

Midocean University
Management College
Specialization of risk management



The impact of using gamification elements to reduce supply chain risks.

An applied study on the Saudi Electricity Company in Jeddah

**Research submitted as a requirement for the master's degree in
risk management.**

Preparing students

Mohammad Al-Sati
Mohammed AL-Amoudi
Abdul Karim Al-Qafari

Supervision of Drs.
Walid Soliman
Alfaisal Abdelhameed

2023 AD - 1445 H



قال تعالى في محكم تنزيله:

(وَلَا تُكَلِّفْ نَفْسًا إِلَّا وُسْعَهَا وَلَدَيْنَا كِتَابٌ يَنْطِقُ بِالْحَقِّ وَهُمْ لَا يُظْلَمُونَ)

سورة المؤمنون: الآية 62

(وَمَنْ يَعْمَلْ مِنَ الصَّالِحَاتِ وَهُوَ مُؤْمِنٌ فَلَا يَخَافُ ظُلْمًا وَلَا هَضْمًا)

سورة طه: الآية 112

(وَنَضَعُ الْمَوَازِينَ الْقِسْطَ لِيَوْمِ الْقِيَامَةِ فَلَا تُظْلَمُ نَفْسٌ شَيْئًا وَإِنْ كَانَ مِثْقَالَ حَبَّةٍ مِنْ خَرْدَلٍ أَتَيْنَا بِهَا وَكَفَى بِنَا حَاسِبِينَ)

سورة الأنبياء: الآية 47.

(وَلِكُلِّ دَرَجَاتٍ مِمَّا عَمِلُوا وَلِيُوفِّيَهُمْ أَعْمَالَهُمْ وَهُمْ لَا يُظْلَمُونَ).

سورة الاحقاف: الآية 19.

(مَنْ عَمِلَ صَالِحًا فَلِنَفْسِهِ وَمَنْ أَسَاءَ فَعَلَيْهَا وَمَا رَبُّكَ بِظَلَّامٍ لِلْعَبِيدِ).

سورة فصلت، الآية 46.

(يَوْمَ نَدْعُو كُلَّ أُنَاسٍ بِإِمَامِهِمْ فَمَنْ أُوْتِيَ كِتَابَهُ بِيَمِينِهِ فَأُولَئِكَ يَقْرَءُونَ كِتَابَهُمْ وَلَا يُظْلَمُونَ فَتِيلًا) ..

سورة الإسراء، الآية: 71.

(وَوُضِعَ الْكِتَابُ فَتَرَى الْمُجْرِمِينَ مُشْفِقِينَ مِمَّا فِيهِ وَيَقُولُونَ يَا وَيْلَتَنَا مَا هَذَا الْكِتَابُ لَا يُغَادِرُ صَغِيرَةً وَلَا كَبِيرَةً إِلَّا أَحْصَاهَا وَوَجَدُوا مَا عَمِلُوا حَاضِرًا وَلَا يَظْلِمُ رَبُّكَ أَحَدًا)

سورة الكهف ، الآية 49.



إهداء

إلى من جنتي تحت قدميها وسعادتي مرهونة بدعوة من بين يديها إلى من وجودها يعني الحياة ... أُمي الغالية

إلى من غرسني غرسة سقاها بحنانه وظلل عليها بعطفه وظل واقفاً بجوارها حتى نضجت وشقت طريقها للحياة والذي العزيز لا حرمني الله وجودك ..

كما أهدي هذا البحث المتواضع إلى إخواني وأخواتي وكل أفراد أسرتي الأعزاء جعلهم الله ذخراً صالحاً لهذا الوطن الشامخ المبارك ..

وإلى أسرة الشركة السعودية للكهرباء بالمنطقة الغربية فرع مدينة جدة الذين تجاوبوا مع هذه الدراسة سواء بمدي بالكتب والمراجع والمعلومات والبيانات أو بالمشاركة الفعالة في تعبئة الاستبيان ..

كما أهدي هذا البحث إلى سعادة الدكتور/ وليد سليمان و الدكتور/ الفیصل عبدالحمید الذاني تكرموا بإشرافهم على هذا البحث ..

وإلى كل لسان لهج بذكري في دعائه وتمنى لي الخير بعد حمد الله سبحانه والثناء عليه، والصلاة والسلام على نبيه محمد الأكرم، وآله وصحبه ..

الباحثين

شكر وتقدير

الحمد لله رب العالمين والصلاة والسلام على سيد المرسلين نبينا محمد وعلى آله وصحبه أجمعين. يعد هذا البحث العلمي ثمرة جهد جماعي لأطراف متعددة، كان لها الدور الكبير في خروجه بهذه الصورة المشرفة بإذن الله تعالى، ولذلك فإنه لا يسعني إلا أن أسند الفضل إلى أصحابه، كعرفان بالجميل وشكر موصول من خلجات القلب لكل من أعانني في إتمام هذا البحث، وأوجه امتناني:

لوالدي العزيزين اللذين لولاهما لما رأت عيناى نور الحياة، حيث كان لهما الفضل في وجودي وتنشئتي بعد إرادة الله تعالى، وزرع حب العلم في نفسي وتزويدي بنصائحهما العبة ورعايتي بدعواتهما القلبية، التي كانت لي مشعل نور في ديجور الحياة المتلاطم. ولأفراد أسرتي الكريمة، الذين شاركوني بأحاسيسهم المرهفة كل مراحل دراستي بما في ذلك إنجاز هذا البحث المتواضع، والذين أثروني على أنفسهم وكانوا لي كالروح في الجسد وكالماء في طري الشجر.

كما يسرني أن أتقدم بخاص الشكر والتقدير إلى العاملين بالشركة السعودية للكهرباء بجهة الذين تجاوزوا مع هذه الدراسة سواء بمدي بالكتب والمراجع والمعلومات والبيانات أو بالمشاركة الفعالة في تعبئة الاستبيان.

كما أزجي عميق شكري وتقديري للأستاذ الدكتور / وليد سليمان و الدكتور / الفيصل عبدالحميد اللذان تكرما بالإشراف على هذا البحث وأمداني بالتشجيع والتوجيه والإرشاد. أشكر لهم سعة صدره وعميق صبرهم، وعظيم توجيههم، وخالص نصحهم وأسأل الله الكريم أن يجعلهم دائما في خدمة العلم والبحث العلمي، وأن يتمتعهم بالصحة والعافية حتى يكونا سندا ومعينين لطلابهم وزملائهم في جامعة ميدأوشن .. وأسأل الله العليقدير أن يجعل جهودهم العلمية في ميزان حسناتهم.. والشكر موصول إلى أسرة هيئة التدريس ببرنامج ماجستير إدارة المخاطر ..

والشكر أولاً وأخيراً لله رب العالمين الذي وفقنا وهدانا لهذا وما كنا لنهتدي لولا أن هدانا الله، فله الحمد والشكر وعظيم الثناء أنه حميدٌ مجيدٌ. وختاماً فإنني أبتهل إلى الله تعالى أن يجعل هذا العمل عوناً لي على طاعته وأن يعينني على شكر نعمه وآلائه فما كان من صوابٍ وسداد فمن الله تعالى، وما كان من خطأ أو نسيان فمن نفسي ومن الشيطان وجزى الله العليقدير الجميع عني خير الجزاء والحمد لله رب العالمين.

الباحثين

Abstract in Arabic :

أثر استخدام عناصر التلعيب للحد من مخاطر سلاسل الامداد دراسة تطبيقية على الشركة السعودية للكهرباء بمدينة جدة

المستخلص:

ظهر مؤخرًا مصطلح التلعيب وكان للتدريب والتعليم نصيب كبير، وتهدف هذه الدراسة إلى التعرف على مدى أثر استخدام عناصر التلعيب في تقليل مخاطر إدارة سلاسل الامداد لدى الشركة السعودية للكهرباء – في القطاع الغربي بمدينة جدة.

سوف نقوم بالنظر في الادبيات والدراسات السابقة لمعرفة مدى إمكانية استخدام عناصر التلعيب ودمجها مع مدخلات استراتيجيات مخاطر سلاسل الامداد لتشجيع الموظفين على المشاركة والممارسات المثالية لتقليل مخاطر سلاسل الامداد.

وتمثلت عينة الدراسة من (351) موظف وموظفة من الشركة السعودية للكهرباء – القطاع الغربي، كما تم استخدام المنهج شبه التجريبي لمعرفة أثر المتغير المستقل وهو استخدام عناصر التلعيب بالمتغير التابع وهو تقليل مخاطر سلاسل الامداد.

وباستخدام التحليل الاحصائي توصلنا بانه توجد فروق ذات دلالة إحصائية أيضا تم استخراج معادلات الانحدار البسيط بين العناصر المستقلة والعنصر التابع (عناصر التلعيب وتقليل مخاطر سلاسل الامداد). وأوصى الباحثين بتعميم استخدام عناصر التلعيب لتقليل مخاطر سلاسل الامداد بالإضافة عمل المزيد من الدراسات في شركات مختلفة سواء قطاعات خاصة وحكومية.

الكلمات المفتاحية: التلعيب - إدارة سلاسل الامداد - إدارة المخاطر – إدارة مخاطر سلاسل الامداد.

Abstract in English:

The impact of using gamification elements to reduce supply chain risks,

An applied study on the Saudi Electricity Company in Jeddah

Abstract:

The term gamification has recently appeared, and training and education have played a large role. This study aims to identify the extent of the impact of using gamification elements in reducing the risks of supply chain management at the Saudi Electricity Company - in the western sector of Jeddah.

We will look at literature and previous studies to determine the extent to which gamification elements can be used and integrated with supply chain risk strategy inputs to encourage employee participation and ideal practices to reduce supply chain risks.

The study sample consisted of (351) male and female employees from the Saudi Electricity Company - Western Sector. The quasi-experimental approach was also used to determine the effect of the independent variable, which is the use of gamification elements, on the dependent variable, which reduces supply chain risks.

Using statistical analysis, we concluded that there are statistically significant differences. Also, simple regression equations were extracted between the independent elements and the dependent element (elements of gamification and reducing supply chain risks). The researchers recommended generalizing the use of gamification elements to reduce supply chain risks, in addition to conducting more studies in different companies, both private and government sectors.

Keywords: Gamification - Supply Chain Management - Risk Management- Supply Chain Risk Management.

Contents

Chapter One: The general framework of the study	13
Introduction:	14
Problem of the Study:	14
Objectives of the study:.....	15
The importance of studying:.....	15
Scientific importance of the study:.....	15
The practical importance of the study:	15
Study hypotheses:.....	16
Study model:	17
Study methodology:.....	17
The limits of the study:	18
Previous studies:.....	18
Comment on previous studies:.....	20
Study Structure:.....	21
Chapter Two: The theoretical framework of the study	22
Gamification:.....	23
Gamification learning and training:	23
Definition of learning and training through gamification:	23
Gamification elements:	24
Gamification components:	24
Learner-centered theories and gamification:.....	25
Advantages of gamified learning:.....	26
Steps to apply gamification training:.....	26
Determine the characteristics of people and trainees:.....	26
Setting goals:.....	26
Building content and training activities for gamification:.....	26
A framework for designing gamification in education:.....	27
Supply Chain:.....	29
Supply Chain Management:	30
Objectives of supply chain management include:.....	32
Reasons for maintaining supplies include:	33
Characteristics of Supply Chain Management:.....	33
Key Functions of Supply Chain Management:	35
Upstream and Downstream Supply Chain:.....	36

Classification of Inventory:.....	36
Methods of Store Management and Codification Methods:.....	36
Benefits of coding:.....	37
Labeling:.....	37
Significance of Labeling:	37
Types of warehouse labels:	38
Standardization:.....	38
Reasons for standardization:.....	39
Advantages of Standardization:.....	39
Disadvantages of Standardization:.....	40
A supply chain comprises three essential components:.....	40
Supply chain management can be categorized into three primary flows:	41
Objective of Supply Chain Management:.....	41
The goals of supply chain management include the following:	41
Supply Chain Management Activities:.....	42
Challenges in Supply Chain Management:.....	42
Supply Chain Trends:.....	43
Differentiation between Supply Chain Management and Logistics:.....	43
Factors impacting global supply chain management:.....	44
Why is Supply Chain Management a Source of Competitive Advantage?	45
The Marketing Contribution to Supply Chain Management:.....	45
The Role of Sales In SCM:.....	46
The Role of Research and Development In SCM:	46
The Role of Forecasting In SCM:	47
The Role of Production In SCM:	47
The Role of Purchasing In SCM:.....	48
The Role of Logistics In SCM:.....	49
The Role of Information Systems In SCM:	49
Finance's Role in Supply Chain Management:	50
The Role of Customer Service in Supply Chain Management:.....	50
Inter-Functional Coordination in Supply Chain Management:	51
Intercompany Coordination in Supply Chain Management:.....	52
Performance Evaluation in Supply Chain Management:	52
Supply Chain Risk management:.....	53
The difference between internal and external risks:.....	54
Importance of Risk Management on Decisions:	54
Strategies for identifying risks:.....	54

Approach to risk management:	55
Managing Supply Chain Risks:	56
There are three widely accepted steps to managing supply chain risks:	56
Risk identification:.....	56
Supply Chain Risk Classification according to sources:.....	57
Supply Chain Risk Classification According Market view:.....	62
Supply chain risk categories and their triggers:	62
Each risk requires a unique response, and there is no single response strategy that covers all risks. Some of the most common risk responses in a supply chain include:.....	65
Chapter Three: Field survey framework and hypotheses analysis	67
Presentation and analysis of the study results:	68
Characteristics of the study sample members:	68
The study population and the research sample:.....	68
Statistical methods:.....	68
Questionnaire:	69
Descriptive analysis:.....	69
Validity and reliability:	70
Internal consistency validity (Correlation):	72
Measurement tool:.....	76
Analyzing the attitudes of the study sample members regarding the study variables:	77
Hypothesis testing:.....	81
Differences in the responses of sample members according to demographic variables: .	87
Chapter Four: Framework of results and recommendations, then finally a list of references and research.....	90
Hypothesis results:.....	91
Conclusion:	91
Recommendations:	91
Suggested future research:.....	92
References:.....	93
Appendices:.....	95

List of tables

Table	Page
Table No. (1) Description of the study sample	
Table No. (2): A table showing the value of Cronbach's alpha coefficient for the questionnaire's axes.	
Table No. (3) Reliability of the study instrument	
Table No. (4) Shows a comparison of the elements of the Gamification Elements with Reduce supply chain risks.	
Table No. (5) Shows the comparison of the paragraphs of the Leaderboards axis with its overall axis.	
Table No. (6) Shows the comparison of the Badges axis paragraphs with their overall axis.	
Table No. (7) Shows the comparison of the paragraphs of the Points axis with their overall axis.	
Table No. (8) Shows the comparison of the paragraphs of the Levels axis with its overall axis.	
Table No. (9) Shows a comparison of the paragraphs of the Achievements axis with its overall axis.	
Table No. (10) Shows a comparison of the paragraphs of the Avatar axis with its overall axis.	
Table No. (11): A table showing the areas of response to the questionnaire questions and their weights.	
Table No. (12): A table showing the direction of the sample members' answers.	
Table No. (13): A table representing the attitude of the study sample members regarding awareness of the concept and importance of supply chain risk management.	
Table No. (14): A table representing the attitude of the study sample members regarding awareness of the concept and importance of the Leaderboards.	
Table No. (15): A table representing the attitude of the study sample members regarding awareness of the concept and importance of the Badges.	
Table No. (16): A table representing the attitude of the study sample members regarding awareness of the concept and importance of the Points.	
Table No. (17): A table representing the attitude of the study sample members regarding awareness of the concept and importance of the Levels.	
Table No. (18): A table representing the attitude of the study sample members regarding awareness of the concept and importance of the Achievements.	
Table No. (19): A table representing the attitude of the study sample members regarding awareness of the concept and importance of the Avatar.	
Table No. (20): A table showing the results of a simple regression analysis to measure the effect of the Leaderboards to Reduce supply chain risks.	
Table No. (21): A table showing the results of a simple regression analysis to measure the effect of the Badges to Reduce supply chain risks.	
Table No. (22): A table showing the results of a simple regression analysis to measure the effect of the Points to Reduce supply chain risks.	
Table No. (23): A table showing the results of a simple regression analysis to measure the effect of the Levels to Reduce supply chain risks.	
Table No. (24): A table showing the results of a simple regression analysis to measure the effect of the Achievements to Reduce supply chain risks.	

Table No. (25): A table showing the results of a simple regression analysis to measure the effect of the Avatar to Reduce supply chain risks.	
Table No. (26): Analysis of Variance (ANOVA) test for differences in the responses of sample members towards using gamification elements to reduce supply chain risks in the Saudi Electricity Company for (age, gender, marital status, income level, work experience, educational qualification, employment).	

Chapter One: The general framework of the study

The impact of using gamification elements to reduce supply chain risks,

An applied study on the Saudi Electricity Company in Jeddah

Introduction:

Among the most important contemporary and modern concepts that have received great attention from educational institutions of all kinds, especially in recent times, is the “concept of gamification.” The reason for this is to facilitate the process of training and motivating employees by using and adopting gamification elements that include collecting points and badges, forming teams, challenges, and levels that must be achieved. Employees must master it, as it contains more comprehensive activities that stimulate a sense of competition and interaction.

The researchers wanted to link the elements of gamification to supply chain risk management and measure their impact to train and motivate employees in modern ways.

Problem of the Study:

All companies and institutions in both the private and governmental sectors, including the Saudi Electricity Company, face the challenges of the increasing demand for electricity services. The provision of this service affected supply chains and management of those risks. Risk management in the Saudi Electricity Company seeks to address supply chain risks and improve the response to them for both known and unknown risks (which predicted before it happened). The most important basics of risk management that it is not possible to predict all the supply chain risks facing companies due to their different sizes and activities, but we can benefit from the turmoil that all countries of the world have faced during previous years in order to ensure the safety and efficiency of current and future supply chains. We can mention the most important risks faced by the Saudi Electricity Company, including (political unrest, natural disasters and climate change, human risks, shortage of raw materials, the economy and inflation).

According to this perspective, the research problem revolved around raising the main question of this study, which is:

What is the impact of using gamification strategies and tools to reduce supply chain risks for the Saudi Electricity Company?

During this study, we will address some of the sub-questions of this study:

- To what extent do Saudi Electricity Company leaders perceive supply chain risks?
- What does gamification mean?
- What does supply chain management mean?
- What is risk management?
- What does supply chain risk management mean?

Objectives of the study:

This study aims to provide a theoretical framework for managing supply chain risks facing the Saudi Electricity Company and to obtain recommendations and proposals that will contribute to reducing supply chain risk management in the Saudi Electricity Company - Distribution Engineering Department - Western Sector and then circulating them to the rest of the company's sectors in the Kingdom of Saudi Arabia .

Which the Electricity Company is able to use and demonstrate, as it is a useful instrument for deterring supply chain risks. Through the project, we also hope to demonstrate how gamification might help the Saudi Electricity Company handle its supply chain risk challenge.

The importance of studying:

The scientific importance of the study stems from reducing the risks of supply chains for the Saudi Electricity Company, which is a basic pillar of economic growth. In addition, the study expected to provide important data and results that can contribute to providing scientific and practical evidence about the impact of applying gamification strategies and tools in reducing supply chain risks to the Saudi Electricity Company. Which represents the main nerve in achieving economic and social development and sustainability, and therefore it is necessary to consider the factors influencing and affected by it.

Scientific importance of the study:

- Highlighting of gamification and its impact on supply chain risks
- Contributing to determining the nature of direct impacts
- Contributing to bridging the research gap in the field of supply chain risks at the Saudi Electricity Company and related research centers
- Contributing to the formation of a cycle of continuous scientific research
- Contributing to technology transfer by publishing the findings of previous studies regarding the research topic

The practical importance of the study:

- Trying to draw attention (management and employees of the Saudi Electricity Company) to the importance of gamification in reducing supply chain risks.
- Providing a scientific framework to the Saudi Electricity Company for the variables and dimensions of the study (gamification, supply chains, risk management, supply chain risk management) to help it develop the appropriate mechanism for its implementation.
- The study considered a modest contribution to supporting trends and policies aimed at reducing supply chain risks in the Saudi Electricity Company.
- Concluding recommendations and proposals that help reduce the risks of supply chains for the Saudi Electricity Company.

Study hypotheses:

We relied on what mentioned in the study problem that shows there is a gap between the use of gamification elements and the risks of supply chains that affect the business of the Saudi Electricity Company and the needs and desires of consumers.

Gamification elements contribute to reducing the risks of supply chains for the Saudi Electricity Company. Gamification elements can consider independent hypotheses:

- Finding the relationship between the uses of the gamification element and the **leaderboard** in order to reduce the risks of supply chain management.
- Finding the relationship between the use of gamification **badges or tags** in order to reduce the risks of supply chain management.
- Finding the relationship between the uses of the gamification element and the **points** in order to reduce the risks of supply chain management.
- Finding the relationship between the uses of the gamification element **levels** to reducing the risks of supply chain management.
- Finding the relationship between the uses of gamification **achievement** in order to reduce the risks of supply chain management.
- Finding the relationship between the uses of gamification **avatars** to reduce the risks of supply chain management.

Study model:

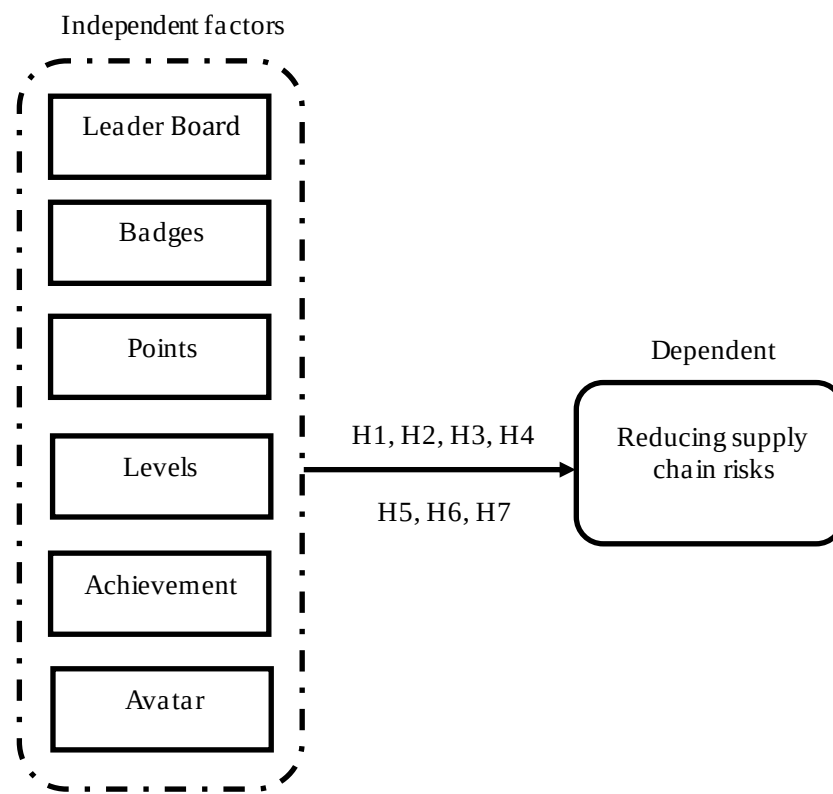


Figure (1) Study model: The independent variable will reduce supply chain risks, and the dependent variables will be gamification elements.

Study methodology:

In the theoretical part of the research, we relied on the descriptive approach and the analytical approach by referring to books, scientific journals, and publications from some relevant authorities (the Saudi Electricity Company), which dealt with the concepts and elements included in the study. The literature of many scientific articles and previous studies also reviewed in order to describe Search variables.

As for the applied part, it also depends on the analytical statistical approach, by using a random sample in distributing the study questionnaire. After collecting the data, the statistical analysis program (SPSS) will be used to analyze the available data and test the study hypotheses.

The limits of the study:

Spatial boundaries: Kingdom of Saudi Arabia, Makkah Al-Mukarramah Governorate.

Time limits: 2023 AD

Human Limits: Employees of the Saudi Electricity Company - Distribution Engineering Department - in Jeddah.

Previous studies:

1. Study of Dennis Arias-Chávez, and others, “Gamification as a Resource in Education. A Bibliometric Analysis in Times of Pandemic”, Journal of Pharmaceutical Negative Results, Volume 13, Special Issue 3, 2022.

This study aimed to identify the role of gamification as a source of education during periods of disasters. Researchers from Spain conducted an original bibliometric study by selecting the most important scientific databases with a sample of 754 documents from Wos and 1443 from Scopus. Researchers have found during the period from 2020 to 2022, which characterized by the Corona Covid 19 pandemic, a noticeable growth in scientific production due to the use of gamification and its ability to motivate students in virtual classrooms, and expected growth is expected in the coming years.

2. Study of Alba Fiuza-Fernandez and others “the knowledge about gamification of degree in primary education students”, PLOS ONE, March 29, 2022.

This study aimed to understand the impact of gamification in the primary education stage for students. The study conducted in Spain, and the researchers selected a sample of 164 students from the fourth and final year of science colleges for the primary stage to test the effectiveness of using gamification in education. Through this study, teachers’ knowledge about gamification measured, and therefore teachers must meet the requirements of Modern education, as the current generation is very familiar with the culture of gaming. It also showed that there is a significant shortage in gamification education resources, and 70% of the participants were unable to apply the gamification method in the classroom due to a lack of experience. There is also a willingness to teach, but there are no facilities. Inside schools.

3. Study by Andreas A Bouzakis, “The effects that gamification has on employee’s motivation, engagement, loyalty levels”, Aristotle University, Thessaloniki, 28/03/2021.

This study aimed to determine the ability of gamification technology to motivate employees and understand how gamification can be used to improve employee loyalty and retention and how gamification can increase employee engagement levels. The researcher selected a sample of 140 to 200 people from the city of Thessaloniki in Greece to test and analyze the statistical relationship between gamification and levels of participation, motivation, and loyalty. The researcher found that employees of companies that use gamification have a high level of motivation and engagement and are more loyal. It showed that women may be slightly more motivated than men and that women tend to understand the relationship between work and pleasure and employees can be positively motivated through material rewards.

4. Article of Manzano-Leon, A, and others, “Between Level Up and Game Over: A Systematic Literature Review of Gamification in Education”, Sustainability, Publisher’s Note: MDPI, 19 February 2021.

This study aimed to understand the impact of education with the strategy and elements of gamification by reviewing the literature that was previously published in research databases, from 750 articles, 198 articles selected. This study conducted at the University of Almeria in Spain. Researchers have found that applying educational strategies using gamification is beneficial at various stages of education, from schools to universities, on a large scale, and has shown improvement in students’ motivation, engagement, and level of academic achievement. The relationship is direct: the more the various gamification elements used (points, badges, classifications, and narratives) are motivating for students, the more its impact will be reflected on entire societies and on our daily lives. This study also attempts to develop a fun education strategy to improve the quality of study through use of learning games more efficiently.

5. Study of Ana Isabel Polo-Pena, and others,” Influence of gamification on perceived self-efficacy: gender and age moderator effect”, International Journal of Sports Marketing and Sponsorship, 27 July 2020.

This study aimed to understand the impact of the factors that facilitate the adoption and use of games and their impact on user behavior, in addition to the impact of this between male and female genders. The study conducted in Spain, and the researchers took samples in two ways. The first method was through 30 offices, including 20 countries, and 40 million samples obtained. The second method was by telephone from a Spanish population, and 300,000 samples were obtained to test the effectiveness of using gamification on users, and through this study measured the effect of using gamification on users’ behavior and perceived self-efficacy between genders.

6. Thesis Title and Preparer: Supply Chain Risk Management in Small and Medium-sized Enterprises, Adam Dandabo & Philip Kivelo.

This thesis Conducted at Karlstad University, in 2021. This master's thesis delves into the implementation of supply chain risk management (SCRM) in small and medium-sized enterprises (SMEs). The COVID-19 pandemic underscored the criticality of SCRM in safeguarding business operations against disruptions. However, SMEs often face challenges in implementing SCRM due to limited resources, structured processes, and proactive tools. To address this gap, the thesis investigates key factors for successful SCRM implementation in SMEs through a mixed methods approach, combining semi-structured interviews and a survey. The findings provide valuable insights for SMEs to effectively manage supply chain risks and enhance their overall resilience.

7. Thesis Title and Preparer: Supply chain Risk Understanding and Facing the Main Risks on the Chain, Yan Coelho Albertin

This thesis is for a Bachelor’s thesis Logistics Engineering degree at South Eastern Finland University of Applied Science, in 2017. This thesis aims to develop a proactive supply risk

management (SRM) model for Company Alpha, an agrifood company in Sweden. The model addresses the perceived issues caused by lacking transparency in their upstream supply chain and is specifically tailored for medium-sized agrifood companies. The model encompasses five key elements: risk identification, risk assessment, risk mitigation, risk monitoring, and risk organization. It includes a primary process performed annually, complemented by continuous elements throughout the year. The model also introduces enablers such as upstream supply chain mapping and Kraljic segmentation to enhance SRM and overall purchasing effectiveness.

8. Thesis Title and Preparer (Research note): Assessing and managing risks using the Supply Chain Risk Management Process (SCRMP), Rao Tummala & Tobias Schoenherr

This paper was prepared in 2011 for Eastern Michigan University and Michigan State University. This Paper aims to develop a proactive supply risk management (SRM) model for Company Alpha, an agrifood company in Sweden. The model addresses the perceived issues caused by lacking transparency in their upstream supply chain and is specifically tailored for medium-sized agrifood companies. The model encompasses five key elements: risk identification, risk assessment, risk mitigation, risk monitoring, and risk organization. It includes a primary process performed annually, complemented by continuous elements throughout the year. The model also introduces enablers such as upstream supply chain mapping and Kraljic segmentation to enhance SRM and overall purchasing effectiveness.

9. Thesis Title and Preparer (Development of a Proactive Supply Risk Management Model, Albin Melin & Jesper Ehlers, Page 2, 2021)

This thesis aims to develop a proactive supply risk management (SRM) model for Company Alpha, an agrifood company in Sweden. The model addresses the perceived issues caused by lacking transparency in their upstream supply chain and is specifically tailored for medium-sized agrifood companies. The model encompasses five key elements: risk identification, risk assessment, risk mitigation, risk monitoring, and risk organization. It includes a primary process performed annually, complemented by continuous elements throughout the year. The model also introduces enablers such as upstream supply chain mapping and Kraljic segmentation to enhance SRM and overall purchasing effectiveness.

Comment on previous studies:

The researchers reviewed (9) nine Arab and foreign studies conducted between (2020-2022) AD, which were similar in their approach to gamification and supply chain risk management, in addition to their focus on using gamification strategies and elements in order to reduce supply chain risks. They also addressed the role of effective gamification in reducing risks. Through use of (strategies - gamification elements - developing laws and legislation).

The researchers used what was mentioned in previous studies from various sources of data and information in order to form a theoretical background on the subject of the study and to define the concepts and terminology of the study. However, this study differed from

because the spatial and temporal limits in terms of its application in the Kingdom of Saudi Arabia in the Makkah Al-Mukaromah Governorate and targeted employees of the Saudi Electricity Company in Jeddah city. It also aims to identify the role of gamification in reducing supply chain risks by linking the elements of gamification in this study and knowing its impact on reducing supply chain risks.

Study Structure:

We will cover the following four chapters in this study: The study's overall framework and earlier research covered in the first chapter. The theoretical foundations of gamification, supply chains, and supply chain risks are covered in the second chapter. Field surveys and hypothesis analysis are covered in the third chapter. Results and recommendations are included in the fourth chapter, which is followed by a list of references and research publications.

Chapter Two: The theoretical framework of the study

Gamification:

We see that the history of games is linked to the beginning of human history, and play may be considered, in our opinion, a characteristic of human nature. (2010 Demirbilek & others) During the theoretical part, the researchers will address the strategies and elements that take gamification as their basis in order to benefit from it in various fields, including the field of education and training in general, and an attempt to use gamification to reduce the risks of supply chains in particular. The elements and strategy of gamification will be studied. And linking its impact to reducing supply chain risks.

Peña, Frías-Jamilena & Fernández-Ruano (2020).

Gamification learning and training:

In recent times, there has been a lot of talk about learning through gamification, and many researchers have been interested in studying the impact of using gamification in education, as learning continues regardless of the ages and personalities of individuals, and education and training through gamification includes many new tools, elements, and modern technologies that stimulate education and training and work to improve and develop it.

Peña, Frías-Jamilena & Fernández-Ruano (2020).

Definition of learning and training through gamification:

Gamification is the use of game elements, techniques, and mechanisms in an environment other than the game environment (Kapp, 2012). The term is derived from the word game, meaning game or play, and can be translated in Arabic into different terms such as competitive games or gamification. In this research, we will use the term gamification.

There are many definitions of gamified learning in general, but the best one is defined by Kim (2015) as using game elements to motivate trainees to learn and make learning and training interesting and enjoyable.

While Huotari and Hamari (2012) defined it as the use of game elements and the way of thinking of the game in environments outside the game to enhance behavior and participation in the elements of the games (not the complete game) and the way of thinking of the game (it does not need the technology of the game, but it is the idea of designing the game and interacting with it) in an environment outside of the game. The game (non-profit environment).

Nicholson (2015) defines it as taking scoring elements from video games, such as points, levels, and achievements, and applying them at work or in an educational context. The definition of gamified learning can be derived as using game design elements in contexts other than game contexts, to motivate the learner and make the educational process more enjoyable.

Fiuza-Fernández, Lomba-Portela, Soto-Carballo & Juste (2022).

Gamification elements:

They are procedures and steps that aim, through these elements, to collect points, move to higher levels, and obtain prizes. These elements and procedures aim to achieve the desired and previously specified goals, and we include elements in the training that depend on knowledge. Glover (2013) pointed out that the main element in gamified learning is that Trainees perform the objectives, knowledge and skills that should be obtained as a result of this task and these elements are:

- **Points:** The player gets them after performing a number of activities in the game.
- **Badges:** They are a visual representation of the player's achievements in the game.
- **Leaderboards:** Lists of all players ranked by their level.
- **Progress bars:** Provide information about the player, their current status, and their trend towards achieving the goal.
- **Performance graphs:** Show data about a player's high performance and compare it to previous performances.
- **Tasks:** Tasks that the player wants to achieve during the game.
- **Characters:** These are symbols or cartoon characters, for example, that the player chooses to represent him in the game.
- **Achievement File:** Shows the developments and achievements of the character representing the player and the behaviors he or she performs.

Bouzakis (2021).

Gamification components:

Gamification consists of three main components that he mentioned: the mechanisms driving interaction (Mechanics), Aesthetics, and the nature of interaction (Dynamics).

First: The mechanisms that drive interaction contain various ways and methods to help users interact, and these mechanisms include such as: points, levels, challenges, medals, titles, and leaderboards.

Second: The nature of interaction, which is represented by people's reactions while using the mechanisms that have been applied, and includes human desires such as status, reward, self-expression, achievement, and competition.

Third: Aesthetics, which can be clarified by the outputs from gamification elements, such as the appearance of the game that also attracts the attention of users, such as the variety, colors used, originality, cheerfulness, and presentation. Which achieves the desired feelings such as happiness, fun, satisfaction, achievement, pride, credibility, surprise, etc. The following table shows the relationship between these three components as follows:

Mechanics	Dynamics	Aesthetics
Points Challenges Levels Leaderboards Medals and badges	Lead to getting the reward Doing tasks Progress in level Get status Get titles	Feeling fun Feeling competitive A sense of self-expression sense of accomplishment Feeling proud

León, Camacho-Lazarraga, Guerrero, Puerta, Aguilar-Parra, Trigueros, & Alías (2021).

Learner-centered theories and gamification:

There are several theories in forming the general picture of learner-centered learning and gamification, and they are explained in the following table.

The Theory	Definition
Personal tendencies theory Trait/ dispositional theory Gordon Allport	Personality tendencies or trait theory proves that those with strong motivation for achievement will be more successful
Behavioral theory Behaviorism Skinner	Behavioral theory explains that trainees are more motivated when gamification provides feedback in the form of positive or negative reinforcement, and they are more motivated when gamification provides rewards.
Cognitive theory Cognitive Jean Piaget	This theory asserts that players are more motivated when gamification provides a clear, achievable goal and shows the consequences of achieving a specific goal.
The theory of free will Self Determination Richard Ryan- Edward Deci	The theory describes that players become more motivated if they feel competent, independent, and connected to social relationships
The theory of interests Interest Arthur Cecil Pigou	Players are more motivated when gamification meets their interests, enhances a sense of flow through direct feedback and adapts difficulty level to individual skills
Emotion theory Emotion James and Lange	Players are more motivated when gamification reduces negative emotions such as fear, envy, and anger, and increases positive emotions such as empathy, enjoyment, and sharing.

Požnel, Zrnec, & Lavbič (2022).

Advantages of gamified learning:

- Giving freedom to training and people using the mechanism they prefer.
- Motivating continuous self-learning and arousing motivation.
- Using virtual cases and characters in training.
- Training by trial and error without this negatively affecting the trainers.
- Make training more fun.
- Providing training through various means.
- Trying to link training to real life and practical application.
- Prepare an appropriate and unlimited set of tasks for students.
- Discovering trainees' personal motivations towards learning.

Steps to apply gamification training:

The approach was to follow a set of steps and procedures that contain a detailed analysis of the existing situations and available tools. Among the most important steps and procedures for using the gamification strategy in training are:

Determine the characteristics of people and trainees:

The characteristics of the participants must be determined in order to determine the appropriateness of the tools and techniques, and the extent of the participants' readiness to interact with the training content and participate, taking into account the skills required by the participants to achieve the goals, and the special skills required by the tasks and activities from the learners.

Setting goals:

Training objectives must be specific and clear, and the purpose of training is to achieve clear objectives, so that the content objectives that will be included in the training process can be determined, and an appropriate mechanism to achieve them can be chosen.

Building content and training activities for gamification:

Training content must be interactive, participatory, and rich in multiple elements.

Structuring the experience:

In it, the trainer determines the stages through which the trainee will move, and if the trainer understands the trainee's needs and their weak points, it will be easier to know and determine the stages, as the trainee becomes prepared and has the skill that enables him to move on and complete the following stages and acquire more of the required skills.

Identify sources or resources:

Once the trainer determines the methodology and stages, he moves to the next stage, which is to determine the distribution of incentive elements in these stages.

Application of catalysts:

These elements can be individual or social. Individual elements such as points, achievements, badges, and time restrictions. These elements help in self-realization and relationships. Social elements such as competition, interaction, and cooperation.

Shortcomings of gamified training:

It must be taken into account that game applications are not the only solution to the training process, and if relied on only, it may contribute to creating a less effective learning environment. We will mention some obstacles:

Attention Deficit:

In the case of incomplete design and shortcomings in some aspects of the curriculum, the trainee may discover other ways to achieve the goal of the game, and the trainees may search for loopholes in it in order to succeed easily.

Social stress:

It is a state of fear and shyness in front of people or interacting with people, and this can be overcome by developing something that breaks this tension. For example, a scale can be applied to know the characteristics of the trainees.

Material rewards:

One of the biggest risks of gaming applications is offering and granting material rewards over moral rewards, and this can be overcome by reducing the provision of material rewards by transforming the training process into a search for points and badges or progress in stages.

Georgiou, Gouras & Nikolaou (2019).

A framework for designing gamification in education:

There are three main ways to use gamification in education and training, three of which are in column (A), five steps in column (B), and a model for learner-centered gamification design in five steps in column (C).

A	B	C
1. Choose a game that helps students achieve learning outcomes. 2. Providing supplementary	1. Understanding the target audience: and the context, i.e. understanding the	1. Determine goals and target behaviors. 2. Describing players: identifying their

materials that help focus learners on the language. Such as a list of vocabulary contained in the game, grammar notes, dictionaries, culture, etc. 3. Debriefing, as it helps learners understand the extent to which they achieved the objectives, and also gives them the opportunity to compare their experience with their classmates to get a broader perspective of the activity and its objectives.	identity and interests of the students. 2. Determine learning objectives. 3. Structuring the experience: where the ultimate goal becomes achievable and measurable. 4. Determine the sources of gamification: what level can be gamified, the criteria for success and achievement, and the rules of gamification. 5. Applying gamification elements: social elements such as cooperation and interaction, personal elements such as points.	identities and needs. 3. Creating Fun Episodes: Identifying Gamification Elements and Tools. 4. Experimenting with gamification in a learning environment. 5. Evaluating the effectiveness of gamification: Collecting and analyzing data to measure the achievement of goals.
--	---	--

Preferring division (C) for several reasons, including it is more precise and clearer than the other two divisions, because it places a strong focus on learners, and also because it includes the experimentation stage, which is one of the most important stages of design because it leads to avoiding shortcomings that the design may face. Here are some details of its five steps:

Determine cognitive and skill goals by answering the following questions: What are the specific topics that we want to gamify? What is the goal of gamifying these topics? Is the goal to improve learning itself? Or increase motivation and motivation of students?

Description of players: Determine the type of students, their interests, and their needs in order to determine the learning activities, the size of the student groups, and the duration of the program to take this into account when designing the gamification.

Designing gamification activities and tools: Gamification mechanics and learner-centered learning activities to be applied are identified. Here the design must be linked to the previous objectives.

Deploy and implement fun learning sessions: The resources and tools needed for gamification activities are identified, and depending on the availability of resources, the gamification system can be deployed with or without electronic platforms.

Evaluation and modification phase: Collect and measure data with the aim of adapting and enriching the gamification system and repeating the process. Finally, depending on the data collected, it is possible to move to iteration with the inclusion of new activities or redesign of previous activities.

Gryaznova (2019).

Supply Chain:

A supply chain encompasses a system comprising organizations, individuals, technology, operations, information, and resources dedicated to the movement of a product or service from its supplier to the end customer. It constitutes a network involving retailers, distributors, transporters, storage facilities, and suppliers, all collaborating in the production, transportation, and sale of a product to consumers. These activities revolve around the seamless flow and transformation of goods, starting from the raw materials stage and culminating in the delivery to the end user, encompassing associated information and fund flows.

The supply chain's key functions involve the conversion of natural resources, raw materials, and components into a finalized product, ultimately reaching the end customer. Put simply, the supply chain acts as the vital connection between a business and its suppliers.

Also known as the logistics network, the supply chain comprises suppliers, manufacturing centers, warehouses, distribution centers, retail outlets, and the interconnected flow of raw materials, work-in-process inventory, and finished products between these facilities.

Jaipur J., Supply Chain Management, First Edition, (2013).

In any business transaction, there exists a supplier or a group of suppliers, and a customer. The set of processes and operations that establish a connection between these suppliers and customers is referred to as the supply chain. While supply chains exhibit significant variations in complexity and size, their fundamental principles are applicable to operations of all scales, irrespective of company size.

The supply chain comprises a series of processes and activities facilitating the movement of materials through the supply chain from initial suppliers to the ultimate customer. Therefore, the supply chain encompasses both internal divisions of the company and external partners such as suppliers. Each supplier to a specific company has its own suppliers (second-tier supplier), creating a network that links all these suppliers to the final customer.

Another conventional definition posits that a supply chain is "the network of organizations involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer".

In recent years, globalization has intensified, prompting companies to concentrate on their core functions and outsource other aspects of production. Consequently, supply chains have become more intricate and expansive, traversing various countries, cultures, and operating under diverse conditions worldwide. A notable example is the supply chain of Apple Inc., which sources components from various countries such as China, Taiwan, the United States, Singapore, and others across different continents. These components are assembled in China and then distributed to the main warehouse in Elk Grove, USA, or other intermediaries before reaching their destination.

Albertin Y.C. (2017)

Supply Chain Management:

Supply chain management (SCM) constitutes a holistic approach aimed at overseeing the seamless flow of information, materials, and services from raw material suppliers through production facilities and warehouses to the end customer. Another perspective defines SCM as "an integrative philosophy for overseeing the complete flow of a distribution channel from the supplier to the ultimate user." This implies enhanced coordination of business processes and activities, including inventory management, throughout the entire channel rather than just between specific pairs of entities.

SCM is a guiding principle that underscores the importance of employing an efficient integrated system involving suppliers, producers, warehouses, retailers, and customers. This ensures the production and distribution of items on a system-wide scale with optimal quantities, locations, and timing to minimize costs and enhance services. A supply chain represents the interconnected series of organizations, encompassing facilities, functions, processes, and logistics activities involved in creating and delivering a product or service. The scope of supply chain management extends to the planning and oversight of all activities related to sourcing and procurement, conversion, and various logistics management functions. Crucially, it involves collaboration and coordination with channel partners, which may include suppliers, intermediaries, third-party service providers, and customers. Ultimately, supply chain management integrates the management of both supply and demand within and across companies.

Muheesi, A. G, Supply chain Management, (2022), A. G, Supply chain Management, (2022)

The Council of Supply Chain Management Professionals provides the following definition of supply chain management:

- "Supply chain management involves the planning and oversight of all activities related to sourcing and procurement, conversion, and various logistics management functions."
- Significantly, it incorporates the coordination and collaboration with channel partners, including suppliers, intermediaries, third-party service providers, and customers.
- Essentially, supply chain management integrates the management of supply and demand both within individual companies and across interconnected entities.

Supply chain management serves as an integrative function, primarily tasked with connecting key business functions and processes within and across companies, forming a cohesive and high-performing business model. This encompasses the logistics management activities mentioned earlier, along with manufacturing operations. Additionally, it entails coordinating processes and activities with and across marketing, sales, product design, finance, and information technology.

Supply chain management is often referred to as the art of effectively delivering the correct product to the customer at the right time, in the right place, and at the right cost. (Supply Chain Management, JNU, Jaipur, First Edition 2013)

The definition of SCM may vary depending on the implementing organization. Nevertheless, there is a consensus that SCM oversees the flow of materials within a supply chain, with differences in the description of materials and the supply chain itself.

Organizations are now navigating increasingly intricate markets with extensive supply chains extending globally. As markets grow in complexity, supply chains also become more intricate due to their extended global reach, resulting in less interconnected partners.

Upstream and downstream activities are segmented into different tiers, with tier one representing the closest supplier or customer to the focal organization. As the supply chain lengthens, the number of tiers increases, substantially escalating the complexity of the supply chain.

Resources within a supply chain can be broadly categorized as tangible goods and intangibles. Intangibles involve information exchanged among partners in a supply chain, while tangible goods encompass materials and monetary resources. In essence, tangible goods and intangibles represent anything an organization moves along the supply chain. Effectively managing resources in a supply chain aims to achieve a more profitable outcome than without SCM.

Dandebo, A., Kivelö, P., 2021)

Due to the growing size and intricacy of supply chains, companies are recognizing the imperative need to adopt a broader perspective that encompasses the movement across all interconnected organizations constituting the supply chain. Managing this chain as one integrated entity has become crucial.

While the term "Supply Chain Management" has seen increased use in both industry and academia over the past 30 years, a consistent and universally accepted definition remains elusive. This lack of uniformity can lead to discrepancies in understanding within the chain. Despite many managers primarily focusing on supply chain analyses within their own organizations, it is equally essential to oversee the integration of all interconnected supply chains. Given the strong interconnections between companies, any impact on one organization ripples through to affect subsequent ones. Supply Chain Management addresses the gaps between different partners within a supply chain, extending to the final customer.

Supply chain management involves the oversight of materials, information, and finances as they traverse from various suppliers to manufacturers, wholesalers, and/or retailers, ultimately reaching the end consumer. It is an active management and coordination of supply chain activities aimed at enhancing customer value and attaining a competitive advantage. It signifies a collaborative effort among supply chain partners to develop and operate supply chains in the most effective and efficient ways. Figure 4 effectively illustrates the complexity inherent in the design of the supply chain network.

Klemencic underscores the fundamental importance of coordinating and integrating activities among different partners in the supply chain. This network coordination fosters a win-win relationship, leading to reduced inventory levels, increased revenue through improved customer service, and various other benefits.

In essence, supply chain management revolves around the efficient integration of operations, suppliers, warehouses, and stores to produce and distribute the right goods at the right time, location, and price. **Albertin, Y.C. (2017)**

Also SCM is process-oriented discipline that should be approached as a systemic endeavor. To comprehend this concept, it is essential to first elucidate the terms supply chain and value chain. The supply chain encompasses the journey of raw materials, traversing

processes of procurement, production, sales, and post-sales. Consequently, various stages and departments within an enterprise become integral parts of the supply chain. Each industry and company possess its unique value chain, organized based on the distinct internal and external business environments and requirements.³ Certain factors have prompted businesses to pay heightened attention to their supply chain. These factors include the imperative to meet customer needs, the perpetual demand for enhanced products at competitive prices, and the evolving circumstance of shorter product life cycles. Historically, businesses prioritized cost-cutting measures extensively, necessitating a holistic evaluation of all facets of their operations to enhance efficiency and productivity.

Franziska Jagals, F., Schultze, K. (2017)

Supply Chain Management constitutes a highly intricate array of operations and functions fraught with a wide spectrum of inherent risks. These risks may manifest as minor inconveniences, such as a slight delay with negligible consequences, or escalate into major disruptions, such as a fire in a supplier, causing a ripple effect across the entire chain. The escalating complexity within the supply chain places continuous pressure on managers to curtail operational costs and swiftly navigate intricate situations. Coupled with the swiftly changing landscape and the demands of daily decision-making, managers may be inclined to make decisions or alter processes without adequately considering the associated risks and consequences. Consequently, while supply chains are becoming more efficient, they are concurrently growing more vulnerable. Contends in his research that, despite the awareness among most managers regarding the existence and significance of risks in the supply chain, none of the surveyed companies sought external expertise to assess these risks. Notably, 90% of these companies do not quantify risks when outsourcing production, and 100% of the managers acknowledge insurance as a mitigation tool but do not effectively utilize this resource.

Increasing disruptions in companies underscore the need for a more comprehensive understanding of the entire spectrum of risks and their consequences. Although certain risks cannot be completely eradicated, they can be identified, assessed, quantified, and mitigated. To gain insights into supply chain risk management and address these diverse risks, this chapter commences with an introduction and categorization, followed by sections on risk identification, risk analysis, strategies and approaches for risk mitigation, concluding with a focus on risk control.

Albertin, Y.C. (2017)

Objectives of supply chain management include:

- **Shared Efficiency:** Efficient management of stock, transportation, and logistics is crucial for companies to avoid complexity and high costs. When manufacturers collaborate on a supply chain system, it becomes easier for each company and its partners to ensure effective efficiency.
- **Optimization of Transportation:** Supply chain management places a significant emphasis on the optimization of transportation and logistics within a company. In a self-dependent business model, where each entity is solely responsible for ordering, shipping, and transporting goods, costs tend to be high, and timing may suffer.
- **Quality Improvement:** The primary goal for a company and its partners should be providing the best value. A closely connected relationship between a company and

its partners enhances the overall quality of the consumer experience and their expectations.

- **Long-Term Stability:** Establishing strong and trusting supply chain relationships, coupled with the pursuit of best practices in distribution, allows a company to strive for long-term stability. Collaborative planning, coordination, and distribution activities help spread the risks of business decisions across multiple companies.

Muheesi, A. G, Supply chain Management, (2022)

Reasons for maintaining supplies include:

- **Meeting Variation in Production Demand:** Production plans adapt to changes in sales, estimates, orders, and stocking patterns. Consequently, the demand for raw material supply fluctuates with batch quantities in the production plan. Keeping supplies in a nearby warehouse facilitates issuing the required quantity and item to production just in time.
- **Addressing Cyclical and Seasonal Demand:** Market demand and supplies are subject to seasonal variations influenced by factors such as seasons and festivals. Past sales data assists companies in anticipating a significant surge in market demand. Accordingly, they stock up on raw materials and maintain inventories to increase production and meet the heightened demand.
- **Economies of Scale in Procurement:** Procuring raw materials in larger quantities and holding inventory is often more cost-effective than frequent small lot purchases. Companies, in such cases, opt to buy in bulk and maintain inventories at the plant warehouse.
- **Leveraging Price Increase and Quantity Discounts:** Anticipating a future price increase due to changes in market demand, supply, taxes, or budgets prompts companies to buy raw materials in advance and hold stocks as a hedge against increased costs. Bulk purchasing and holding raw material inventories allow them to take advantage of quantity discounts offered by suppliers.
- **Reducing Transit Cost and Transit Times:** Importing raw materials from a foreign country or a distant vendor within the country becomes cost-effective by buying in bulk and transporting as a container load or a full truck load. Part shipments can be more expensive, and full shipments have direct and faster transit times, minimizing shipping delays and transportation issues.
- **Holding Long Lead and High-Demand Items in Inventory:** Raw material supplies from vendors often have long lead times extending over several months. When combined with high demand and low supply, disruptions in supplies are likely. In such cases, holding inventories provides a safety net and greater control.

Muheesi, A. G, Supply chain Management, (2022)

Characteristics of Supply Chain Management:

- The forthcoming generation of supply chains must embody a set of distinctive characteristics to foster efficiency and adaptability. Below are key attributes that should be integral to the evolution of supply chain strategies:
- **Inventory Management Approach:** Rather than each firm independently dictating its inventory management policies, a supply chain management approach entails a comprehensive, channel-wide strategy. This focuses on minimizing redundant

inventories in the system while allowing for strategic inventory retention, differentiating it from systems like just-in-time.

- **Cost Efficiencies:** Supply chain management emphasizes a holistic evaluation of costs across the entire channel. This includes considerations such as borrowing rates, labor costs, effective processes, available capital, tax rates, logistics costs, and other factors, encouraging a strategic approach to cost optimization.
- **Time Horizon:** Enduring relationships within the supply chain necessitate an extended time horizon. This commitment extends beyond contractual agreements, with investments in integrated systems expected to yield returns over a more extended relationship lifecycle.
- **Mutual Information Sharing and Monitoring:** Effective channel management requires bidirectional information flow among members, ensuring access to relevant information for improved supply chain linkages without the necessity for universal information parity.
- **Joint Planning:** Moving beyond transactional planning, supply chain management involves collaborative, continuous planning, and evaluation of activities such as material flows and new product development across multiple years, engaging multiple entities within the channel.
- **Compatibility of Corporate Philosophies:** Long-term relationships benefit from compatible corporate philosophies, fostering coordination. Agreement on fundamental channel directions is emphasized, acknowledging that incompatible cultures can hinder collaboration.
- **Breadth of Supplier Base:** Contrary to traditional systems with numerous suppliers for risk mitigation, supply chain management suggests a more integrated approach with a reduced supplier base for closer management and coordination.
- **Channel Leadership:** Leadership within the supply chain is essential for strategic development and execution. Traditionally, channels have a leader responsible for managing and resolving conflicts within the channel.
- **Sharing of Risks and Rewards:** Long-term relationships thrive on shared risks and rewards, promoting a win-win scenario over the life of the supply chain, in contrast to independent, short-term approaches.
- **Flexibility:** Agility is crucial, requiring a supply chain to be responsive to unforeseen circumstances. A flexible, demand-driven approach, supported by risk assessment and intelligent decision support systems, ensures resilience.
- **Speed of Operations and Delivery:** Leveraging information technologies like EDI channel-wide contributes to accelerated operations and delivery, addressing the need for quick responses to customer demands.
- **Global Reach:** Next-gen supply chains leverage the global reach afforded by the Internet, establishing effective global hubs capable of local product supply without extensive transportation.
- **Optimized Inventory:** Efficient inventory management involves maintaining the right stock levels dictated by consumer behavior, buying trends, and local demand, incorporating tools like industrial weighing scales and innovative shipping techniques.
- **Go Green and Sustainable:** Sustainable practices, eco-friendly packaging, and utilizing alternative energy sources contribute to creating environmentally friendly and sustainable supply chains.

- **Proactive Strategy:** A proactive approach involves utilizing data modeling and research to prepare for disruptions and potential disasters, ensuring consistent and reliable services.
- **Innovativeness:** Embracing innovation and technology across various functions and processes ensures that supply chains remain competitive and provide excellent services continually.

Muheesi, A. G, Supply chain Management, (2022)

Key Functions of Supply Chain Management:

Supply Chain Management employs a cross-functional approach to oversee the flow of raw materials into an organization and the movement of finished goods toward the end consumer. Various models, such as SCOR and the Supply Chain Management model by the Global Supply Chain Forum (GSCF), have been proposed to comprehend the activities involved in managing material movement across organizational and functional boundaries. These activities can be categorized into strategic, tactical, and operational levels, and they must align with the overall business strategy, as well as efforts in areas such as purchasing, logistics, manufacturing, and marketing.

- **Strategic Activities:**
 - Strategic network optimization, determining the number, location, and size of warehouses, distribution centers, and facilities.
 - Establishing strategic partnerships with suppliers, distributors, and customers to facilitate communication channels and operational improvements like cross docking, direct shipping, and third-party logistics.
 - Coordinating product design to seamlessly integrate new and existing products into the supply chain.
 - Implementing an Information Technology infrastructure to support supply chain operations.
 - Making decisions on where to manufacture and what to make or buy, aligning with overall organizational strategy.
- **Tactical Activities:**
 - Negotiating sourcing contracts and making other purchasing decisions.
 - Making production decisions, including contracting, locations, scheduling, and process planning.
 - Deciding on inventory quantity, location, and quality.
 - Developing transportation strategy, determining frequency, routes, and contracting.
 - Benchmarking operations against competitors and implementing best practices throughout the enterprise.
 - Managing milestone payments.
 - Focusing on customer demand and habits.
- **Operational Activities:**
 - Planning daily production and distribution, involving all nodes in the supply chain.
 - Implementing production scheduling for each manufacturing facility in the supply chain on a minute-by-minute basis.
 - Conducting planning and forecasting, coordinating demand forecasts of all customers and sharing the forecast with all suppliers.

- Planning sourcing, considering current inventory and forecast demand in collaboration with all suppliers.
- Managing inbound operations, encompassing transportation from suppliers and receiving inventory.
- Overseeing production operations, including material consumption and the flow of finished goods.
- Managing outbound operations, involving all fulfillment activities and transportation to customers.
- Implementing order promising, accounting for all constraints in the supply chain, including suppliers, manufacturing facilities, distribution centers, and other customers.
- Tracking the performance of all activities.

Muheesi, A. G, Supply chain Management, (2022)

Upstream and Downstream Supply Chain:

Upstream and downstream supply chains emerge from the diverse positions of companies within the supply chain, involving various types of businesses. Upstream supply chains pertain to companies primarily engaged with suppliers on their buy-side, while downstream supply chains are associated with companies focusing on customers and delivering services, operating from the sell-side of the supply chain.

Muheesi, A. G, Supply chain Management, (2022)

Classification of Inventory:

Item coding is a method employed for the identification and categorization of distinct items and their related inventory counterparts. This coding system facilitates the monitoring of item quantities within an inventory and keeps track of their respective statuses. Additionally, services may be allocated an item code for the purpose of invoicing.

Methods of Store Management and Codification Methods:

- **Alphabetical Codification:** In this approach, items are described using letters of the alphabet. Occasionally, combinations of alphabets are crafted to provide mnemonic meanings, such as BT for Bolt, NT for NUT, PN for PIN, SC for Screw, RT for Rivet. However, due to the limited number of alphabets, even with combinations, there is a significant constraint on the unique coding of items. Moreover, the same combinations of alphabets may convey different meanings. It is also challenging to create combinations with mnemonic meanings, necessitating the use of alphabets without specific meanings. This method is most suitable for tiny organizations with a very limited number of items to be coded.
- **Numerical Codification:** In contrast to the alphabetical system, the numerical system relies on numbers, including simple numbers, block numbers, or dash/stroke numbers. Examples include:
 - **Simple Number:** Each material is assigned a single number, with another number reserved for additional items.
 - **Block Number:** Numbers are designed to group materials of a similar nature or category. For instance, the raw material block may range from 1-1000, consumable oil and lubricant materials block from 1001-2000, and packaging materials block from 2001-3000. Additionally, the raw material

block may be subdivided into smaller blocks based on material categories, such as iron, steel, and allied groups, with codes like 1-100, 101-200, 201-300, 301-400, 401-500, respectively.

- Dash/Stroke Number: An improvement over block numbering, this system involves placing a dash or stroke against the main element of the material to code it within the same group.
- Mnemonic Codification: This system, a special application of the alphabetical system, assigns alphabets to an item based on its initials or abbreviation. However, relying solely on mnemonic symbols can be confusing, as one symbol may represent two or more objects (e.g., 'FIT' for furniture, fuel, or 'St' for stationery, steel).

Benefits of coding:

Minimizes the need for lengthy descriptions.

Ensures accurate identification of items.

Averts duplication of information.

Standardizes items for consistency.

Decreases the diversity of items.

Streamlines recording, accounting, and costing processes.

Simplifies the locating and indexing of information.

Muheesi, A. G, Supply chain Management, (2022)

Labeling:

- When manufacturing a product, conveying its value to customers is crucial. An effective method for achieving this communication is through product labeling, which has evolved into a key channel of interaction between brands and consumers. The essential information, integral to this communication, is imprinted on the product packaging.
- Product labeling constitutes a component of the product's overall packaging, encompassing written information on the packages. These written labels on the packaging convey vital details that need communication to the customer. It is important to note the distinction between product labeling and packaging; while product packaging may include brand colors, logos, materials, and package shapes, the product's informational and written aspects are encapsulated in the labeling.

Significance of Labeling:

- **Brand and Product Identity** The label on the product serves as the primary identifier of the product. Both the product name and the brand contribute to the product's identity, and these labels collectively establish the brand identity.
- **Grade and Type** Product labeling aids in distinguishing between various grades and types of the product, providing clarity to consumers.
- **Legal Requirements** Complying with legal obligations is paramount, and product labeling often includes information mandated by regulatory bodies. Common requirements encompass details such as ingredients, manufacturing plant, batch number, expiry date, and safety instructions.

- **Description** While certain products may not be legally obliged to print usage instructions on the packaging, some include usage instructions directly on the packaging itself. This ensures clarity and compliance with regulations.
- **Promotion** Incorporating promotions, such as "Buy 2, get 1 free," on product packaging is a common labeling strategy, particularly during festive seasons. Adherence to these promotions is crucial, capturing immediate customer attention.
- **Additional Information** Product labeling may also include supplementary information useful to customers, enhancing their understanding and experience with the product.

Types of warehouse labels:

- **Floor Labels** Suitable for expansive warehouses with multiple rooms, floor labels are built to endure heavy floor traffic and wear. Resilient against harsh substances like solvents, oils, and hydrocarbons, they can be customized to fit any size, shape, length, or content requirements.
- **Rack Labels** The most prevalent type, rack labels enhance workflow efficiency by aiding in the easy identification of items and sections for employees. These labels assist in product identification for inventory management, storage, and shipping purposes. Various types of rack labels, including multi-level, magnetic, and cold storage labels, can be color-coded or designed with arrows for easy identification. They can also be positioned on aisles to facilitate item location.
- **Warehouse Magnets** Among the diverse warehouse label options, magnets stand out as a highly reusable choice. They can be applied in any temperature, removed without leaving a mess or scratches, and reapplied without the need for sticky adhesives like tape. Magnetic signs and labels are commonly used for shelf and rack location labeling due to their easy repositioning capabilities.
- **Retro-Reflective Labels** Ideal for barcoding shelves, retro-reflective labels can be scanned from a distance of up to 45 feet. This option is particularly effective for labeling warehouse racks, pallets, and other industrial surfaces.
- **Warehouse Signs** Serving as a crucial safety feature, warehouse signs play a vital role in identifying hazards for employees working in the facility. Given the operation of heavy machinery and the need to navigate sharp corners and aisles, warehouse signs are essential. These signs communicate proper procedures and potential hazards within the warehouse, offering notifications for forklift safety, clearance height, capacity alerts, quality control, and safety reminders.

Muheesi, A. G, Supply chain Management, (2022)

Standardization:

Product standardization involves maintaining consistency and uniformity across various iterations of a specific product or service available in diverse markets. This approach entails marketing a product or service without introducing substantial alterations. Any changes made are typically superficial, ensuring that the essential characteristics of the product or service remain consistent. This includes using the same materials and manufacturing processes, identical packaging, and marketing under the same name. Product standardization proves beneficial for several reasons.

Additionally, standardization encompasses the establishment of technical standards, which may include:

- Standard specifications
- Standard test methods
- Standard definitions
- Standard procedures or practices

Through standardization, both providers and users can communicate effectively by adhering to established guidelines.

Reasons for standardization:

- Achieving economies of scale in production.
- Realizing economies in product research and development.
- Attaining economies in marketing efforts.
- The "shrinking" of the world marketplace and economic integration.
- Navigating global competition.
- Managing the high costs associated with the adaptation process.
- Applicability to industrial and high-tech products.
- Penetrating similar markets.
- Facilitating export operations.
- Establishing a strong image for the country, producer, or brand.

Advantages of Standardization:

- For businesses, the widespread adoption of International Standards enables suppliers to develop and offer products and services that meet specifications widely accepted in their respective sectors. This allows businesses using International Standards to compete in numerous global markets.
- For innovators of new technologies, International Standards related to terminology, compatibility, and safety expedite the dissemination of innovations and their transformation into manufacturable and marketable products.
- For customers, the global compatibility of technology, established when products and services adhere to International Standards, provides them with a diverse array of choices. Customers also benefit from increased competition among suppliers.
- For governments, International Standards serve as the technological and scientific foundations supporting health, safety, and environmental legislation.
- For trade officials, International Standards establish guidelines for all competitors in the markets. Divergent national or regional standards can create technical trade barriers, and International Standards serve as the technical means to implement political trade agreements.
- For developing countries, International Standards, reflecting an international consensus on the state of the art, become a vital source of technological knowledge. By delineating the expected characteristics of products and services for export markets, International Standards offer developing countries a foundation for making informed decisions in resource allocation and preventing wasteful expenditure.

Disadvantages of Standardization:

- Lack of Uniqueness:
- Standardized products may lead to a lack of uniqueness, reducing supplier bargaining power and limiting flexibility to meet diverse market demands within the supply chain.
- Vulnerability to Trade Barriers:
- Overreliance on standardized processes can expose supply chains to challenges in navigating diverse international trade regulations, potentially resulting in delays, added costs, or barriers to entry.
- Presence of Strong Local Competitors:
- Standardization may give rise to strong local competitors with more efficient local networks, posing a challenge to standardized supply chains in terms of cost competitiveness and responsiveness.
- Assumption of Similarities Among Customers:
- Assuming uniform customer needs across regions may lead to mismatched inventory and an inability to meet specific local requirements within the supply chain.
- Potential for Over-Standardization:
- Overly rigid standardization in supply chain processes may hinder adaptability, making it difficult to respond quickly to changes in demand, disruptions, or advancements in technology.
- Narrow Vision in Supply Chain Strategies:
- Excessive standardization can result in a narrow vision, limiting the exploration of opportunities to optimize processes, embrace innovative technologies, and form strategic partnerships within the supply chain.

Muheesi, A. G, Supply chain Management, (2022)

A supply chain comprises three essential components:

- Supply: This facet centers on the raw materials provided for manufacturing, addressing aspects such as the method, timing, and source of these materials.
- Manufacturing: This aspect is dedicated to the transformation of raw materials into finalized products.
- Distribution: This component emphasizes the organized network of distributors, warehouses, and retailers to facilitate the efficient delivery of products to consumers.

Supply Chain Management (SCM) is the supervision of the distribution of materials, information, and finances from the supplier to the consumer, encompassing all essential points along the way. The coordination of material flow within a company and towards the ultimate consumer is integral to supply chain management.

Jaipur, J., Supply Chain Management, First Edition (2013)

Supply chain management can be categorized into three primary flows:

- The Product flow involves the movement of goods from suppliers to consumers and addresses customer service requirements.
- The Information flow encompasses order details and delivery status.
- The Financial flow incorporates payment schedules, credit terms, and supplementary arrangements.

Jaipur, J., Supply Chain Management, First Edition (2013)

Objective of Supply Chain Management:

- The primary goal of supply chain management is to enhance the flow of material and information between organizations globally, fostering cooperation to achieve the most efficient and swift movement of goods at the lowest cost. Ultimately, the overarching objective of a supply chain is to achieve customer satisfaction.
- Supply chain management encompasses every facility influencing costs and contributing to aligning products with customer requirements. This spans from suppliers and manufacturing facilities to warehouses, distribution centers, retailers, and stores.
- The fundamental purpose of the supply chain is to maximize the overall value generated. This value represents the difference between the costs incurred by the supply chain and the perceived worth of the end product to the customer. The commercial supply chain's value is closely tied to its profitability, often referred to as the supply chain surplus.
- For instance, when a customer purchases a personal computer from IBM for \$2,000, it indicates the revenue achieved by the supply chain. Each stage incurs costs to facilitate the efficient transfer of funds, information, product storage, transportation to the final consumer, etc. The disparity between the supply chain cost and revenue generated from the personal computer signifies the supply chain surplus or profitability.
- The supply chain surplus is the total profit distributed among all the stages and intermediaries of a supply chain. A more successful supply chain is characterized by a higher supply chain surplus. However, supply chain success is measured by its overall surplus, not the profit at each stage.
- Efficiency and cost-effectiveness are crucial for supply chain management across the entire system, from transportation and distribution to minimizing inventories of raw materials, work in process, and finished goods. The emphasis is not merely on reducing transportation costs or inventory, but rather on adopting a systems approach to supply chain management.

Jaipur, J., Supply Chain Management, First Edition (2013)

The goals of supply chain management include the following:

- Improving customer service.
- Increasing sales revenue.
- Minimizing inventory costs.
- Enhancing on-time delivery.
- Reducing the cycle time from order to delivery.
- Decreasing lead time.
- Cutting transportation costs.

- Lowering warehouse expenses.
- Streamlining the supplier base.
- Broadening the depth of distribution.

Jaipur, J., Supply Chain Management, First Edition (2013)

Supply Chain Management Activities:

There are three tiers of activities within supply chain management that various parts of the company will concentrate on:

- **Strategic:** At the strategic level, decisions regarding the entire organization are made, including factors such as the size and location of manufacturing sites, partnerships with suppliers, the selection of products to manufacture, and target sales markets. These decisions have a lasting impact on the firm and involve choices related to product design, internal production versus outsourcing, supplier selection, strategic partnerships, and the flow of materials through the logistics network.
- **Tactical:** Tactical decisions center on implementing measures to yield cost benefits, such as adopting industry best practices, formulating a purchasing strategy with preferred suppliers, collaborating with logistics companies to establish cost-effective transportation, and creating warehouse strategies to minimize inventory storage costs. Typically updated between once every quarter and once every year, these decisions encompass purchasing and production strategies, inventory policies, and transportation strategies, including the frequency of customer visits.
- **Operational:** Decisions at the operational level impact the movement of products along the supply chain. Operational decisions involve making schedule adjustments to production, negotiating purchasing agreements with suppliers, managing customer orders, and overseeing product movements in the warehouse. These decisions pertain to day-to-day activities like scheduling, lead time quotations, routing, and truck loading.

Jaipur, J., Supply Chain Management, First Edition (2013)

Challenges in Supply Chain Management:

The challenges faced in supply chain management encompass:

- Insufficient support from top management.
- Misalignment of strategic and operational philosophies.
- Inability or reluctance to share information.
- Lack of trust among members within the supply chain.
- Unwillingness to jointly bear risks and rewards.
- Rigid organizational systems and processes.
- Conflicts across various functions.
- Inconsistent or insufficient performance measures.
- Resistance to change.
- Absence of training for adopting new mindsets and skills.

Jaipur, J., Supply Chain Management, First Edition (2013)

Supply Chain Trends:

The supply chain is undergoing rapid evolution and is no longer an overlooked aspect for CEOs, investors, and managers. Over the past 50 years, extensive research has heightened the focus on supply chain and logistics among many companies. Managers face constant pressure to discover improved methods and enhance activities and operations.

The internet and the increased utilization of computers have facilitated a revolution in the activities of every company. Continuing this trend, new technology is poised to drive further changes in supply chain management.

Waters (2011, p. 52-74) outlines several of these trends:

- Integration of supply chains - Managers are moving away from segregating activities within the organization and adopting an integrated strategy.
- Cost Reduction.
- Agile Logistics - Activities must be flexible and responsive to changing conditions.
- E-business.
- Globalization - Supply chains are extending in length and spanning different continents.
- Outsourcing - Companies are concentrating on their core activities, influencing the size and complexity of the supply chain.
- Increasing environmental concerns.
- Concentration of ownership - Some global companies dominate the market.
- Postponement strategy.

Albertin, Y.C. (2017)

Differentiation between Supply Chain Management and Logistics:

To elucidate the distinction between supply chain management and logistics, it is essential to begin with their respective definitions. As previously mentioned.

Supply chain management is the development of a strategy that takes all levels of the supply chain into consideration, which essentially means the integration of suppliers, production facilities, inventory, sales, and aftersales. The goal is to reduce costs and implement a more efficient production by delivering all products at the right time and the right location.

Conversely, logistics requires a more in-depth exploration. In a business context, logistics broadly refers to the organization of resources, encompassing storage, production, and distribution. Here, resources extend beyond materials to include personnel requirements. Furthermore, logistics is responsible for the planning, organization, execution, and control of these aspects and processes, which also entail the procurement of a company. However, like all other departments, logistics must act and react to achieve the overarching goals and objectives of the company.

The descriptions provided for logistics and supply chain management lead to the inference that logistics is a component of supply chain management. While logistics addresses issues within its own company, supply chain management extends beyond the procurement and organization of materials. It encompasses the entire supply chain, from the supplier (and sometimes deep-tier supplier) to customer satisfaction at the end of the value chain. To view this argument from a company's perspective, it is crucial to note that logistics deals solely with internal company issues. In contrast, supply chain management aims to optimize material and information flows between the supplier and buyer or the company and customers. Therefore, supply chain management involves a broader spectrum of activities than logistics.

Jagals F., Schultze, K. (2017)

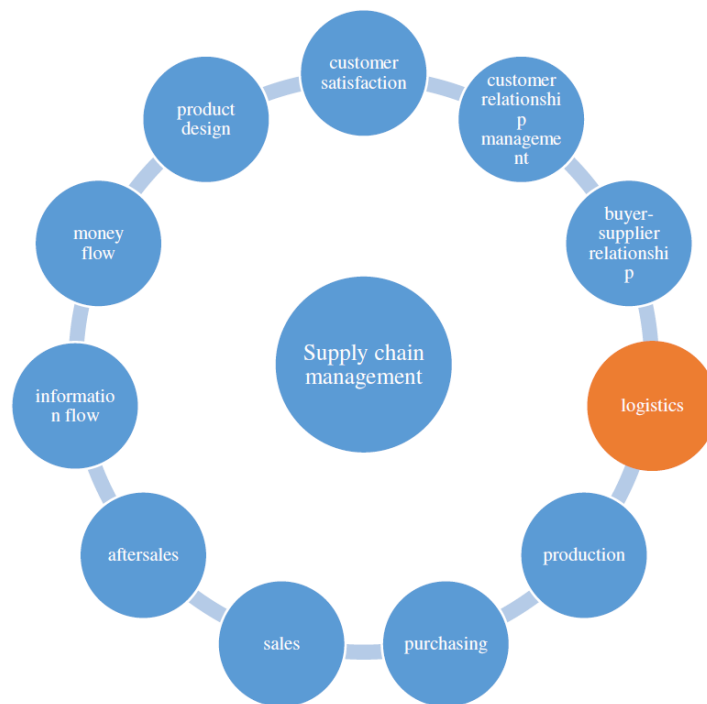
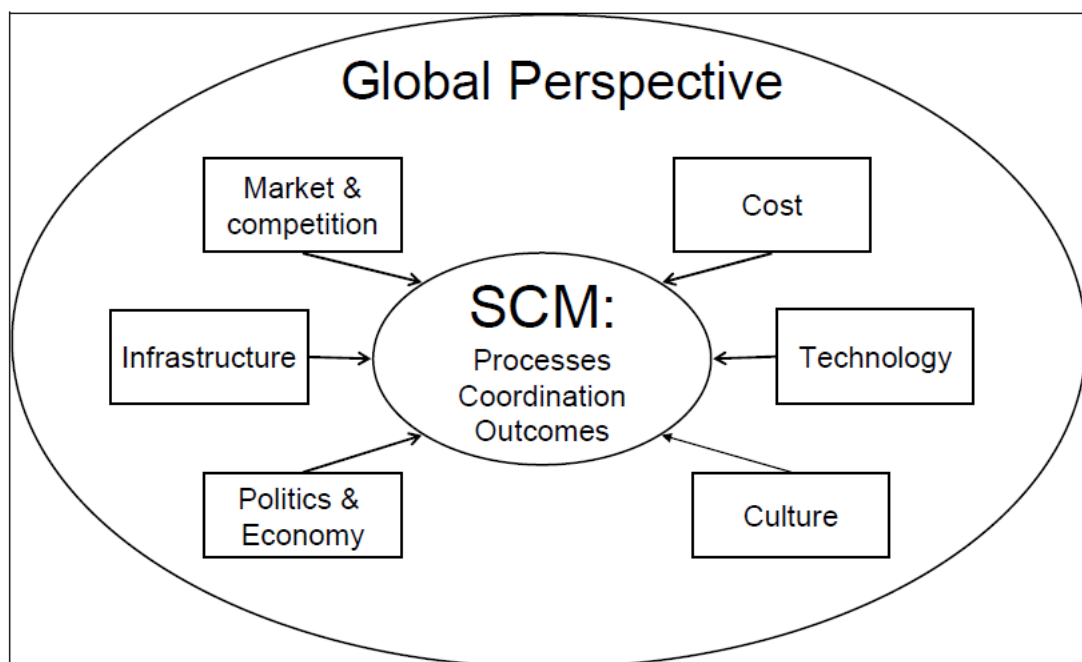


Figure XX: The functions of supply chain management - Illustration at own construction.

Jagals F., Schultze, K. (2017)

Factors impacting global supply chain management:



Marco Antonio, M., Borges, V. (2015)

Why is Supply Chain Management a Source of Competitive Advantage?

Many individuals dedicate significant time and effort to thinking, writing, and engaging in Supply Chain Management (SCM). The reason behind this is that SCM serves as a substantial source of competitive advantage in the global marketplace. But why is that the case? The intense competition prevalent in today's markets is driven by advancements in industrial technology, increased globalization, significant improvements in information accessibility, abundant venture capital, and innovative business models. In highly competitive markets, the mere pursuit of market share is no longer adequate to ensure profitability. As a result, companies shift their focus towards redefining their competitive space or profit zone. For instance, companies engage in cooperative efforts to gain a competitive edge.

The Marketing Contribution to Supply Chain Management:

Considering the integral role of marketing in the implementation of supply chain management (SCM), which is suggested through a cause-and-effect relationship involving the marketing concept, market orientation, relationship marketing, and SCM, Min (2000a) drew the following conclusions:

- The primary goal of marketing is to create exchanges, with the desired outcome being customer satisfaction.
- The marketing concept comprises three key pillars: (1) customer focus, (2) coordinated marketing, and (3) profitability.
- The marketing concept serves as a business philosophy guiding firms towards achieving customer satisfaction while maintaining profitability.
- Market orientation is the practical application of this philosophy, compelling firms to generate, disseminate, and respond to market information.
- The marketing concept not only forms the philosophical foundation of a market orientation but also plays a crucial role in firm management, inter-functional relationships, and the implementation of SCM.
- A market orientation has far-reaching effects on firm management, interfirm relationships, and the overall supply chain. It encourages a firm to focus on generating, disseminating, and responding to market information, leading to customer satisfaction, coordinated marketing efforts, redefined functional responsibilities, organizational restructuring, and superior business performance. Simultaneously, a market orientation fosters an environment that supports a firm's efforts to develop, maintain, and enhance close relationships with other firms, facilitating organizational learning, commitment, trust, and cooperative norms in relationships with partners.
- Market orientation is applied both internally and externally to recognize and respond to customers' needs while obtaining experiences, products, skills, technologies, and knowledge from external sources not available to competitors.
- A market orientation actively promotes the implementation of SCM.
- Relationship marketing is focused on establishing, maintaining, and enhancing either dyadic relationships or multiple relationships within a supply chain, aiming to create enhanced customer value.

- Relationship marketing contributes to achieving SCM objectives, such as efficiency (cost reduction) and effectiveness (customer service), through increased cooperation in long-term interfirm relationships among supply chain partners.
- Leveraging the marketing concept, market orientation, and relationship marketing, SCM attains a competitive advantage for the supply chain and its partners by reducing costs and investments while improving customer service.

Managerial Conclusion: The role of marketing, facilitated through the marketing concept, market orientation, and relationship marketing, is indispensable for the success of supply chain management.

The Role of Sales In SCM:

The evolving nature of the contemporary salesperson's role has led to a significant transformation, rendering traditional sales models obsolete and counterproductive in achieving supply chain management (SCM) goals. Garver and Min (2000) emphasized several key points:

- While conventional sales organizations focus on pre-purchase activities, supply chain partners prioritize relationship management and post-purchase activities to improve SCM performance.
- The sales force is strategically positioned to implement, facilitate, and coordinate various SCM activities.
- In essence, the SCM sales force should actively engage in any SCM activity that transcends organizational boundaries.
- Specifically, sales teams should play a vital role in fostering cooperative behaviors such as joint planning, evaluation, forecasting, and the exchange of information to nurture SCM relationships.
- To excel in their evolving role, the SCM sales force must acquire expertise in logistics and SCM, encompassing knowledge, experience, and skills related to logistics issues.
- While logistics managers typically design logistics solutions, salespeople often represent the primary conduit for conveying the needs and requirements of supply chain partners.
- Effective communication and collaboration between salespeople and logistics managers are essential for innovative solutions and successful teamwork in addressing SCM issues.

Managerial Conclusion: To empower the sales force in their new SCM roles, sales managers must invest in training, support, and encouragement for SCM activities and logistics expertise. Achieving this requires a shift in managerial orientation, embracing new techniques to enhance SCM performance. Sales managers must act as change agents, leading the sales force in a new direction. Traditional training programs, performance objectives, and compensation packages must be adapted and aligned more closely with SCM principles.

The Role of Research and Development In SCM:

Examining the significance of research and development (R&D) within the company and in collaboration with suppliers, customers, and the entire supply chain, observations:

- Supply chain activities play a pivotal role in influencing the capabilities and profitability of both the supply chain and its member firms in the realm of new product development.

- In the dynamic and highly uncertain business environment of the future, innovative and effective new product development holds paramount importance.
- Collaborative efforts between R&D and immediate customers and suppliers can substantially enhance the new-product development process.
- R&D collaboration with customers' customers and suppliers' suppliers throughout the supply chain contributes to improvements in the new-product development process.
- Multinational companies stand to gain by globalizing the R&D process and engaging in collaboration with global supply chain partners.
- The concept of postponement, deferring final product configuration as close to the end consumer as possible, sees significant benefits through collaborative R&D with supply chain partners.
- Involving R&D in the supply chain expedites speed to market, leading to a substantial reduction in the cycle time for developing new products.
- Flexible new-product development, facilitated by supply chain R&D involvement, allows companies to adapt swiftly to changing customer requirements and evolving technologies.

Managerial Conclusion: Expanding the knowledge base in a company's R&D process empowers managers to design and develop efficient and effective new-product development systems. This implies that adopting a supply chain orientation for R&D creates opportunities for long-term benefits such as lower costs, improved customer value, and sustained competitive advantages.

The Role of Forecasting In SCM:

Considering the increasingly significant impact of effective sales forecasting management on supply chain performance, following conclusions:

- Effective supply chain sales forecasting management holds the potential to exert a substantial influence on operating performance at both the individual member and collective levels within a supply chain.
- To positively impact supply chain operations, organizations collaborating within a supply chain must enhance both their internal forecasting management performance and their cross-company supply chain forecasting management performance.
- The four key dimensions of sales forecasting management—functional integration, approach, systems, and performance measurement—can be expanded to integrate a supply chain perspective.
- Initiatives such as Collaborative Planning, Forecasting, and Replenishment (CPFR) embody the four dimensions of forecasting management and offer an approach that considers factors influencing both forecasting management performance and supply chain forecasting management performance.

Managerial Conclusion: To contribute to enhanced supply chain performance, supply chain managers need to move beyond traditional measures of forecast accuracy. They should instead focus on comprehending the entire supply chain demand-planning process and influencing the behaviors of individuals and organizations involved in the development and application of sales forecasts.

The Role of Production In SCM:

Examining the involvement of production within the company, with suppliers, customers, and the overall supply chain, observations:

- For functional products in stable markets, a supply chain production system should prioritize reducing volume costs and enhancing production efficiency.
- Highly innovative products in uncertain and dynamically changing environments require a supply chain production system that emphasizes strategic flexibility and rapid time to market.
- Dispersed production holds significant value as a supply chain production system in a globally competitive market that emphasizes cost efficiency.
- Build-to-order production and postponement prove beneficial as supply chain production systems in markets characterized by quickly obsolete existing products, rapidly evolving customer requirements, and shrinking product life cycles.

Managerial Conclusion: A comprehensive understanding of various production systems empowers managers to design and develop a production system tailored to the specific market environment of the supply chain.

The Role of Purchasing In SCM:

Considering the evolving role of purchasing and its support for a firm's SCM strategies and objectives, along with the changing landscape compared to historical approaches, following conclusions:

- Purchasing assumes a critical and boundary-spanning role in a firm's supply chain management activities.
- To realize the potential benefits of SCM, the role of purchasing must be considered within a systemwide context, extending beyond the management of buyer-seller relationships.
- Managers need to comprehend the potential benefits derived from SCM relationships, based on environmental conditions and specific resource or performance requirements.
- Understanding the potential benefits and costs of such relationships is crucial for making informed business decisions.
- Successful achievement of SCM objectives requires an understanding of purchasing requirements within the overall firm strategy, strategic selection of supply chain partners, and effective long-term relationship management.
- Systemwide perspectives on cost and quality improvements are essential for optimal results.
- Integration of purchasing and logistics is necessary to achieve SCM objectives related to improved quality and reliability, reduced inventories, and lower total system cost in an operational approach.
- Collaboration with strategic supply chain partners, focusing on redesigning products and business processes to deliver customer value, is essential for achieving objectives of speed, flexibility, and competitive advantage in a strategic approach.
- In a strategic context, the role of purchasing involves understanding supplier capabilities and finding ways to align them with the needs of strategic customers.
- Purchasing contributes to effective product and process design by ensuring supply reliability and quality, managing supplier involvement, and providing insights about the competitive supply environment.
- Organizational structure and communication processes should be designed to support the requirements and objectives of the purchasing organization in the context of the firm's SCM activities.

- Information technology plays a critical role in managing the increasing complexity of the purchasing function, facilitating process integration across firms in a supply chain context, and providing decision support tools for systemwide optimization.

Managerial Conclusion: While past attention focused on supplier partnerships, emphasizing stronger buyer-seller relationships, realizing the full potential of SCM requires a broader, systemwide approach. Managers and researchers must adopt this perspective to understand and harness the contribution that purchasing can make in the context of SCM.

The Role of Logistics In SCM:

Examining the role of logistics in the supply chain, encompassing the primary functions of logistics, emerging logistics strategies, and the competencies that provide a competitive advantage for the firm, following conclusions:

- Logistics activities exert a significant influence on the capabilities and profitability of the supply chain and its constituent firms.
- Logistics functions represent crucial operational components within an organization, necessitating design and management aligned with corporate strategy and the evolving competitive landscape.
- Implementation of logistics strategies should align with corporate strategies and be grounded in the marketplace's needs and the unique capabilities of the firm.
- Corporate leaders who comprehend and mold logistics competencies have the potential to greatly enhance the competitiveness of the firm.

Managerial Conclusion: Seizing these opportunities requires the ability to forge alliances within and between firms, a commitment to planning and integrating information flows, and proficiency in performance measurement to inform the enhanced design of the logistics system and supply chain processes. The significance of the supply chain manager's capability to leverage logistics competencies is poised to increase in the future.

The Role of Information Systems In SCM:

Considering the function of information systems within the company and their interaction with suppliers, customers, and the supply chain, following conclusions:

- In response to the dynamic and customer-driven marketplace, characterized by increased variety and quicker response times, there is a need for the development of better and more effective information systems.
- Developing effective intrafirm information systems, such as enterprise resource planning systems, is among the most effective ways to meet the demands of a discerning marketplace.
- Intrafirm information systems, particularly enterprise resource planning systems, play a crucial role in enhancing the flow of information between firms.
- Managers must assess whether the benefits of efficient information flow outweigh the risks associated with developing partnerships with suppliers or customers.
- Establishing relationships within the supply chain allows firms to create more efficient and effective information systems, leveraging the capabilities of the Internet to facilitate enhanced supply chain integration.
- The Internet is anticipated to enable true supply chain management in the future through transparent, real-time connections across all links in the supply chain.

Managerial Conclusion: Managers are compelled to embark on the development of information systems that enhance and integrate the supply chain. This enhances the

competitiveness of firms by reducing costs, improving customer value, and maintaining long-term competitive advantages in the rapidly changing, customer-driven, Internet-enabled, e-commerce business environment.

Finance's Role in Supply Chain Management:

Examining the financial ramifications of decisions within the supply chain, analyzing trends in supply chain costs, employing a financial model for investment evaluation, and addressing concerns related to financial and supply chain management, the following:

- Supply chain activities have a direct impact on profit and loss statements, balance sheets, and capital costs.
- Competent supply chain managers can identify significant opportunities to reduce expenses, enhance returns on invested capital, and optimize cash flows.
- Strategic control of supply chain expenses leads to improved profit margins.
- Continual reduction of cycle times contributes to enhanced cash flows.
- Superior supply chain performance serves as a catalyst for leveraging competitive advantages, resulting in increased revenues and a larger market share for the supply chain.
- Traditional accounting methods lack accuracy and timeliness in providing information crucial for making financial decisions in the supply chain.
- The utilization of activity-based costing is not widespread.
- The potential benefits of enhanced supply chain management are hindered by the absence of activity-based financial data and the inability to connect performance measurement with costs.
- Improved collaboration between finance and other business and supply chain functions is essential to facilitate the development of Activity Based Costing.
- This collaboration should address the prevalent challenge of supply chain managers in articulating the costs and benefits associated with supply chain activities.

Managerial Conclusion: Seizing these opportunities requires the capability to plan and measure supply chain performance, effectively communicate performance implications in financial terms, and recognize the growing importance of a supply chain manager's ability to articulate the financial aspects of inter-firm exchanges.

The Role of Customer Service in Supply Chain Management:

In examining the crucial aspects of customer service management within the context of supply chain management, as well as the performance outcomes associated with customer service activities and their impact on supply chain objectives, following conclusions:

- Strategic planning for customer service activities is essential to achieve supply chain objectives, necessitating an understanding of service levels critical to key customers.
- Identifying important customer segments and comprehending their requirements, both for immediate and downstream customers, is crucial.
- Understanding the impact of service levels on customers is vital, with internal capabilities tailored to deliver service levels that optimize overall supply chain performance.

- The quality of the customer interface significantly influences trust and information exchange between firms, contributing to a better understanding of customer needs and improved supply chain management performance.
- Measurement of customer service outcomes, as perceived by customers, is important, along with an understanding of which performance outcomes are most valued at various supply chain levels.
- Customer service requirements, performance, and the influence of service levels on customer behavior should be comprehended and monitored for both immediate and downstream customers in the supply chain.
- While customer service is not the ultimate objective of supply chain management, it is an outcome that can create value for customers through enhanced efficiency or effectiveness.
- Creating superior value for customers compared to competitors is anticipated to result in greater customer satisfaction, a competitive advantage, and the shaping of customer behavior to enhance overall supply chain performance.

Managerial Conclusion: Although customer service is frequently identified as a key objective in supply chain management, it only contributes to improved supply chain performance if the services offered create value for customers. To attain this objective, supply chain managers must strategically manage customer service and develop capabilities to deliver services deemed important by critical downstream customers.

Inter-Functional Coordination in Supply Chain Management:

Emphasizing the significance of inter-functional coordination among individual members of the supply chain for the successful implementation of supply chain management, following conclusions:

- Effective supply chain management demands a concurrent approach that strikes a balance between specialization through the division of labor and cross-functional coordination.
- Inter-functional coordination within a specific firm involves the synchronized efforts across functions to achieve common goals, such as creating customer value and responding to market changes, within closely-knit relationships among functions and stringent management control.
- Implementation of inter-functional coordination can take various forms, including cooperative arrangements where personnel from different functional areas engage in interaction and collaboration, managerial control featuring integration of managers serving as liaisons with formal authority over significant aspects across functions (such as budgets), standardization to guide coordinated processes, functional expertise essential for participation in cooperative arrangements, and organizational structure that integrates the flow of products, services, finance, and information within an organization.
- Organizations cannot rely solely on a single mechanism or organizational structure, necessitating flexibility to employ an appropriate combination of these mechanisms to achieve a high level of coordination.
- Factors promoting cooperative efforts within a firm include common goals, trust, commitment among personnel from different functional areas, and top management support.

- Well-executed inter-functional coordination yields competitive advantages, including reduced cycle time, increased success with new products, and ultimately enhanced profitability.

Managerial Conclusion: For individual firms within a supply chain, expertise in key functional areas is essential, and concurrently, achieving functional integration serves as a foundational step toward effective supply chain management.

Intercompany Coordination in Supply Chain Management:

Examining the significance of collaborative efforts between firms in supply chain management and proposing a model of interfirm cooperation encompassing drivers, prerequisites, and the outcomes of successful cooperative relationships within a supply chain context, following conclusions:

- The dynamic and uncertain nature of today's business environment necessitates supply chain management, departing from the traditional approaches of vertical integration or arm's length relationships.
- Supply chain management (SCM) goes beyond the concept of functional integration within a single firm, extending to all firms within the supply chain. Consequently, members of a supply chain must collaborate to enhance the competitiveness of the entire supply chain.
- The implementation of SCM inherently relies on cooperation, defined as a series of joint actions among firms in a close relationship aimed at achieving common goals that yield mutual benefits.

Managerial Conclusion: The supply chain manager's proficiency in establishing, sustaining, and improving cooperative relationships between firms is pivotal for effective supply chain management.

Performance Evaluation in Supply Chain Management:

Highlighting the significance of performance measurement in the supply chain, following observations:

- Supply chain activities lack sufficient definition, measurement, and enhancement.
- Research on supply chain measurement predominantly focuses on individual firms.
- The emphasis in research leans toward internal efficiency rather than external effectiveness.
- Multi-firm performance measurements or measures across the entire supply chain are notably absent.
- Interdependent planning and governance structures seem lacking across firms.
- Supply chain members often act independently, prioritizing self-interest.
- Vertical conflicts within supply chains could potentially be resolved through joint planning and measurement.
- Despite being a critical performance measurement capability, Activity Based Costing is not widely adopted.
- The absence of activity-based financial data and the inability to link performance measurement with cost hinder the potential benefits of improved supply chain management.

Managerial Conclusion: Seizing the opportunities to plan and measure key supply chain processes enhances both individual firm performance and overall supply chain outcomes.

Although supply chain performance measurement is in its early stages, its importance is expected to grow.

Building on these managerial conclusions, we can explore Supply Chain Management (SCM) as a source of competitive advantage. The initial example demonstrates how adopting a comprehensive "systemic, strategic orientation" can lead to a competitive advantage, especially when recognizing the final consumer as one of the "three or more companies (entities) directly linked by the supply chain flows."

Mentzer, J.T., Supply Chain Management (2002)

Supply Chain Risk management:

Increased market volatility and stretched supply chains are creating an increasingly uncertain business world, which exposes companies to more risks. Businesses face risks, and managing those risks is essential for success. The main reason for managing risks is to avoid major disruptions to the supply chain. Improved supplier reliability leads to improved customer reliability, which in turn improves company stability.

Dandebo A., Kivelö P. , (2021).

There is no universally accepted definition of supply chain risk management in the literature. Dealing with unknown, disruptions/disasters/low probability, high impact events. Supply chain risk management is the process of systematically identifying, analyzing, and dealing with risks to supply chains.

Supply chain risk management (SCRM) should include both known and unknown risks, which provides a more comprehensive approach to risk management than only focusing on unknown risks.

Supply chain risk management is a holistic approach to managing all risks within the supply chain, both internal and external.

Failure to adequately manage risks exposes the company to internal and external losses.

Dandebo A., Kivelö P. (2021).

Anticipating disruptions and developing contingency plans is an integral part of supply chain design and redesign. Companies must thoroughly understand the interconnectedness of their supply chains, identify potential risk factors, assess their likelihood and potential consequences, and evaluate their severity. Based on this comprehensive risk assessment, risk management action plans can be tailored to avoid identified risks whenever possible or, if avoidance is not feasible, to mitigate, contain, and control them effectively.

Potential supply chain risks extend beyond the quality of upstream products to encompass environmental concerns, maritime piracy, and other emerging threats." Supply chain risk refers to an event or situation that has a negative impact on the smooth functioning of a supply chain, potentially compromising its performance metrics such as service levels, responsiveness, and cost-effectiveness.

Across all domains, risk inherently involves the potential for adverse outcomes, characterized by unwanted negative consequences and inherent uncertainty.

Rao Tummala R., Schoenherr T. (2011)

The difference between internal and external risks:

Internal supply chain risks are caused by human error during normal business operations, such as warehouse stock mismanagement and late deliveries. Internal supply chain risks are all the risks that can occur within the supply chain, caused by factors within the company's control.

External supply chain risks are caused by factors outside of the company's control. External supply chain risks originate from the external environment.

Supply chain risk management aims to reduce risks throughout the supply chain by aligning all supply chain partners towards a common goal of creating customer value.

Dandebø A., Kivelö P. (2021).

Importance of Risk Management on Decisions:

Business leaders, including managers and investors, continuously encounter decision-making scenarios that require the integration of vast amounts of data and complex information. Oftentimes, this data is incomplete or subject to rapid change, and the constant pressure to reduce costs and enhance efficiency further complicates the decision-making process.

While existing decision-making frameworks provide some guidance, they often lack comprehensiveness, leaving managers to rely on their intuition and experience to make critical decisions.

Albertin Y.C. (2017).

Strategies for identifying risks:

There are four general strategies for identifying risks:

- 1- Failure mode and effects analysis (FMEA): This method involves identifying all potential failure modes of a system or process, and then assessing the effects of each failure mode.

Failure mode analysis (FMEA) is a widely used risk identification tool that uses a simple template based on three variables: probability of occurrence, severity of the impact if it does occur, and detectability of the risk before it occurs. Each variable is rated on a scale of 1 to 10, with 10 being the most critical outcome. The ratings are then multiplied together to produce a risk priority number (RPN), which can be used to compare risks.

- 2- Scenario analysis: This method involves developing different scenarios for the future, and then assessing the risks associated with each scenario.

Scenario analysis involves identifying and assessing the risks of different possible future events.

Scenario analysis is a way to anticipate the future by understanding how decisions made today will affect the future. Even if a particular scenario does not occur, the thinking, ideas, and planning that go into scenario analysis are still valuable. The thinking behind scenario analysis can be used in the real world for a variety of purposes. It also keeps the people involved alert and prepared for future risks.

Fault tree analysis (FTA): This method involves constructing a tree of events that can lead to a particular failure event. This helps to identify all of the potential causes of the failure event.

Fault tree analysis (FTA) is a technique for identifying the root cause of a failure event by breaking it down into smaller events and their logical relationships.

The key element of this approach is to analyze failures to better understand the cause-and-effect relationships that led to them. Suppose we use FTA on a more general level, without focusing on a specific failure event.

FTA can provide a comprehensive and easy-to-understand analysis of areas that are prone to failure.

Network models: This method involves creating a network of events and processes, and then using the network to identify potential risks and bottlenecks.

A network approach to risk management involves companies collaborating to identify and mitigate risks.

This can be done by establishing a decentralized supply chain group that manages the flow of resources throughout the supply chain.

This process is time-consuming and requires a lot of resources, but there are less resource-intensive alternatives, such as increasing information exchange and communication within the supply chain.

The highest level of SCRM is achieved when communication and information sharing is integrated throughout the entire supply chain.

Dandebo A., Kivelö P. (2021).

Albertin Y.C. (2017).

Approach to risk management:

- i. **Proactive approach:** Proactive risk management is an approach in which companies anticipate risks and develop plans to mitigate them before they can cause harm.

Proactive risk management is the practice of taking steps to mitigate risks before they happen.

- ii. **Reactive risk management** is an approach in which companies respond to risks after they have occurred.

Reactive risk management is the process of taking steps to respond to risks after they have occurred.

Reactive risk management responds to risks after they occur, while proactive risk management anticipates risks and prepares for them in advance. Having redundancies, such as safety stock, can mitigate the impact of risk events, both internal and external, by keeping operations afloat.

The proactive approach to risk response is generally considered to be better than the reactive approach because it provides insurance for the company by following the three steps described previously.

Most of the literature on risk management focuses on proactive risk management, but it is also important to focus on reactive risk management. This is because no company can ever be fully prepared for all possible risks, no matter how much effort they put into proactive risk management.

Albin Melin A. , Ehlers J. (2021)

Norrman & Wieland 2020).

Managing Supply Chain Risks:

There are three widely accepted steps to managing supply chain risks:

- iii. Identify Risks:** The first step in supply chain risk management. where risks occur in the supply chain. This can be done by examining the entire supply chain, from raw materials to finished goods, and considering all potential factors that could disrupt operations. A common approach to risk identification is scenario-based analysis, which involves considering different future outcomes and the potential risks associated with each outcome. This can help to identify risks that may not be obvious at first glance.
- iv. Analyzing risks:** The second step in supply chain risk management is to assess the probability and impact of each identified risk. This involves considering how likely the risk is to occur and how much it would disrupt operations if it did occur. Once this information has been gathered, risks can be prioritized based on their overall risk score. Monetary valuation is often used to assess the impact of risks, as this makes it easier to compare risks to each other and to countermeasures.
- v. Risk response:** The third step in supply chain risk management is to develop strategies to respond to the identified risks. There are three main risk responses: prevention, mitigation, and response.
 - 1- Prevention: Strategies to prevent risks from occurring in the first place.
 - 2- Mitigation: Strategies to reduce the impact of risks if they do occur.
 - 3- Response: Strategies to respond to risks as they are happening or after they have occurred.

This is done to ensure that the risk management plan is always up-to-date and able to address new risks and changes in the probability of existing risks, given the many factors that can affect them.

Dandebö A., Kivelö P. (2021)

Risk identification:

The risk identification step aims to find, recognize, and describe all possible risks and uncertainties.

Because companies have limited resources, they need to have a well-organized approach.
Dandebö A., Kivelö P. (2021)

Risk identification is the foundation of the risk management process so it is essential for ensuring that risk management is effective.

(Fan, Stevenson, 2018)

Dandebö A., Kivelö P. (2021)

Albertin Y.C. (2017)

The importance of effective risk identification in supply chain risk management. If managers fail to identify all potential risks, those risks cannot be managed. An accurate understanding of supply chain risks is necessary to develop tailored risk reduction approaches.

Melin A., Ehlers J. (2021)

Companies should take a holistic approach to risk identification and regularly screen for early signs of potential risks in their supply chain and environment. Global companies must consider all of their supply chain partners and the different environments they operate in when identifying risks.

Supply Chain Risk Classification according to sources:

risks are classified according to the following:

Melin A., Ehlers J. (2021)

1. Macro risks are risks that affect the entire economy or industry, such as economic recessions, political instability, and natural disasters.
macro risks classified into the following six subcategories:

a. Economic:

The risks that arise from the overall economic environment in which a company and its suppliers operate. These risks affect everyone in society, not just individual companies, or industries.

In other words, macroeconomic risks are large-scale risks that can have a significant impact on the entire economy. These risks can be caused by a variety of factors, such as government policy, natural disasters, and global economic trends.

- Risk factors:

- 1- Exchange rate fluctuations
- 2- Changes in interest rate
- 3- Changes in the overall economic situation

b. Environmental:

Those that arise from the physical world around a company's supply chain. Natural disasters, such as floods, droughts, hurricanes, earthquakes, fires, and explosions, are one subcategory of environmental risks. Man-made disasters, such as terrorist attacks and fuel protests, are another subcategory. Weather-related events, such as droughts, heat waves, and thunderstorms, are a third subcategory.

- Risk factors:

- 1- Natural disasters
- 2- Man-made disasters
- 3- Weather
- 4- Pandemics

c. Infrastructural:

The next risk category is physical infrastructure. This includes risks such as outdated or unreliable transportation, communication, and energy systems. It also includes poor agricultural infrastructure, such as a lack of roads and transportation for farmers in rural areas. Other risks in this category include port congestion, customs delays, and major changes to the transportation network.

- Risk factors:

- 1- Poor infrastructure

- 2- Port congestion
- 3- Customs delays
- 4- Security check delays
- 5- Changes in transportation network
- 6- Infrastructure security

d. Legal:

Laws and regulations can create risks for businesses, especially in global supply chains, where the different legal standards in different markets can lead to conflicts between actors. Additionally, changing requirements and regulations can create new risks.

- **Risk factors:**

- 1- Uncertainty in external legal environment.
- 2- (Potential) new regulations

e. Political:

The risks associated with changes to government policies, export and import regulations, and tariffs. the impact of the ruling party on businesses, noting that they can cut aid to specific industries and implement strict regulations. The political risks related to monetary, fiscal, and tax policies, as well as the ethical dilemma of operating in corrupt regions. The risks of operating in politically unstable areas. Risks related to administration and bureaucracy.

- **Risk factors:**

- 1- Changes in government policies
- 2- Changes in export or import regulations;
- 3- Tariff changes
- 4- Administrative and bureaucratic issues
- 5- Political instability

f. Social:

Social risks are those that arise from the social and cultural environment in which a company operates. Examples of social risks include changes in public opinion about social issues, such as child labor and unfair wages. as well as direct actions, such as labor strikes, **and** boycotts.

- **Risk factors:**

- 1- Changing social demands
- 2- Labor strikes, boycotts, and social riots

- 3- **Network risks** are risks that arise from the complex relationships between different companies and organizations in a supply chain. For example, if one company in a supply chain experiences a disruption, it can have a ripple effect on other companies in the supply chain.

Network risks are not specific to individual suppliers, but rather to entire sections of a company's supply chain, such as the supply chain for a specific component.

As those related to the structure, flow, operational dynamics, and complexities of the supply network. This means that network risks are relatively broad and can be caused by a variety of factors, such as the overall structure of the supply chain or the behavior of other companies in the supply chain.

a. Network Behavior:

Network behavior risks are caused by the way that supply chain partners interact with each other and with the changing environment. the danger of chaos in the system, such as the bullwhip effect, warn that even small disruptions can have cascading effects throughout the supply chain. The bullwhip effect is a phenomenon where small changes in demand at the retail level can cause large changes in demand at the manufacturing level. This is caused by a lack of information sharing between different partners in the supply chain.

Melin A., Ehlers J. (2021)

- **Risk factors:**

- 1- Chaos in system;
- 2- Opportunistic behavior
- 3- Lack of ownership
- 4- Supply chain inertia

b. Supply Market:

The overall characteristics of the supply market for a particular product or component. One example is when there is not enough supply to meet demand, which can cause problems for companies that rely on that product or component. Supply market risks also include general market price fluctuations, which can affect the entire supply chain. The risk of having too many suppliers for a certain product concentrated in one geographic area, which could be disrupted by an aerial incident.

- **Risk factors:**

- 1- Production/capacity constraints on supplier market;
- 2- Limited available suppliers
- 3- Market failures;
- 4- Commodity price fluctuations
- 5- Geographic concentration of suppliers

2. **Supplier risks:** are risks that are associated with individual suppliers. For example, a supplier may go bankrupt, fail to deliver on time, or produce defective products. Supplier risks associated **with suppliers into the following ten smaller categories:**

a. commercial,

Commercial risks arise from the business choices made by individual suppliers, extending beyond general market price fluctuations. These risks can manifest as unexpected price increases from specific suppliers.

- **Risk factors:**

- 1- Supplier-specific price escalations

b. Corporate fit

This category encompasses risks that arise from the dynamics of a company's interactions with a particular supplier.

The risk of poor alignment in plans between actors, which can also be categorized as a corporate fit risk.

- **Risk factors:**

- 1- Cultural differences.
- 2- Poor communication.
- 3- Reluctance to share information.
- 4- Poor alignment and coordination.

5- Relationship issues.

c. Financial

An integral aspect of this evaluation involves assessing the supplier's overall financial stability. Engaging in business relationships with financially unstable suppliers carries an inherent credit risk. Financial instability may render some supplier's incapable of meeting their financial obligations. The weak financial position of some suppliers could lead to difficulties in covering expenses, posing a risk to business continuity.

- **Risk factors:**

- 1- Supplier's financial health
- 2- Credit risk
- 3- Tax evasion

d. Legal:

Unlike the macro legal risk factor that adopts a broader view, this factor focuses on the specific legal commitments between the focal company and its suppliers. Numerous legal risks can arise from supplier relationships, including patent infringement, antitrust violations, false claims, price-fixing schemes, and bribery.

- **Risk factors:**

- 1- Contracts and agreements regarding liability
- 2- Bribery
- 3- False claims
- 4- Patent infringements
- 5- Antitrust claims
- 6- Price fixing accusations

e. Logistical:

Effective logistical management encompasses delivering the correct product, in the exact quantity, at the precise time. Timing-related risks include deliveries arriving prematurely or excessively late. Quantity-related issues arise from shipment inaccuracies. Additionally, logistical risks encompass potential problems with unloading facilities.

- **Risk factors:**

- 1- Delivery reliability issues
- 2- Problem with unloading facilities

f. Operational:

As an example, Equipment breakdowns can significantly hinder production output, falling under the umbrella of operational risks. One major subcategory within operational risks encompasses internal accidents. Risk of fire accidents and internal accidents can also relate to employee safety. Lack of skills among the workforce can be a potential risk source. Managerial negligence can manifest in operational risks, including inaccurate forecasting, inadequate planning, and ineffective decision-making.

- **Risk factors:**

- 1- Breakdown in equipment(s)
- 2- Improper product handling and storage
- 3- Internal accidents
- 4- Skills of workforce

- 5- Poor forecasting, planning, and inventory management
- 6- Supplier stockouts

g. Quality:

Sourcing products from suppliers who fail to meet the company's stringent quality standards poses a significant risk to the organization's reputation and overall success. Inadequate or ineffective quality control measures at supplier facilities pose a significant risk to product quality and overall organizational success.

- **Risk factors:**

- 1- Product quality do not conform to Specifications.
- 2- Lack of quality control

h. Security:

Security risks stem from external criminal activities that pose threats to both property and lives. These risks manifest in various forms, including piracy attacks on maritime routes and general criminal intrusion.

- **Risk factors:**

- 1- Security breaches

i. Sustainability:

Environmental and social risks are two broad categories that encompass various potential issues. Environmentally, the risk of sourcing from suppliers who employ unsustainable design and material choices is a significant concern. Moreover, suppliers with excessive product waste contribute to environmental degradation. Generally, suppliers that contaminate or deplete natural resources pose a serious environmental threat. Socially, several aspects demand careful consideration, including excessive labor hours, unfair wages, child labor practices, employee discrimination, and exploitative hiring policies.

- **Risk factors:**

- 1- Poor product material, design, and safety
- 2- Contamination and degradation of resources
- 3- Unhealthy, unsafe, and unhygienic working environment
- 4- Excessive labor worktime
- 5- Unfair wages
- 6- Child labor
- 7- Discrimination
- 8- Exploitive hiring policies
- 9- Unethical treatment of animals
- 10- Biological risks

j. Technology:

Technology risks can be categorized into two main areas: IT/IS systems and overall technological maturity. Compatibility between the company's IT/IS systems and those of its suppliers is crucial to avoid potential disruptions and bottlenecks. Additionally, suppliers' IT/IS systems must be sophisticated, reliable, and secure to handle the demands of the business relationship. In terms of overall technological maturity, suppliers should demonstrate the ability to adapt to evolving technologies and market trends. A lack of responsiveness to the environment can hinder collaboration and innovation.

- **Risk factors:**

- 1- Incompatible IT/IS systems for information sharing
- 2- Unreliable IT systems
- 3- Unfinished transformation initiatives
- 4- Inability to follow rapid technological development.

Supply Chain Risk Classification According Market view:

Classify supply chain risks into three categories: supply risks, operational risks, and demand risks.

3. Supply risks occur in the upstream flow of materials, from suppliers' suppliers to the focal firm. These risks can be caused by factors such as disruptions to transportation or production, or changes in supplier performance.
4. Operational risks affect the focal firm's ability to produce goods and services. These risks can be caused by factors such as equipment failures, labor strikes, or natural disasters.
5. Demand risks are associated with the downstream supply chain and affect the overall variability of demand. These risks can be caused by factors such as changes in customer preferences, economic conditions, or competitive activity.

Supply chain risk management (SCRM) focuses on identifying and managing risks across the entire supply chain, including both upstream and downstream risks. Supply risk management (SRM), on the other hand, only focuses on managing risks in the upstream supply chain.

Melin A., Ehlers J. (2021)



An overview of how supply chain risks can be categorized, adapted from Manuj and Mentzer (2008)

Supply chain risk categories and their triggers:

6. Demand risks:
 - Risk Trigger:
 - 1- Order fulfillment errors
 - 2- Inaccurate forecasts due to longer lead times,
 - 3- product variety, swing demands, seasonality, short
 - 4- life cycles, and small customer base
 - 5- Information distortion due to sales promotions and incentives, lack of SC visibility, and exaggeration of demand during product shortage
7. Delay risks:

- Risk Trigger:
 - 1- Excessive handling due to border crossings or change
 - 2- in transportation mode
 - 3- Port capacity and congestion
 - 4- Custom clearances at ports
 - 5- Transportation breakdowns
- 8. Disruption risks:
 - Risk Trigger:
 - 1- Natural disasters
 - 2- Terrorism and wars
 - 3- Labor disputes
 - 4- Single source of supply
 - 5- Capacity and responsiveness of alternate suppliers
- 9. Inventory risks:
 - Risk Trigger:
 - 1- Costs of holding inventories
 - 2- Demand and supply uncertainty
 - 3- Rate of product obsolescence
 - 4- Supplier fulfillment
- 10. Manufacturing (Process) breakdown Risks:
 - Risk Trigger:
 - 1- Poor quality (ANSI or other compliance standards)
 - 2- Lower process yields
 - 3- Higher product cost
 - 4- Design changes
- 11. Physical plant capacity) risks:
 - Risk Trigger:
 - 1- Lack of capacity flexibility
 - 2- Cost of capacity
- 12. supply (procurement) risks:
 - Risk Trigger:
 - 1- Quality of service, including responsiveness and delivery performance
 - 2- Supplier fulfillment errors
 - 3- Selection of wrong partners
 - 4- High capacity utilization supply source
 - 5- Inflexibility of supply source
 - 6- Poor quality or process yield at supply source
 - 7- Supplier bankruptcy
 - 8- Rate of exchange
 - 9- Percentage of a key component or raw material procured from a single source
- 13. System risks:
 - Risk Trigger:
 - 1- Information infrastructure breakdowns
 - 2- Lack of effective system integration or extensive
 - 3- system networking
 - 4- Lack of compatibility in IT platforms among SC partners
- 14. Sovereign risks:
 - Risk Trigger:
 - 1- Regional instability

- 2- Communication difficulties
- 3- Government regulations
- 4- Loss of control
- 5- Intellectual property breaches

15. Transportation risks:

- Risk Trigger:
 - 1- Paperwork and scheduling
 - 2- Port strikes
 - 3- Delay at ports due to port capacity
 - 4- Late deliveries
 - 5- Higher costs of transportation
 - 6- Depends on transportation mode chosen

16. Steps to manage supply Chain Risk:

Tummala R., Schoenherr T., (2011)

b. Risk Analyzing:

The second step of risk management is to analyze the identified risks and evaluate them. Two common ways to evaluate risks are using indices or monetary values. Dandebo A., Kivelö P., (2021).

values assigned to risks to prioritize those that are most critical to business continuity. Two things are generally required for this evaluation: the consequence of the risk and the probability of it occurring.

There are a number of risk indices that can be used to assign a value to a risk. All of these indices include a scale for measuring the severity (consequence) of the risk and a measurement of probability.

One example of a risk index method with four different consequence levels, stretching from negligible to catastrophic, valued from one to four, is as follows:

- i. **Consequence Level: Catastrophic**
 - **Value: 4**
 - **Description:** Shuts down the production facility for more than a month
- ii. **Consequence Level: Major**
 - **Value: 3**
 - **Description:** Causes significant damage to the production facility or results in a major loss of production
- iii. **Consequence Level: Moderate**
 - **Value: 2**
 - **Description:** Causes some damage to the production facility or results in a moderate loss of production
- iv. **Consequence Level: Negligible**
 - **Value: 1**
 - **Description:** Has no significant impact on the production facility or production

To use this index method, the risk assessor would first identify the consequence level of each risk. For example, if a risk could shut down the production facility for more than a month, it would be assigned a consequence level of 4. If a risk could cause some damage to

the production facility but would not have a significant impact on production, it would be assigned a consequence level of 2.

Once the consequence level of each risk has been identified, the risk assessor would then estimate the probability of each risk occurring. This can be done using a variety of methods, such as historical data, expert judgment, or simulation modeling.

Finally, the risk assessor would multiply the consequence level of each risk by its probability to calculate the risk index. The risk index is a measure of the overall risk posed by each risk. The higher the risk index, the greater the risk.

Instead of using a risk event scale to evaluate the severity of a risk, the second example is the monetary valuation method uses the expected losses to the company to measure the severity of a risk event.

c. Risk Response:

Risk response strategies vary depending on the situation. The three primary strategies are prevention, mitigation, and acceptance. The best strategy to choose depends on the value and likelihood of the risk.

Dandebo A., Kivelö P. (2021)

Each risk requires a unique response, and there is no single response strategy that covers all risks. Some of the most common risk responses in a supply chain include:

- i. Maintaining a safety stock of key components and materials from uncertain suppliers. Maintaining a safety stock of critical components helps keep production running even when suppliers are unreliable. However, safety stock comes with costs, such as storage and the uncertainty of whether it will be needed based on demand.
- ii. Dual or multi sourcing reduces risk, dependencies, and increases supply chain flexibility. If one supplier's production is disrupted, the company will still have a backup source of supply, so production can continue. One drawback of dual or multi sourcing is that it can be expensive to have multiple suppliers for the same component, especially for smaller companies. Having two suppliers with the same lower-tier supplier slightly reduces risk.
- iii. Increased communication and collaboration improve the supply chain by making it more effective and flexible. Increased communication helps to identify disruptions or problems earlier and find solutions more quickly, which improves reliability and makes risk events easier to manage. It takes time to start working jointly to improve and discuss risks, but it is worth it because it reduces the impact of those risks.
- iv. Supplier relationship management that can improve the supply chain includes actions such as financial penalties for late deliveries, poor quality, and general errors, as well as rewards for on-time deliveries and error-free products. These actions and good relationships reduce the likelihood of risk events by incentivizing suppliers to perform at a higher level and providing a strong foundation for collaboration.

Each risk response strategy has its own pros and cons, so it is important to evaluate them carefully to determine which one is most efficient for a specific organization. Another benefit of risk response and mitigation is implementing an environmental sustainability plan in the supply chain. Implementing environmental and social sustainability practices reduces supply chain risk.

Dandebo A., Kivelö P. (2021)

Chapter Three: Field survey framework and hypotheses analysis

Presentation and analysis of the study results:

In this section, what has been achieved through the field study is presented and analyzed, and the main goal of that study is to identify the extent to which gamification contributes to reducing supply chain risks, according to the opinion of the research and study sample.

Characteristics of the study sample members:

The study population consisted of employees of the Saudi Electricity Company in Jeddah. The study was conducted on 351 samples for a comprehensive study of all aspects of the subject.

The study population and the research sample:

The study population consists of all employees of the Saudi Electricity Company in the city of Jeddah. As for the method and method through which the study sample was limited, we distributed the electronic questionnaire link and collected a number of (351) forms that can be analyzed.

Statistical methods:

Statistical methods used within the Statistical Program for Social Sciences (SPSS V29) to process the data. Specifically, the following statistical methods used:

Arithmetic mean: with the aim of identifying the sample ratings in each paragraph.

Standard deviation: To measure the degree of dispersion of the values of the study population's answers from the arithmetic mean for each item.

Percentages: To deduce trends in classified data according to the frequency of each paragraph of the study, in order to support the validity or incorrectness of the basic hypotheses.

Frequency distribution tables: They reflect the extent of concentration of answers in favor or against certain answers.

The t-test: to measure simple statistical differences between averages.

Simple regression: to measure the impact relationship between gamification tools and reducing supply chain risks.

Questionnaire:

This study relied on sending a questionnaire link to collect field information, and it consists of a set of questions related to the subject of the study.

After designing it correctly and accurately, it is one of the methodological stages that the researcher must pay attention to, especially since the assumptions that transformed into questions within the form constitute the first building blocks in building the theoretical and cognitive absolutes of the research studied.

It considered the appropriate means of collecting information, which are often used in scientific research. Through questionnaires, information derived directly from the original source and represented in a combination of questions, which in turn included two axes:

- Personal data axis: dedicated to identifying personal and employment data (age, gender, marital status, income level, work experience, educational qualification, and employment).
- The second axis: the following notes:

From 09 to 13 The importance of supply chain risk management (5 expressions)

From 14 to 16 Gamification element Leaderboards (3 expressions)

From 17 to 19 Gamification element Badges (3 phrases)

From 20 to 22 Gamification element Points (3 statements)

From 23 to 25 Gamification element Levels (3 phrases)

From 26 to 28 Gamification element Achievements (3 phrases)

From 29 to 31 Gamification element Avatar (3 phrases)

Descriptive analysis:

The researchers used SPSS V29 to enter primary data and conduct descriptive and statistical analysis, find out the following results:

The results of the descriptive analysis of Table No. (1), which describes the study sample, indicate that 59% of the study members ranged in age from 31 years to less than 40 years, the majority of them were males, as their percentage reached 76.1% of the study members, and the marital status amounted to 56.4% of the sample members. 35.9% of the people with an average income of more than 15 thousand riyals, have 10 years or more of experience 34.2% of the study individuals and hold a university qualification 70,1%, and 72.6% of the study and research individuals work in the private sector.

N	Variable	The code in the database	Category	Repetition	The ratio
1	Age	1	From 20 to 30 years old	99	28.2
		2	From 31 to 40 years old	207	59
		3	From 41 to 50 years old	30	8.5

		4	older than 50 years old	15	4.3
			the total	351	100
2	Gender	1	Male	267	76.1
		2	Female	84	23.9
			the total	351	100
3	Social status	1	Married	198	56.4
		2	Single	153	43.6
			the total	351	100
4	Income level	1	From 2500 to 5000	51	14.5
		2	From 5001 to 9000	84	23.9
		3	From 9001 to 15000	90	25.6
		4	More than 15000	126	35.9
			the total	351	100
5	Practical experience	1	From 1 to 3 years	84	23.9
		2	From 4 to 7 years	90	25.6
		3	From 8 to 10 years	48	13.7
		4	More than 10 years	120	34.2
		5	Retired	9	2.6
			the total	351	100
6	Academic qualification	1	Diploma	27	7.7
		2	Bachelor's degree	246	70.1
		3	Postgraduate studies	78	22.2
			the total	351	100
7	Functional	1	Public sector	63	17
		2	Private sector	255	72.6
		3	Self-employed	15	4.3
		4	Unemployed	18	5.1
			the total	351	100

Table No. (1) Description of the study sample

Source: Prepared by the researcher based on the results of the SPSS V29 program.

Validity and reliability:

To ensure the validity of the questionnaire data and its ability to achieve the desired goals, we used the reliability coefficient "Alpha Cronbach's" to measure the stability of the study tool in terms of the internal consistency of the items, as the axes' coefficient reached a percentage of 0.91, which is a percentage with high reliability. This percentage means that if the questionnaire was redistributed to the same sample, they would return the same first answers. This indicates a high degree of reliability for all questionnaire questions.

Number of questionnaire statements	Alpha Cronbach's coefficient	The percentage of Validity and reliability
23	0.91	91%

Table No. (2): A table showing the value of Cronbach's alpha coefficient for the questionnaire's axes.

Source: Based on SPSS V29 output

To ensure the stability of the measurement tool and that it would give the same results if the questionnaire redistributed to the same sample and under the same circumstances, the researcher, according to the available capabilities, chose the Cronbach's alpha method. The statistical analysis of Table No. (3) Indicates that the reliability coefficient of the measurement tool was as follows:

1. The reliability coefficient of the tool measuring the dependent variable, importance of supply chain risk management, according to the Cronbach's alpha scale, is equal to 0.77, and this indicates the stability of the measuring tool.
2. The reliability coefficient for the tool measuring all independent variables of Leaderboards according to the Cronbach's alpha scale is equal to 0.80, and this indicates the stability of the measuring tool.
3. The reliability coefficient for the tool for measuring the independent variable, the Badges according to the Cronbach's alpha scale, is equal to 0.87, and this indicates the stability of the measuring tool.
4. The reliability coefficient for the tool for measuring the independent variable, the Points according to the Cronbach's alpha scale, is equal to 0.89, and this indicates the stability of the measuring tool.
5. The reliability coefficient for the tool for measuring the independent variable, the Levels according to the Cronbach's alpha scale, is equal to 0.80, and this indicates the stability of the measuring tool.
6. The reliability coefficient for the tool for measuring the independent variable, the Achievements, according to the Cronbach's alpha scale, is equal to 0.88, and this indicates the stability of the measuring tool.
7. The reliability coefficient for the tool for measuring the independent variable, the Avatar, according to the Cronbach's alpha scale, is equal to 0.92, and this indicates the stability of the measuring tool.

N	Variables	Number of phrases	Cronbach's alpha coefficient	Percentage
1	Dependent variable importance of supply chain risk management	5	0.77	77%
2	Independent variable Leaderboards	3	0.80	80%
3	Independent variable Badges	3	0.87	87%
4	Independent variable Points	3	0.89	89%
5	Independent variable Levels	3	0.80	80%
6	Independent variable Achievements	3	0.88	88%
7	Independent variable Avatar	3	0.92	92%
The overall rate of study performance		23	0.91	91%

Table No. (3) Reliability of the study instrument

Source: Prepared by the researcher based on the results of the SPSS V29 program

Internal consistency validity (Correlation):

The validity of the internal consistency of the questionnaire verified by calculating the Pearson correlation coefficient between the scores of each item of the Gamification Elements and the total score of the axis to which the item belongs, using the SPSS statistical program. The following table shows the correlation coefficients between each period of the axis items and the total score of the axis.

From the results of the Table No. (4), we find that all Pearson correlation coefficients for the Reduce supply chain risks (its dependent element) are statistically significant at a significance level of 0.01, where the minimum correlation coefficients were 0. .641, while the upper limit was 0.766. Accordingly, all independent item items are internally consistent with its dependent item, which proves the validity of the internal consistency .

Independent elements	Dependent element: Reduce supply chain risks	
1	Pearson correlation coefficient	.708**
	Significance level	0.000
2	Pearson correlation coefficient	.756**
	Significance level	0.000
3	Pearson correlation coefficient	.751**
	Significance level	0.000
4	Pearson correlation coefficient	.766**
	Significance level	0.000
5	Pearson correlation coefficient	.641**
	Significance level	0.000

Table No. (4) Shows a comparison of the elements of the Gamification Elements with Reduce supply chain risks.

From the results of the following Table No. (5), we find that all Pearson correlation coefficients from the items of the first axis and the total score of the first axis are statistically significant at the level of significance of 0.01, where the minimum limit of the correlation coefficients was 0.829, while the upper limit was 0.884. Accordingly, all items

of the first axis are internally consistent with the axis that it belongs to him, which proves the validity of the internal consistency of the paragraphs of the first axis.

Paragraph number	Dimension: Leaderboards	
1	Pearson correlation coefficient	.836**
	Significance level	0.000
2	Pearson correlation coefficient	.884**
	Significance level	0.000
3	Pearson correlation coefficient	.829**
	Significance level	0.000

Table No. (5) Shows the comparison of the paragraphs of the Leaderboards axis with its overall axis.

From the results of the following Table No. (6), we find that all Pearson correlation coefficients from the items of the second axis and the total score of the second axis are statistically significant at the level of significance of 0.01, where the minimum of the correlation coefficients was 0.863, while the maximum was 0.909. Accordingly, all items of the second axis are internally consistent with the axis that it belongs to him, which proves the validity of the internal consistency of the paragraphs of the second axis.

Paragraph number	Dimension: Badges	
1	Pearson correlation coefficient	.899**
	Significance level	0.000
2	Pearson correlation coefficient	.909**
	Significance level	0.000
3	Pearson correlation coefficient	.863**
	Significance level	0.000

Table No. (6) Shows the comparison of the Badges axis paragraphs with their overall axis.

From the results of the following Table No. (7), we find that all Pearson correlation coefficients from the items of the third axis and the total score of the third axis are statistically significant at the level of significance of 0.01, where the minimum limit of the correlation coefficients was 0.901, while the maximum limit was 0.914. Accordingly, all items of the third axis are internally consistent with the axis that it belongs to him, which proves the validity of the internal consistency of the paragraphs of the third axis.

Paragraph number	Dimension: Points	
1	Pearson correlation coefficient	.914**
	Significance level	0.000
2	Pearson correlation coefficient	.910**
	Significance level	0.000
3	Pearson correlation coefficient	.901**
	Significance level	0.000

Table No. (7) Shows the comparison of the paragraphs of the Points axis with their overall axis.

From the results of the following Table No. (8), we find that all Pearson correlation coefficients from the items of the fourth axis and the total score of the fourth axis are statistically significant at the level of significance of 0.01, where the minimum limit of the correlation coefficients was 0.823, while the maximum limit was 0.902. Accordingly, all items of the fourth axis are internally consistent with the axis that it belongs to him, which proves the validity of the internal consistency of the paragraphs of the fourth axis.

Paragraph number	Dimension: Levels	
1	Pearson correlation coefficient	.823**
	Significance level	0.000
2	Pearson correlation coefficient	.823**

	Significance level	0.000
3	Pearson correlation coefficient	.902**
	Significance level	0.000

Table No. (8) Shows the comparison of the paragraphs of the Levels axis with its overall axis.

From the results of the following Table No. (9), we find that all Pearson correlation coefficients from the items of the fifth axis and the total score of the fifth axis are statistically significant at the level of significance of 0.01, where the minimum limit of the correlation coefficients was 0.895, while the maximum limit was 0.913. Accordingly, all items of the fifth axis are internally consistent with the axis that it belongs to him, which proves the validity of the internal consistency of the paragraphs of the fifth axis.

Paragraph number	Dimension: Achievements	
1	Pearson correlation coefficient	.895**
	Significance level	0.000
2	Pearson correlation coefficient	.913**
	Significance level	0.000
3	Pearson correlation coefficient	.894**
	Significance level	0.000

Table No. (9) Shows a comparison of the paragraphs of the Achievements axis with its overall axis.

From the results of the following Table No. (10), we find that all Pearson correlation coefficients from the items of the sixth axis and the total score of the sixth axis are statistically significant at the level of significance of 0.01, where the minimum limit of the correlation coefficients was 0.916, while the maximum limit was 0.940. Accordingly, all items of the sixth axis are internally consistent with the axis that it belongs to him, which proves the validity of the internal consistency of the paragraphs of the sixth axis.

Paragraph number	Dimension: Avatar	
1	Pearson correlation	.916**

	coefficient	
	Significance level	0.000
2	Pearson correlation coefficient	.940**
	Significance level	0.000
3	Pearson correlation coefficient	.933**
	Significance level	0.000

Table No. (10) Shows a comparison of the paragraphs of the Avatar axis with its overall axis.

Measurement tool:

In order to facilitate the processing of the questionnaire, the response scale was determined using a five-point Likert scale, to measure the opinion of the sample members regarding the questions included in the questionnaire, so that the answer areas for the questions and the weights of the answers were determined.

Strongly Agree	Agree	I don't know	not agree	Strongly Disagree
5	4	3	2	1

Table No. (11): A table showing the areas of response to the questionnaire questions and their weights.

To calculate the range ($5 - 1 = 4$), it is divided by the number of cells of the scale to obtain the correct cell length. ($1.33 = 3/4$)

After that, the value added to the lowest value on the scale (the correct one), to determine the upper limit of this cell and then determine the direction of the answer according to the arithmetic mean values.

Weighted average	5 – 3.68	3.67 – 2.34	2.33 – 1
Direction of the answer	Strong	Medium	Weak

Table No. (12): A table showing the direction of the sample members' answers.

Analyzing the attitudes of the study sample members regarding the study variables:

- 1) The attitude of the study sample members regarding awareness of the concept and importance of the importance of supply chain risk management:

From the following Table No. (13), the study members' attitudes indicate their agreement with the company importance of supply chain risk management, as the general arithmetic mean reached 4.11 and came within the third category, and the study members' agreement with the statements that measure this to a strong degree, with a standard deviation of 0.64.

It also indicates that the study members agreed with all phrase's strong degree.

N	Phrases	arithmetic mean	standard deviation	Direction of the answer
1	The Saudi Electricity Company establishes effective regulatory means to reduce supply chain risks in order to achieve stability and success of operations	4.16	.67	Strong
2	The Saudi Electricity Company educates and encourages employees to use strategies and tools regarding supply chain risks to achieve successful operations.	4.26	.55	Strong
3	Should supply chain risk assessment be an essential part of the Saudi Electricity Company's business strategy	4.08	.65	Strong
4	The Saudi Electricity Company cares greatly about complaints from employees and customers about the service, and emergency services work 24 hours a day, 7 days to address the risks of supply chains.	3.82	.74	Strong
5	Does the Saudi Electricity Company have a specific emergency plan to deal with potential risks in supply chains	4.23	.60	Strong
General Average		4.11	0.64	Strong

Table No. (13): A table representing the attitude of the study sample members regarding awareness of the concept and importance of supply chain risk management.

Source: Based on SPSS V29 output

- 2) The attitude of the study sample members regarding awareness of the concept and importance of the Leaderboards:

From the following Table No. (14), the study members' attitudes indicate their agreement with the company implementing Leaderboards to Reduce supply chain risks, as the general arithmetic mean reached 4.11 and came within the third category, and the study members' agreement with the statements that measure this to a strong degree, with a standard deviation of 0.74.

It also indicates that the study members agreed with all phrase's strong degree.

N	Phrases	arithmetic mean	standard deviation	Direction of the answer
1	Using the Leaderboards board encourages a culture of transparency and open communication regarding supply chain risks	4.06	.71	Strong
2	Using the Leaderboards board demonstrates a strong commitment to identifying and mitigating supply chain risks	4.05	.71	Strong
3	The Leaderboards board motivates employees to regularly reviews and updates supply chain risk management policies and procedures.	4.19	.77	Strong
General Average		4.11	0.74	Strong

Table No. (14): A table representing the attitude of the study sample members regarding awareness of the concept and importance of the Leaderboards.

Source: Based on SPSS V29 output

3) The attitude of the study sample members regarding awareness of the concept and importance of the Badges:

From the following Table No. (15), the study members' attitudes indicate their agreement with the company implementing Badges to Reduce supply chain risks, as the general arithmetic mean reached 4.21 and came within the third category, and the study members' agreement with the statements that measure this to a strong degree, with a standard deviation of 0.77.

It also indicates that the study members agreed with all phrase's strong degree.

N	Phrases	arithmetic mean	standard deviation	Direction of the answer
1	Receiving badges for completing training modules on supply chain risk management has increased my understanding and sense of accomplishment in supply chain risk	4.17	.76	Strong
2	Earning badges for achieving specific supply chain risk management goals has motivated me to improve my performance	4.17	.79	Strong
3	I would recommend the badge system to other organizations as a way to improve supply chain risk management	4.29	.74	Strong
General Average		4.21	0.77	Strong

Table No. (15): A table representing the attitude of the study sample members regarding awareness of the concept and importance of the Badges.

Source: Based on SPSS V29 output

4) The attitude of the study sample members regarding awareness of the concept and importance of the Points:

From the following Table No. (16), the study members' attitudes indicate their agreement with the company implementing Points to Reduce supply chain risks, as the general arithmetic mean reached 4.23 and came within the third category, and the study members' agreement with the statements that measure this to a strong degree, with a standard deviation of 0.78.

It also indicates that the study members agreed with all phrase's strong degree.

N	Phrases	arithmetic mean	standard deviation	Direction of the answer
1	Earning points for completing tasks to reduce supply chain risk mitigation motivates me to perform these tasks more effectively	4.25	.76	Strong
2	The desire to earn points encourages me to identify and address potential supply chain risks proactively	4.23	.82	Strong
3	The points system makes supply chain risk management tasks more enjoyable and less like a chore	4.19	.77	Strong
General Average		4.23	0.78	Strong

Table No. (16): A table representing the attitude of the study sample members regarding awareness of the concept and importance of the Points.

Source: Based on SPSS V29 output

5) The attitude of the study sample members regarding awareness of the concept and importance of the Levels:

From the following Table No. (17), the study members' attitudes indicate their agreement with the company implementing Levels to Reduce supply chain risks, as the general arithmetic mean reached 4.23 and came within the third category, and the study members' agreement with the statements that measure this to a strong degree, with a standard deviation of 0.75.

It also indicates that the study members agreed with all phrases a strong degree and phrase.

N	Phrases	arithmetic mean	standard deviation	Direction of the answer
1	The levels system in place motivates me to reduce supply chain risks	3.98	.78	Strong
2	I feel a sense of accomplishment when I level up and help me track my progress	4.48	.63	Strong
3	The levels make me feel like a valuable member of the team and I recommend companies to implement it	4.25	.84	Strong
General Average		4.23	0.75	Strong

Table No. (17): A table representing the attitude of the study sample members regarding awareness of the concept and importance of the Levels.

Source: Based on SPSS V29 output

- 6) The attitude of the study sample members regarding awareness of the concept and importance of the Achievements:

From the following Table No. (18), the study members' attitudes indicate their agreement with the company implementing Achievements to Reduce supply chain risks, as the general arithmetic mean reached 4.31 and came within the third category, and the study members' agreement with the statements that measure this to a strong degree, with a standard deviation of 0.75.

It also indicates that the study members agreed with all phrase's strong degree.

N	Phrases	arithmetic mean	standard deviation	Direction of the answer
1	I would recommend using achievements to motivate others to reduce .supply chain risks	4.37	0.71	Strong
2	I believe that achievements are an effective way to motivate people .to reduce supply chain risks	4.30	0.79	Strong
3	I believe that achievements are a fair and equitable way to recognize people for their contributions to reducing supply chain risks	4.27	0.75	Strong
General Average		4.31	0.75	Strong

Table No. (18): A table representing the attitude of the study sample members regarding awareness of the concept and importance of the Achievements.

Source: Based on SPSS V29 output

- 7) The attitude of the study sample members regarding awareness of the concept and importance of the Avatar:

From the following Table No. (19), the study members' attitudes indicate their agreement with the company implementing Avatar to Reducing supply chain risks, as the general arithmetic mean reached 3.59 and came within the third category, and the study members' agreement with the statements that measure this to a strong degree, with a standard deviation of 1.03.

It also indicates that the study members agreed with all phrase's medium degree.

N	Phrases	arithmetic mean	standard deviation	Direction of the answer
1	Having a personalized avatar that represents me in the supply chain risk reduction program makes me feel more connected to the work	3.56	1.04	Medium

2	I find that my avatar makes me more engaged in my work on supply chain risk reduction	3.62	1.02	Medium
3	I believe and recommend using avatars are an essential part of a gamified supply chain risk reduction program	3.58	1.05	Medium
General Average		3.59	1.03	Medium

Table No. (19): A table representing the attitude of the study sample members regarding awareness of the concept and importance of the Avatar.

Source: Based on SPSS V29 output

Hypothesis testing:

To measure the impact relationship, use a simple regression test to measure the impact of Gamification Elements in to Reduce supply chain risks:

1) The impact of using the Leaderboards to Reduce supply chain risks.

The hypothesis stated that: There is a relationship between the uses of the Leaderboards, thus reducing the Reduce supply chain risks:

Basic hypothesis H0: There is no direct, statistically significant effect between the uses of the Leaderboards to Reduce supply chain risks in the company under study.

Alternative hypothesis H1: There is a direct, statistically significant effect between the uses of the Leaderboards to Reduce supply chain risks in the company under study.

Leaderboards	Correlation test				Contrast test		Linear regression test				
	R	R ²	Adjusted R ²	Standard error	Significance level	F value	Significance level	T value	Beta	B	Constant
	0.457	0.208	0.206	0.206	0.000	91.889	0.000	9.585	0.456	0.413	2.343

Table No. (20): A table showing the results of a simple regression analysis to measure the effect of the Leaderboards to Reduce supply chain risks.

Source: Based on SPSS V29 output

It is clear from the previous Table No. (20) that the correlation coefficient between the independent variable (Gamification Elements) and the dependent variable (Reduce supply chain risks) is strong and robust with an amount of $R = 0.457$ which is higher than the average, and the correlation is positive and statistically significant between the independent variable and the dependent variable. The coefficient of determination $R^2 = 0.208$ shows a percentage effect of the independent variable on the dependent variable and the completion of this amount due to other factors that were not studied by the researcher or due to chance factors. The adjusted coefficient of determination $\text{Adjusted } R^2 = 0.206$ shows the explanatory and predictive ability of Leaderboards to Reduce supply chain risks. The F

value reached 91.889 and the Sig value = 0.000 was the lowest level of significance. $\alpha = 0.05$. Therefore, the hypothesized model is valid for predicting the values of the dependent variable and that the independent variable affects the dependent variable. The value of Beta = 0.456, which is a positive value and explains the effect of reverse promotion on rationalizing electrical energy consumption. Accordingly, the null hypothesis rejected and accepted the alternative hypothesis, which states that there is a direct, statistically significant effect of the reverse promotion strategy on rationalizing consumption in the company under study at a significance level of 0.05.

Simple linear regression equation:

$$Y = \text{constant} + BX$$

$$Y = 2.343 + 0.413X$$

2) The impact of using the Badges to Reduce supply chain risks.

The hypothesis stated that: There is a relationship between the uses of the Badges, thus reducing the Reduce supply chain risks:

Basic hypothesis H0: There is no direct, statistically significant effect between the uses of the Badges to Reduce supply chain risks in the company under study.

Alternative hypothesis H1: There is a direct, statistically significant effect between the uses of the Badges to Reduce supply chain risks in the company under study.

Badges	Correlation test				Contrast test		Linear regression test				
	R	R ²	Adjusted R ²	Standard error	Significance level	F value	Significance level	T value	Beta	B	Constant
	0.384	0.147	0.145	0.583	0.000	60.304	0.000	9.149	0.439	0.303	3.062

Table No. (21): A table showing the results of a simple regression analysis to measure the effect of the Badges to Reduce supply chain risks.

Source: Based on SPSS V29 output

It is clear from the previous Table No. (21) that the correlation coefficient between the independent variable (Gamification Elements) and the dependent variable (Reduce supply chain risks) is strong and robust with an amount of $R = 0.384$ which is higher than the average, and the correlation is positive and statistically significant between the independent variable and the dependent variable. The coefficient of determination $R^2 = 0.147$ shows a percentage effect of the independent variable on the dependent variable and the completion of this amount due to other factors that were not studied by the researcher or due to chance factors. The adjusted coefficient of determination Adjusted $R^2 = 0.145$ shows the explanatory and predictive ability of Badges to Reduce supply chain risks. The F value reached 60.304 and the Sig value = 0.000 was the lowest level of significance. $\alpha = 0.05$.

Therefore, the hypothesized model is valid for predicting the values of the dependent variable and that the independent variable affects the dependent variable. The value of Beta = 0.439, which is a positive value and explains the effect of reverse promotion on rationalizing electrical energy consumption. Accordingly, the null hypothesis rejected and accepted the alternative hypothesis, which states that there is a direct, statistically significant effect of the reverse promotion strategy on rationalizing consumption in the company under study at a significance level of 0.05.

Simple linear regression equation:

$$Y = \text{constant} + BX$$

$$Y = 3.062 + 0.303X$$

3) The impact of using the Points to Reduce supply chain risks.

The hypothesis stated that: There is a relationship between the uses of the Points, thus reducing the Reduce supply chain risks:

Basic hypothesis H0: There is no direct, statistically significant effect between the uses of the Points to Reduce supply chain risks in the company under study.

Alternative hypothesis H1: There is a direct, statistically significant effect between the uses of the Points to Reduce supply chain risks in the company under study.

Points	Correlation test				Contrast test		Linear regression test				
	R	R ²	Adjusted R ²	Standard error	Significance level	F value	Significance level	T value	Beta	B	Constant
	0.440	0.193	0.191	0.567	0.000	83.72	0.000	9.149	0.439	0.303	2.824

Table No. (22): A table showing the results of a simple regression analysis to measure the effect of the Points to Reduce supply chain risks.

Source: Based on SPSS V29 output

It is clear from the previous Table No. (22) that the correlation coefficient between the independent variable (Gamification Elements) and the dependent variable (Reduce supply chain risks) is strong and robust with an amount of $R = 0.440$ which is higher than the average, and the correlation is positive and statistically significant between the independent variable and the dependent variable. The coefficient of determination $R^2 = 0.193$ shows a percentage effect of the independent variable on the dependent variable and the completion of this amount due to other factors that were not studied by the researcher or due to chance factors. The adjusted coefficient of determination Adjusted $R^2 = 0.191$ shows the explanatory and predictive ability of Points to Reduce supply chain risks. The F value reached 83.71 and the Sig value = 0.000 was the lowest level of significance. $\alpha = 0.05$. Therefore, the hypothesized model is valid for predicting the values of the dependent

variable and that the independent variable affects the dependent variable. The value of Beta = 0.439, which is a positive value and explains the effect of reverse promotion on rationalizing electrical energy consumption. Accordingly, the null hypothesis rejected and accepted the alternative hypothesis, which states that there is a direct, statistically significant effect of the reverse promotion strategy on rationalizing consumption in the company under study at a significance level of 0.05.

Simple linear regression equation:

$$Y = \text{constant} + BX$$

$$Y = 2.824 + 0.303X$$

4) The impact of using the Levels to Reduce supply chain risks.
The hypothesis stated that: There is a relationship between the uses of the Levels, thus reducing the Reduce supply chain risks:

Basic hypothesis H0: There is no direct, statistically significant effect between the uses of the Levels to Reduce supply chain risks in the company under study.

Alternative hypothesis H1: There is a direct, statistically significant effect between the uses of the Levels to Reduce supply chain risks in the company under study.

Levels	Correlation test				Contrast test		Linear regression test				
	R	R ²	Adjusted R ²	Standard error	Significance level	F value	Significance level	T value	Beta	B	Constant
	0.470	0.221	0.218	0.557	0.000	99.141	0.000	9.956	0.470	0.360	2.553

Table No. (23): A table showing the results of a simple regression analysis to measure the effect of the Levels to Reduce supply chain risks.

Source: Based on SPSS V29 output

It is clear from the previous Table No. (23) that the correlation coefficient between the independent variable (Gamification Elements) and the dependent variable (Reduce supply chain risks) is strong and robust with an amount of $R = 0.470$ which is higher than the average, and the correlation is positive and statistically significant between the independent variable and the dependent variable. The coefficient of determination $R^2 = 0.221$ shows a percentage effect of the independent variable on the dependent variable and the completion of this amount due to other factors that were not studied by the researcher or due to chance factors. The adjusted coefficient of determination Adjusted $R^2 = 0.218$ shows the explanatory and predictive ability of Levels to Reduce supply chain risks. The F value reached 99.141 and the Sig value = 0.000 was the lowest level of significance. $\alpha = 0.05$. Therefore, the hypothesized model is valid for predicting the values of the dependent variable and that the independent variable affects the dependent variable. The value of Beta

= 0.470, which is a positive value and explains the effect of reverse promotion on rationalizing electrical energy consumption. Accordingly, the null hypothesis rejected and accepted the alternative hypothesis, which states that there is a direct, statistically significant effect of the reverse promotion strategy on rationalizing consumption in the company under study at a significance level of 0.05.

Simple linear regression equation:

$$Y = \text{constant} + BX$$

$$Y = 2.553 + 0.360X$$

5) The impact of using the Achievements to Reduce supply chain risks. The hypothesis stated that: There is a relationship between the uses of the Achievements, thus reducing the Reduce supply chain risks:

Basic hypothesis H0: There is no direct, statistically significant effect between the uses of the Achievements to Reduce supply chain risks in the company under study.

Alternative hypothesis H1: There is a direct, statistically significant effect between the uses of the Achievements to Reduce supply chain risks in the company under study.

Achievements	Correlation test				Contrast test		Linear regression test				
	R	R ²	Adjusted R ²	Standard error	Significance level	F value	Significance level	T value	Beta	B	Constant
	0.419	0.175	0.594	0.173	0.000	74.284	0.000	8.618	0.418	0.385	2.403

Table No. (24): A table showing the results of a simple regression analysis to measure the effect of the Achievements to Reduce supply chain risks.

Source: Based on SPSS V29 output

It is clear from the previous Table No. (24) that the correlation coefficient between the independent variable (Gamification Elements) and the dependent variable (Reduce supply chain risks) is strong and robust with an amount of $R = 0.419$ which is higher than the average, and the correlation is positive and statistically significant between the independent variable and the dependent variable. The coefficient of determination $R^2 = 0.175$ shows a percentage effect of the independent variable on the dependent variable and the completion of this amount due to other factors that were not studied by the researcher or due to chance factors. The adjusted coefficient of determination Adjusted $R^2 = 0.594$ shows the explanatory and predictive ability of Achievements to Reduce supply chain risks. The F value reached 74.284 and the Sig value = 0.000 was the lowest level of significance. $\alpha = 0.05$. Therefore, the hypothesized model is valid for predicting the values of the dependent variable and that the independent variable affects the dependent variable. The value of Beta = 0.418, which is a positive value and explains the effect of reverse promotion on

rationalizing electrical energy consumption. Accordingly, the null hypothesis rejected and accepted the alternative hypothesis, which states that there is a direct, statistically significant effect of the reverse promotion strategy on rationalizing consumption in the company under study at a significance level of 0.05.

Simple linear regression equation:

$$Y = \text{constant} + BX$$

$$Y = 2.403 + 0.385X$$

6) The impact of using Avatar to Reduce supply chain risks.

The hypothesis stated that: There is a relationship between the uses of the Avatar, thus reducing the Reduce supply chain risks:

Basic hypothesis H0: There is no direct, statistically significant effect between the uses of the Avatar to Reduce supply chain risks in the company under study.

Alternative hypothesis H1: There is a direct, statistically significant effect between the uses of the Avatar to Reduce supply chain risks in the company under study.

Avatar	Correlation test				Contrast test		Linear regression test				
	R	R ²	Adjusted R ²	Standard error	Significance level	F value	Significance level	T value	Beta	B	Constant
	0.361	0.129	0.127	0.589	0.000	52.141	0.000	7.220	0.360	0.287	2.891

Table No. (25): A table showing the results of a simple regression analysis to measure the effect of the Avatar to Reduce supply chain risks.

Source: Based on SPSS V29 output

It is clear from the previous Table No. (25) that the correlation coefficient between the independent variable (Gamification Elements) and the dependent variable (Reduce supply chain risks) is strong and robust with an amount of $R = 0.361$ which is higher than the average, and the correlation is positive and statistically significant between the independent variable and the dependent variable. The coefficient of determination $R^2 = 0.129$ shows a percentage effect of the independent variable on the dependent variable and the completion of this amount due to other factors that were not studied by the researcher or due to chance factors. The adjusted coefficient of determination $\text{Adjusted } R^2 = 0.127$ shows the explanatory and predictive ability of Avatar to Reduce supply chain risks. The F value reached 52.141 and the Sig value = 0.000 was the lowest level of significance. $\alpha = 0.05$. Therefore, the hypothesized model is valid for predicting the values of the dependent variable and that the independent variable affects the dependent variable. The value of Beta = 0.360, which is a positive value and explains the effect of reverse promotion on rationalizing electrical energy consumption. Accordingly, the null hypothesis rejected and

accepted the alternative hypothesis, which states that there is a direct, statistically significant effect of the reverse promotion strategy on rationalizing consumption in the company under study at a significance level of 0.05.

Simple linear regression equation:

$$Y = \text{constant} + BX$$

$$Y = 2.891 + 0.287X$$

Differences in the responses of sample members according to demographic variables:

An analysis of variance (ANOVA) was conducted to test the differences in the responses of the sample members towards the effect of using gamification elements to reduce the risks of supply chains in the Saudi Electricity Company in Jeddah according to the variables (age, gender, marital status, income level, work experience, educational qualification, employment) and the table: The following shows the results:

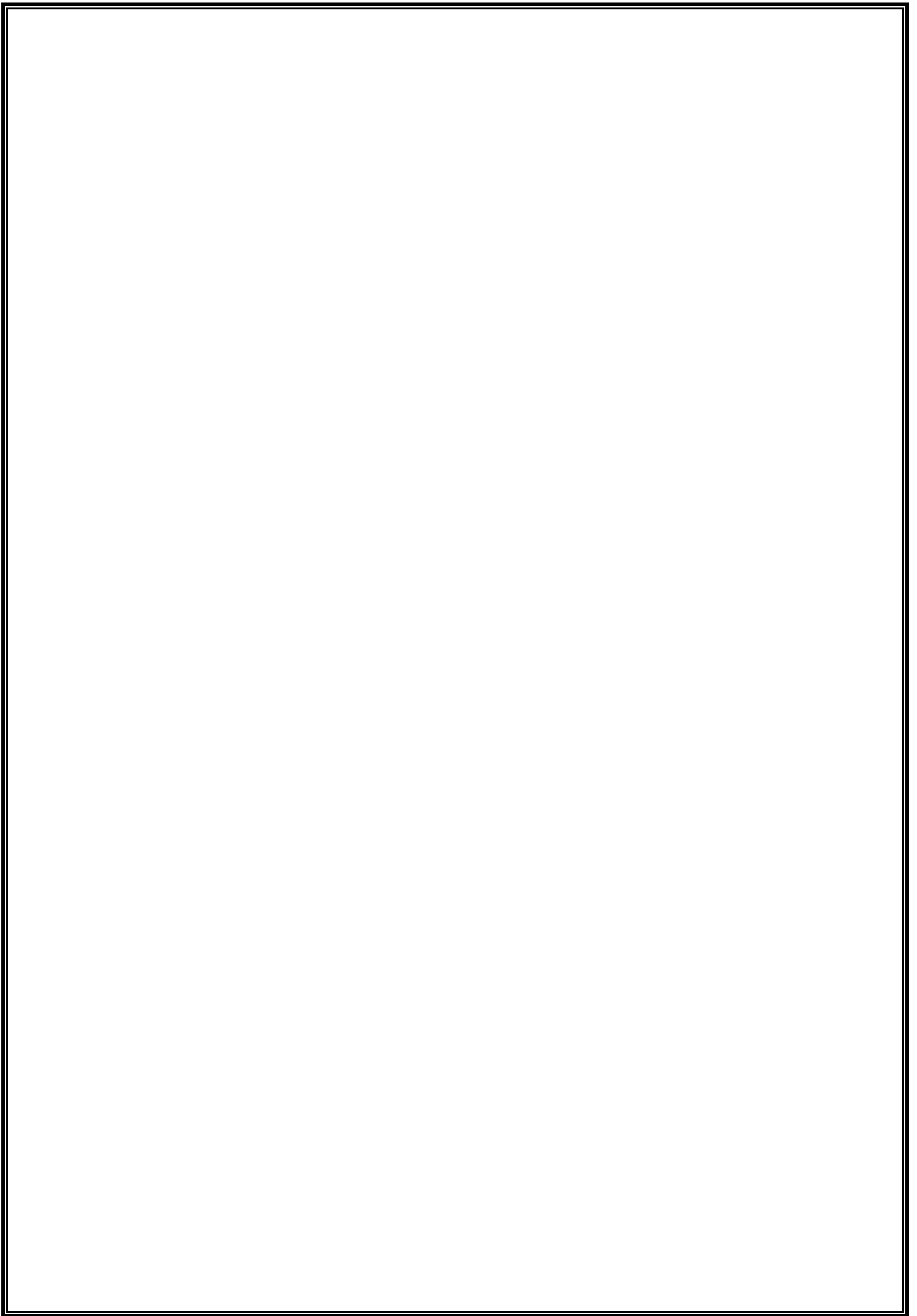
From Table (26), which shows the analysis of variance (ANOVA) for the differences in the responses of the sample members regarding the effect of using gamification elements to reduce the risks of supply chains in the Saudi Electricity Company in Jeddah according to demographic variables, we find that the F values for the responses of the sample members regarding the effect of using gamification elements to reduce the risks of supply chains in The Saudi Electricity Company in Jeddah, according to the variables (age, gender, marital status, income level, work experience, educational qualification, job), was not statistically significant at the level of significance (0.05), as the significance levels for the F values are all greater than the level of significance (0.05), and therefore there are no statistically significant differences in the responses of the sample members towards the effect Using gamification elements to reduce supply chain risks in the Saudi Electricity Company in Jeddah according to variables (age, gender, marital status, income level, work experience, educational qualification, job).

Variable	Source of difference	Sum of squares	Mean squares	Degrees of freedom	F value	Significance level
Age	Between groups	1.117	0.862	3	0.978	0.402
	Within groups	132.059	0.342	347		
Gender	Between groups	0.483	0.483	1	1.271	0.260
	Within groups	132.693	0.380	349		
Marital status	Between groups	0.247	0.247	1	0.650	0.420

	Within groups	132.928	0.380	349		
Income level	Between groups	1.543	0.514	3	1.356	0.256
	Within groups	131.633	0.379	347		
Practical experience	Between groups	1.447	0.361	4	0.950	0.434
	Within groups	131.728	0.380	346		
Educational qualification	Between groups	0.306	0.153	2	0.401	0.669
	Within groups	132.870	0.381	348		
Job	Between groups	2.357	0.785	3	2.084	0.101
	Within groups	130.819	0.377	347		

Table No. (26): Analysis of Variance (ANOVA) test for differences in the responses of sample members towards using gamification elements to reduce supply chain risks in the Saudi Electricity Company for (age, gender, marital status, income level, work experience, educational qualification, employment).

Source: Based on SPSS 29V output



**Chapter Four: Framework of results and
recommendations, then finally a list of references
and research**

Hypothesis results:

- 1- There is a clear moral relationship between the warning and defect elements and the supply chains of the company under study.
- 2- There is a clear significant effect at the significance level of 0.05 between defective birth marks and maternal regression reduction.
- 3- Linear regression equations were written for each gamification element with low-supply blues strings.

Conclusion:

From the above, the study reached a set of results, the most important of which are:

There is a direct effect between the elements of gamification (Leaderboards, Badges, Points, Levels, Achievements, Avatar) and reducing supply chain risks at a significant level of 0.005.

Recommendations:

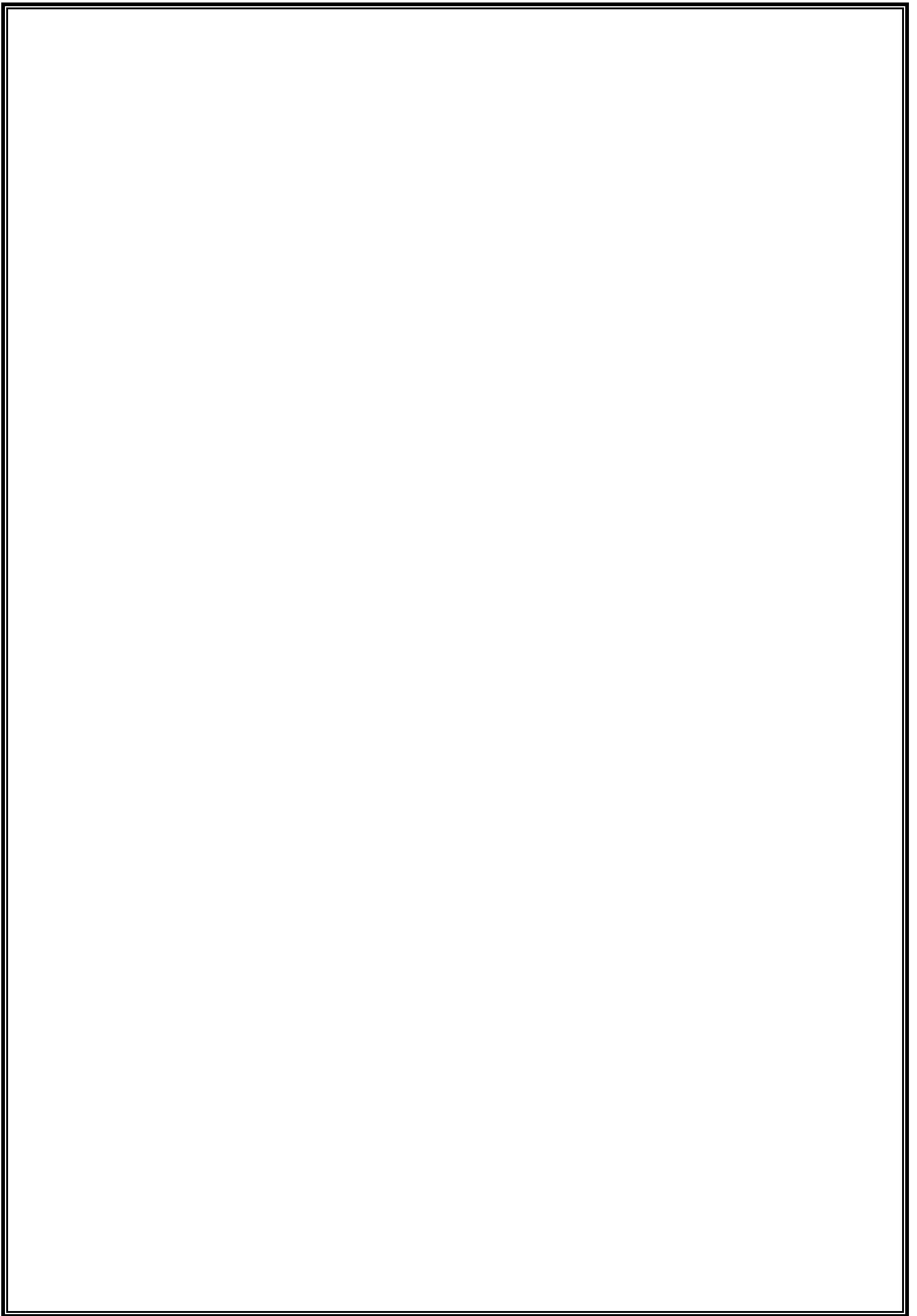
- A set of recommendations were proposed based on the results of this study, which are as follows:
- The Saudi Electricity Company begins to adopt the philosophy of gamification, disseminate it among employees, and then actually work to implement it and spread it to the external community.
- Gradual implementation of gamification strategies to reduce supply chain risks.
- The Saudi Electricity Company must work to diversify training methods to reduce supply chain risks and target all age groups, especially proximity to educational institutions, and this is what contributes to pushing employees towards reducing supply chain risks.
- That the Saudi Electricity Company provides incentives to employees who are committed to reducing supply chain risks has a positive impact on the rest of the employees, encouraging them and pushing them towards compliance with instructions and directives.
- Increasing the Saudi Electricity Company's awareness campaigns, targeting all segments of society, holding awareness programs and campaigns through seminars and conferences, and intensifying attendance, both in the Kingdom's audio-visual media and all social media platforms.

Suggested future research:

- Conduct more similar studies on companies and sectors in the Kingdom of Saudi Arabia.
- The impact of spreading awareness of gamification elements on reducing supply chain risks.
- The impact of knowledge transfer on investment in knowledge creation in companies and linking it with gamification elements.
- Improve knowledge transfer processes to improve skills and knowledge gaps between senior and junior employees.
- The role of educational and training bodies, such as schools, universities, and training institutes, in spreading the concept of gamification and its impact on reducing supply chain risks.

References:

- 1- Gamification as a resource in Education. A Bibliometric Analysis in times of Pandemic. (2022). *Journal of Pharmaceutical Negative Results*, 13(SO3). <https://doi.org/10.47750/pnr.2022.13.s03.043>.
- 2- Poženel, M., Zrnec, A., & Lavbič, D. (2022). Measuring how motivation affects information quality assessment: A gamification approach. *PLOS ONE*, 17(10), e0274811. <https://doi.org/10.1371/journal.pone.0274811>.
- 3- Fiuza-Fernández, A., Lomba-Portela, L., Soto-Carballo, J. G., & Juste, M. R. P. (2022). Study of the knowledge about gamification of degree in primary education students. *PLOS ONE*, 17(3), e0263107. <https://doi.org/10.1371/journal.pone.0263107>.
- 4- León, A. M., Camacho-Lazarraga, P., Guerrero, M. Á. G., Puerta, L. G., Aguilar-Parra, J. M., Trigueros, R., & Alías, A. (2021). Between level up and game over: A Systematic Literature Review of Gamification in Education. *Sustainability*, 13(4), 2247. <https://doi.org/10.3390/su13042247>
- 5- Bouzakis, A. (2021). *The effects that gamification has on employee's motivation, engagement, loyalty levels*. ARISTOTLE University Of THESSALONIKI.
- 6- Peña, A. I. P., Frías-Jamilena, D. M., & Fernández-Ruano, M. L. (2020). Influence of gamification on perceived self-efficacy: gender and age moderator effect. *International Journal of Sports Marketing & Sponsorship*, 22(3), 453–476. <https://doi.org/10.1108/ijms-02-2020-0020>.
- 7- Georgiou, K., Gouras, A., & Nikolaou, I. (2019). Gamification in employee selection: The development of a gamified assessment. *International Journal of Selection and Assessment*, 27(2), 91–103. <https://doi.org/10.1111/ijsa.12240>.
- 8- Gryaznova, S. (2019). *Gamification in Employee Engagement*. etropolia University of Applied Sciences.
- 9- Adam Dandabo & Philip Kivelö, *Supply Chain Risk Management in Small and Medium-sized Enterprises*, 2021, Karlstad University.
- 10- Tummala, V. R., & Schoenherr, T. (2011). Assessing and managing risks using the Supply Chain Risk Management Process (SCRMP). *Supply Chain Management*, 16(6), 474–483. <https://doi.org/10.1108/13598541111171165>
- 11- Yan Coelho Albertin, *Supply chain Risk Understanding and Facing the Main Risks on the Chain*, 2017, South Eastern Finland University of Applied Science.
- 12- Albin Melin & Jesper Ehlers, *Development of a Proactive Supply Risk Management Model*, 2021, Lund University.
- 13- *Supply Chain Management*, First edition, 2013, JNU, Jaipur.
- 14- *Supply chain Management*, Alex Gerald Muheesi, 2022, Uganda Martyrs University.
- 15- *Supply Chain Management: A comprehensive Analysis of how to control, assess and maintain Risks and Transparency in complex Supply Chain Systems*, Franziska Jagals and Klaus Schultze, 2017.
- 16- Mentzer, J.T., *Supply Chain Management* (2002).



Appendices:

Dear participants

Research project questionnaire to collect data.

This questionnaire is a research project to get a master's degree in risk management, entitled: The impact of using gamification elements to reduce supply chain risks in the Kingdom of Saudi Arabia.

It takes approximately 7 minutes to fill out this questionnaire.

<https://forms.gle/QjH7fjJyS45nAtQa8>

Please share and publish.

Thank you for your cooperation.

Personal data:

1- Age:

From 31 to 40 years old		From 20 to 30 years old	
older than 50 years old		From 41 to 50 years old	

2- Gender:

Female		Male	
--------	----------------------	------	----------------------

3- Social status:

Single		Married	
--------	----------------------	---------	----------------------

4- Income level:

From 5001 to 9000		From 2500 to 5000	
More than 15000		From 9001 to 15000	

5- Practical experience:

From 4 to 7 years		From 1 to 3 years	
More than 10 years		From 8 to 10 years	
Retired			

6- Academic qualification:

Diploma		High school or less	
Postgraduate studies		Bachelor's degree	

7- Functional:

Public sector ☐ Private sector ☐ Self-employed ☐ Unemployed

First: The statistical relationship towards the importance of supply chain risk management among the study sample members (inverse product)

N	Ferries	Strongly Agree	Agree	I don't know	not agree	Strongly Disagree
8	The Saudi Electricity Company establishes effective regulatory means to reduce supply chain risks in order to achieve stability and success of operations to deal with potential risks in supply chains.					
9	The Saudi Electricity Company educates and encourages employees to use strategies and tools regarding supply chain risks to achieve successful operations.					
10	Should supply chain risk assessment be an essential part of the Saudi Electricity Company's business strategy					
11	The Saudi Electricity Company cares greatly about complaints from employees and customers about the service, and emergency services work 24 hours a day, 7 days to address the risks of supply chains.					
12	Does the Saudi Electricity Company have a specific emergency plan					

Gamification: a method in training and education that involves a set of elements such as collecting points to accomplish a specific task and designing activities in a progressive way, starting from simple to complex and from easy to hard, with the possibility of repeating the levels to reinforce or improve the skill, and making a board for the outstanding participants in a certain stage, or even the whole game.

Second: The statistical relationship towards the trend of the study sample members regarding Gamification element (Leaderboards).

Leaderboards: lists of all trainees sorted by their level.

N	Ferries	Strongly Agree	Agree	I don't know	not agree	Strongly Disagree
13	Using the leadership board encourages a culture of transparency and open communication regarding supply chain risks.					

14	Using the leadership board demonstrates a strong commitment to identifying and mitigating supply chain risks.					
15	The leadership board motivates employees to regularly reviews and updates supply chain risk management policies and procedures.					

Third: The statistical relationship towards the study sample members regarding Gamification element (Badges).

Badges: a visual representation of the achievements that the trainee makes.

N	Ferries	Strongly Agree	Agree	I don't know	not agree	Strongly Disagree
16	Receiving badges for completing training modules on supply chain risk management has increased my understanding and sense of accomplishment in supply chain risk.					
17	Earning badges for achieving specific supply chain risk management goals has motivated me to improve my performance.					
18	I would recommend the badge system to other organizations as a way to improve supply chain risk management.					

Fourth: The statistical relationship towards the study sample members regarding Gamification element (Points).

Points: the trainee earns them after doing several activities in the game.

N	Ferries	Strongly Agree	Agree	I don't know	not agree	Strongly Disagree
19	Earning points for completing tasks to reduce supply chain risk mitigation motivates me to perform these tasks more effectively.					
20	The desire to earn points encourages me to identify and address potential supply chain risks proactively.					
21	The points system makes supply chain risk management tasks more enjoyable and less like a chore.					

Fifth: The statistical relationship towards the study sample members regarding Gamification element (Levels).

Levels: provide information about the trainees and their current state and direction towards achieving the goal.

N	Ferries	Strongly Agree	Agree	I don't know	not agree	Strongly Disagree
22	The levels system in place motivates me to reduce supply chain risks.					
23	I feel a sense of accomplishment when I level up and help me track my progress.					
24	The levels make me feel like a valuable member of the team and I recommend companies to implement it.					

Sixthly: The statistical relationship towards the study sample members regarding Gamification element (Achievements).

Achievements: shows the progress and achievements of the character that represent the training and behaviors that he performs.

N	Ferries	Strongly Agree	Agree	I don't know	not agree	Strongly Disagree
25	I would recommend using achievements to motivate others to reduce supply chain risks.					
26	I believe that achievements are an effective way to motivate people to reduce supply chain risks.					
27	I believe that achievements are a fair and equitable way to recognize people for their contributions to reducing supply chain risks.					

Seventh: The statistical relationship towards the study sample members regarding Gamification element (Avatar).

Avatar: Characters symbols or cartoon characters, for example, that the trainee chooses to represent him in the training.

N	Ferries	Strong ly Agree	Agree	I don't know	not agree	Strongly Disagree
28	Having a personalized avatar that represents me in the supply chain risk reduction program makes me feel more connected to the work.					
29	I find that my avatar makes me more engaged in my work on supply chain risk reduction.					
30	I believe and recommend using avatars are an essential part of a gamified supply chain risk reduction program.					