0.92**			
14-Implementing advanced planning and scheduling systems helps the factory to accurately deliver products.	**2**	**1**	**47**	**2.90**	**0.42**	**Totally Agree**

	4.0	**2.0**	**94.0**			
15-Implementing advanced planning and scheduling systems helps the factory ensure customer satisfaction with the products.	**4**	**5**	**41**	**2.74**	**0.60**	**Totally Agree**
	8.0	**10.0**	**82.0**			
16-Implementing advanced planning and scheduling systems helps the laboratory give management and workers flexibility in implementing...	**9**	**4**	**37**	**2.56**	**0.79**	**Totally Agree**
	18.0	**8.0**	**74.0**			
17-The application planning and scheduling systems that are applied in the factory contribute to have a big share as compared with the competitors	**7**	**6**	**37**	**2.60**	**0.73**	**Totally Agree**
	14.0	**12.0**	**74.0**			
Total (the extent of the impact of the planning systems on the effectiveness of the factory).				**2.25**	**0.63**	Agree to some extent.

It is noted in Table No. (9) that the overall average of these items related to the extent of the impact of planning systems on the effectiveness of the factory was (2.25), which is a limited degree of agreement, indicating that there is a limited impact of planning systems on the effectiveness of the factory. Looking at the arithmetic averages of the items related to the extent of the impact of planning systems on the effectiveness of the factory individually, we find them ranging between (1.90 - 2.90); there is complete agreement on the items. (14 - 13 - 12 - 15 - 17 -16) They are arranged in order of importance with arithmetic averages respectively (2.90 - 2.84 - 2.78 - 2.74 - 2.60 - 2.56), while we find limited agreement on items (7 - 8 - 6 - 2 - 3 - 11 - 5 - 9 - 10 - 4 - 1), arranged in order of importance with arithmetic averages respectively (2.28 - 2.26 - 2.18 - 2.16 - 2.16 - 2.06 - 2.04 - 1.98 - 1.98 - 1.94 - (1.90). It is also noted from Table (12) that paragraphs (1-11) all came with limited approval, and they are paragraphs related to the extent of the interest of the factory in advanced planning and scheduling systems and the extent to which the factory supports these systems and develops an appropriate infrastructure for them in a way that positively affects the effectiveness of the laboratory, and these answers reflect The factory's senior management must pay more attention to developing plans and mechanisms to ensure the application of advanced planning systems in the laboratory to ensure increased effectiveness. And develop a clear strategy for implementing these systems. As for items (12 - 17), they received complete approval from the sample members, in which the respondents agreed on the extent of the benefit derived from applying advanced planning and scheduling systems, which brings benefit and profit to the factory.

3.2 Definition of Analysis of Variance (ANOVA) test

Analysis of variance (ANOVA) is a set of statistical models with two accompanying procedures that enable the comparison of means for different statistical populations by dividing the total variance observed between them into different parts.

3.3 One-way Analysis of Variance (one-level):

It is a method of testing the significance of the difference between the means of several samples with a single comparison. It is also known as a method that divides the total differences of a set of experimental observations into several parts to identify the source of the difference between them.

The level of significance is the probability of rejecting the null hypothesis while it is true. It is symbolized by the Latin symbol alpha (▪). The two most famous values for the level of significance are (1% and 5%), but there is nothing preventing it from taking other values, i.e. The last level of significance is the complement of the degree of confidence, meaning that their sum equals 100% or one true. If the degree of confidence is 95%, then the level of significance is equal to 5%, and vice versa. If the level of significance

is 5%, this means that the degree of confidence is 95%. The same applies when testing the hypothesis by dividing the area under the curve is divided into two regions:

One of them is called the acceptance zone, meaning the zone of acceptance of the null hypothesis, and the other is called the rejection zone, or the critical zone. Here, the acceptance zone represents the degree of confidence, while the rejection zone represents the level of significance. When we accept the null hypothesis, the test is not significant, meaning that the significance level is greater than or equal to 0.05, and when we reject the null hypothesis, the test is significant, meaning that the significance level is less than 0.05.

3.4 Testing research hypotheses

3.4.1 Testing the first hypothesis

To verify the validity of the hypothesis regarding the extent of the laboratory's interest in advanced planning and scheduling systems, the researcher, using the SPSS statistical program, conducted a t-test, and the results were shown in the following table:

Table (10) t-test of the sample members' answers about the factory's interest in advanced planning and scheduling systems.

Items	Average	T Value	Deviation	Level of Sig.	Results of Test
1- High management is well aware of the importance of planning systems.	**2.20**	**0.76**	**1.871**	**0.067**	Non-sig.
2-The organizational structure of the factory takes into account the applications of modern planning systems	**2.24**	**0.89**	**1.899**	**0.063**	Non-sig.
3-The factory works to improve the information system that supports the planning system	**2.80**	**0.57**	**9.899**	***0.000**	Sig.
4-The factory is concerned with specialized training and education on planning systems.	**2.74**	**0.63**	**8.269**	***0.000**	Sig.
5-The factory provides financial support for planning systems.	**2.70**	**0.58**	**8.530**	***0.000**	Sig.
6- The factory provides the appropriate infrastructure for the planning system to function.	**2.54**	**0.68**	**5.645**	***0.000**	Sig.
7- By applying advanced planning and scheduling systems, the factory seeks to increase its competitiveness.	**2.78**	**0.55**	**10.111**	***0.000**	Non-sig.
8-The factory cares about customers' desires and understands them to support its financial position in the market	**2.74**	**0.56**	**9.268**	***0.000**	Non-sig.
9-The factory collects information about competitors and studies their strengths and weaknesses	**2.18**	**0.77**	**1.644**	**0.107**	Non-sig.
10 -The factory adheres to the specified dates for delivering products to customers.	**2.56**	**0.76**	**5.209**	***0.000**	Sig.
11-The factory uses systems to determine material needs	**2.46**	**0.61**	**5.305**	***0.000**	Sig
12-The factory uses enterprise resource identification systems.	**2.06**	**0.77**	**0.553**	**0.583**	Non-sig.
13-The factory uses just-in-time systems.	**2.12**	**0.72**	**1.181**	**0.243**	Non-sig.

14-The factory is successful in managing supply chains.	**1.94**	**0.91**	**0.465-**	**0.644**	Non-sig.
Total (the extent to which planning systems affect the effectiveness of the factory)	**72.0**	**60.5**	**880.0**	**3830**	Non-sig.

In addition to using frequency distribution and weighted average to identify the extent of the factory's interest in advanced planning and scheduling systems, a t-test was used to test the following hypothesis:

Null hypothesis (H0): The laboratory does not care about applying advanced planning and scheduling systems.

Alternative hypothesis (H1): The factory is interested in applying advanced planning and scheduling systems.

Through the results shown in Table (10), we note that all the (t) values calculated for items (3-4-5-6 -7 8-10-11) at a significance level (0.05=٠) are statistically significant at a significant level. (p- Value< 0.00)

As for the rest of the items at a significance level (٠=0.05), they are not statistically significant at a significance level (p- value< 0.00)

As for the rest of the items at the level of significance (٠=0.05), they are not statistically significant at the level of significance (p- Value< 0.00). In general, and by testing the total items that relate to the extent of the laboratory's interest in applying advanced planning and scheduling systems, we note that the value of the calculated (t) test reached t=0.88, which is not statistically significant at a level less than (0.05) (p- Value< 0.05). Therefore, the null hypothesis is accepted, which means that there is not sufficient interest on the part of the laboratory in applying advanced planning and scheduling systems.

Testing the second hypothesis

- Null hypothesis (H0): There is no statistically significant effect of applying planning systems on the effectiveness of the factory

- **Alternative hypothesis** (H1): There is a statistically significant effect of implementing systems

Testing the second hypothesis

- **Null hypothesis** (H0): There is no statistically significant effect of applying planning systems on the effectiveness of the factory

- Alternative hypothesis (H1): There is a statistically significant effect of implementing systems

Table (11) t-test of the sample members' answers about the impact of planning systems on the effectiveness of the factory:

Items	**Average**	**T Value**	**Deviation**	**Level of Sig.**	**Results of Test**
1- There is a special department in the factory for logistic support	**1.90**	**0.97**	**0.726-**	**0.471**	Non-Sig.
2-Senior management carefully deals with recurring variables in... Planning.	**1.84**	**0.91**	**1.241-**	**0.220**	Non-Sig.
3-The administration supports the Planning Department to have a prominent role in the management All production and distribution centers.	**2.16**	**0.91**	**1.241**	**0.220**	Non-Sig.
4- The factory obtains comprehensive and accurate information as a result of applying planning systems.	**1.94**	**0.91**	**0.465-**	**0.644**	Non-Sig.
5-The laboratory obtains better flexibility by implementing systems Planning.	**2.04**	**0.90**	**0.313**	**0.755**	Non-Sig.

6-The laboratory adopts an effective strategy to control the implementation of planning systems.	**2.18**	**0.85**	**1.498**	**0.141**	Non-Sig.
7- Applying planning systems in the laboratory reduces stopping and waiting times.	**2.28**	**0.83**	**2.374**	**0.022**	Sig.
8-Implementing factory planning systems results in better resource planning.	**2.26**	**0.85**	**2.156**	**0.036**	Sig.
9-Implementing planning systems enables the factory to reduce inventory, strengths and weaknesses	**1.98**	**0.82**	**1.644**	**0.864**	Non-sig.
10 - Implementing factory planning systems results in greater sales.	**2.56**	**0.87**	**0.163-**	**0.871**	Non-sig.
11-Applying laboratory planning systems results in better prediction In the future.	**2.06**	**0.87**	**0.489**	**0.627**	Non-sig.
12- Implementing planning systems gives the factory a competitive advantage.	**2.78**	**0.58**	**9.482**	**0.000**	Sig.
13-Implementing planning systems helps the laboratory coordinate between units.	**2.84**	**0.55**	**10.837**	**0.000**	Sig.
14-Implementing planning systems helps the factory to accurately deliver products.	**2.90**	**0.42**	**15.280**	**0.000**	Sig.
15-Implementing planning systems helps the factory ensure customer satisfaction with the products.	**2.74**	**0.60**	**8.726**	**0.000**	Sig.
16- Applying Planning Systems helps the factory to give the management and the workers enough flexibility	**2.56**	**0.79**	**5.034**	**0.000**	Sig
17-The application of planning systems in the laboratory contributes to its obtaining a large share compared to competitors.	**2.60**	**0.73**	**5.824**	**0.000**	Sig.
Total: The impact of planning systems on the effectiveness of the laboratory	**2.25**	**0.63**	**2.793**	**0.007**	Sig.

It is noted from the results shown in Table (11) that all t values calculated for Items (7-8-12-14 - 15 – 16)

At a significance level(▪=0.05) it is statistically significant at a significance level of (0.05)<value - p), which indicates that the average degree of response to these items exceeds the degree of neutrality, which is 2, and this means that there is agreement by the sample members on these items that It has an impact on the effectiveness of the factory. While we note that the paragraphs (1-2-3-4-5-6-9-10-11) at the level of significance) (▪=0.05) are not statistically significant at the level of significance (p-value<0.05), which means that it is not. There is an agreement among the sample members on the impact of these paragraphs on the effectiveness of the laboratory. In general, when testing the total number of items related to the impact of planning systems on the effectiveness of the laboratory, it is noted that the calculated t-test value reached (t = 2.793), which is statistically significant at a level less than (p-value<0.05) 0.05; therefore the null hypothesis is not accepted, which means that there is an impact of planning systems on the effectiveness of the factory.

Testing the third hypothesis: There are no differences between the averages of the sample answers according to educational level.

(Table 12) One-way analysis of variance (ANOVA) test for differences between the averages of the sample answers according to academic level

Sig. Values	(f) Value	Squares Average	Level of freedom	Total of Squares	Source of Variance	
0.669	**0.405**	**0.131**	**2**	**0.263**	Among Groups	The Factory's level of interest in planning systems
		0.324	**47**	**15.242**	Within Groups	
			49	**15.505**	Total	
0.232		**0.592**	**2**	**1.184**	Among Groups	The Impact of planning systems on the factory
		0.392	**47**	**18.441**	Within Groups	
			49	**19.625**	Total	

Table (12) shows a comparison of the means using the "F" test, where it is noted that the significance values for the axes of the study related to the extent of the laboratory's interest in applying advanced planning systems and the extent of the impact of these systems on the effectiveness of the laboratory are in the order (232 - 0.669), which is greater than the significance level of (0.05) This means accepting the null hypothesis, which means that there are no statistically significant differences between the answers of the sample members according to their educational level.

Testing the Fourth Hypothesis: There are no differences between the averages of the sample's answers depending on the workplace in the factory.

(Table No. 13) One-way analysis of variance (ANOVA) test for differences between the means of the sample answers according to the workplace in the factory:

Sig. Values	(f) Value	Squares Average	Level of freedom	Total of Squares	Source of Variance	
0.928	**0.400**	**0.142**	**9**	**1.280**	Among Groups	The Factory's level of interest in planning systems
		0.365	**40**	**14.225**	Within Groups	
			49	**15.505**	Total	
0.486	**0.960**	**0.388**	**9**	**3.488**	Among Groups	The Impact of planning systems on the factory
		0.403	**40**	**16.138**	Within Groups	
			49	**19.625**	Total	

Table (13) shows comparisons of the averages through the (f) test; it is noted that the significance values for the axes of the study related to the extent of the laboratory's interest in applying advanced planning systems and the extent of the impact of these systems on the effectiveness of the factory are, respectively, (0.928- 0.486) and are greater than the level of significance (0.05).

This means accepting the null hypothesis, which means that there are no statistically significant differences between the answers of the sample members according to their place of work in the factory.

4. Conclusions

By analyzing the data statistically, and after testing the hypotheses included in the study, the researcher reached:

1- A good information system is available to support advanced planning and scheduling systems.

2- There is interest from the factory in specialized training and education in the field of planning systems.

3- The factory provides financial support to support planning systems.

4- The factory is interested in obtaining a competitive advantage that supports its position in the market by striving to implement modern systems

5- The factory cares about and understands customers' desires, and this supports its financial and competitive position in the market.

6- Using systems to determine material needs is considered a good step toward using advanced planning and scheduling systems.

7- Commitment to specific dates for product delivery supports the application of advanced planning and scheduling systems.

8- Weak interest in the infrastructure that would support the application of advanced planning and scheduling systems.

9- The factory's poor efficiency in managing supply chains.

Lack of sufficient attention to logistical support in the factory negatively affects the laboratory's effectiveness in applying advanced planning and scheduling systems.

11- The factory's organizational structure does not sufficiently take into account the requirements of planning systems.

4.1 Recommendations

In light of the scientific and practical results of the applied study (the practical part of the research), the researcher recommends the following:

1- Attention must be paid to the organizational structure of the factory so that it contains offices for collecting information and data in all departments.

2- Paying attention to infrastructure and preparing a suitable ground for building modern systems that meet the development of the factory to serve its aspirations.

3- Striving to increase efficiency in managing supply chains and improving their work.

4- Increased attention to logistical support at the factory to increase its effectiveness in applying advanced planning and scheduling systems.

5- Paying more attention to specialized training in the field of advanced planning systems and seeking to provide these systems from the companies that produce them.

6- Directing financial support to obtain modern systems in general and advanced planning and scheduling systems in particular.

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