

**THE REGULATORY ROLE AND ETHICAL RESPONSIBILITY OF BARCODE IN
PRODUCTIVITY AND MARKETING REQUIREMENTS: APPLIED STUDIES IN
SEVERAL BUSINESS ORGANIZATIONS IN THE MIDDLE EUPHRATES REGION**

**Prof Dr. Muiead A.k.Alfadel, Hussain Ali Hussain, Mohammed Fayez Hussain and Jassim Saleh
Hassan**

Faculty of Administrative Sciences, Al-Mustaqbal University, Babylon, Hillah, 51001, Iraq

<http://doi.org/10.35409/IJBMER.2026.3761>

Received: 18 March 2026/ Published: 25 April 2026

ABSTRACT

Objective: To analyze the regulatory role and ethical responsibility of barcode technology in enhancing productivity and marketing requirements in business organizations in Iraq's Middle Euphrates region.

Methodology: A descriptive analytical approach was used. A questionnaire was distributed to 30 consumers across six marketing outlets in Babylon Governorate. Data were analyzed using SPSS (Cronbach's Alpha = 0.87).

Findings: Half of consumers can identify product origin via barcodes, while the other half cannot. Most consumers feel reassured when reading barcodes, but a gap exists between awareness and practice. Barcode readers are largely unavailable or used only for price checking. Most consumers view barcodes as a quality guarantee.

Recommendations: Companies should adopt clear, standardized barcodes. Governments should enforce consumer protection laws. Consumers should use barcodes as an information source, not just a price tag.

Keywords: Barcode, regulatory role, ethical responsibility, productivity, marketing performance, consumer protection.

1. INTRODUCTION

In light of the rapid expansion of globalization and growing competition in local and regional markets, technology has become one of the fundamental pillars for achieving efficiency and productivity in business organizations. Among the technologies that have brought about a qualitative shift in production and marketing methods, the barcode stands out as an advanced tool that has contributed to reshaping organizational and administrative processes in economic institutions. The barcode has achieved a quantum leap in the speed and accuracy of data recording and tracking, directly impacting the improvement of performance levels and the effectiveness of decision-making, in addition to enhancing the competitiveness of organizations in contemporary business environments.

Superficially, the barcode appears as a simple technology, yet it holds great importance in controlling supply chains, managing inventory, tracking products, and recording commercial transactions. The barcode has become an integral part of the product life cycle – from the production stage to reaching the final consumer – making it a central tool in achieving efficient operational and strategic marketing objectives.

However, the role of the barcode is not limited to the technical aspect; it also extends to an important regulatory and ethical dimension. On the regulatory level, the barcode acts as a means to ensure transparency and accuracy in data and to reduce human errors, which positively reflects on production and sales reports and contributes to improving planning and marketing strategies. It also helps detect attempts at product manipulation or fraud, thereby enhancing the level of trust between the organization, customers, business partners, and governments.

From the perspective of ethical responsibility, the use of barcodes requires adherence to clear ethical rules and standards arising from business organizations' concern to protect consumer rights, ensure information confidentiality, and achieve fairness in commercial transactions. It is not enough for data to be recorded automatically and efficiently; this data must also be used in a way that preserves the dignity of individuals and the rights of institutions and prevents its misuse for illegal purposes such as monopoly or misleading advertising or pricing.

2. METHODOLOGICAL FRAMEWORK

This chapter represents the methodological foundation of the research, outlining the theoretical and applied framework upon which the researcher relies in analyzing the role of the barcode system in enhancing organizational control and ethical responsibility, and its impact on productivity and marketing requirements within business organizations, with applications to the reality of organizations in the Middle Euphrates region.

2.1 Research Problem

The research problem lies in determining the extent to which the barcode system contributes to enhancing internal control and ethical responsibility within business organizations, and the reflection of this on productivity and marketing requirements in the environment of business organizations in the Middle Euphrates region.

This problem stems from the challenges faced by institutions in linking technology with institutional organization and ethical behavior standards, especially when using modern information systems in the supply chain and marketing.

2.2 Research Objectives

This research seeks to achieve a set of main objectives, which can be summarized as follows:

1. To identify the concept of the barcode and its regulatory function within business organizations.
2. To explore the dimensions of ethical responsibility associated with the use of the barcode system.
3. To analyze the impact of the barcode on operational productivity and marketing requirements.
4. To provide practical applications from business organizations in the Middle Euphrates region to measure the effectiveness of the barcode in the work reality.

2.3 Importance of the Research

The importance of the research lies in the following points:

1. Contributing to the understanding of the regulatory role of modern technologies within institutions, especially the barcode, which has become a basic standard for managing information and the flow of resources internally and externally. (Al-Fadl et al., 2025: 15)
2. Highlighting the relationship between technology and ethical responsibility, a sensitive aspect in modern institutional environments requiring high transparency and credibility. (Al-Obaidi, 2018: 42)

-
3. Applying the study to organizations in the Middle Euphrates region, giving it a local character that enriches the research library with contributions related to the reality of business in Iraq. (Middle Euphrates Technical University, 2022: 8)

2.4 Research Hypotheses

This research is based on a number of hypotheses, as follows:

1. There is a statistically significant positive relationship between the application of the barcode system and the enhancement of administrative control within business organizations.
2. The barcode system contributes to supporting ethical responsibility towards the consumer and the work environment.
3. The barcode contributes to improving operational productivity requirements within organizations.
4. The barcode system helps improve marketing performance and achieve consumer satisfaction.

2.5 Research Limits

2.5.1 Spatial Limits

The research focuses on business organizations within the Middle Euphrates region, including a number of commercial, industrial, service, and productive companies. (Middle Euphrates Technical University, 2022: 12)

2.5.2 Temporal Limits

The research covers the period 2025–2026, due to the importance of the period of major technical development in the use of barcode systems. (Al-Fadl et al., 2025: 20)

2.5.3 Subject Limits

The research focuses on the following elements: the barcode system and its regulatory function, the ethical dimensions of barcode use, and its relationship with productivity and marketing within the organization.

2.6 Research Methodology

This research adopts the descriptive analytical method to identify and understand phenomena related to the barcode through:

- Reviewing the literature and previous research related to practical applications of the barcode and its impact on control, productivity, and marketing. (Al-Saedi, 2019: 33)
- Analyzing data from applied studies in business organizations to measure the results of barcode application. (Al-Fadl et al., 2025: 28)
- The analytical method in interpreting results and clarifying relationships between the basic research variables (barcode – control – ethics – productivity – marketing). (Al-Najjar, 2020: 55)

2.7 Research Terminology

2.7.1 Barcode

The barcode is defined as a striped symbol composed of lines and geometric shapes representing digital data read automatically by specialized devices, used to identify and track goods and commodities during production, storage, and marketing processes. (Al-Fadl et al., 2025: 5)

The barcode is considered one of the automatic identification and data collection technologies that contributes to providing accurate and fast information about the product, thereby supporting administrative control and consumer protection. (Al-Tayeb, 2015: 67)

2.7.2 Regulatory Role

The regulatory role is the set of procedures and methods adopted by management to monitor the workflow within the organization, compare actual performance with planned performance, detect deviations, and address them in a timely manner. (Al-Saedi, 2019: 18)

The regulatory role of the barcode in this research refers to the system's ability to control the movement of goods, monitor inventory, and prevent manipulation of production and marketing information. (Al-Fadl et al., 2025: 7)

2.7.3 Ethical Responsibility

Ethical responsibility is defined as the commitment of business organizations to ethical values and principles in their dealings with consumers, employees, and society, ensuring integrity, transparency, and avoidance of harm to others. (Al-Obaidi, 2018: 25)

In this research, the ethical responsibility of the barcode refers to the organization's commitment to providing correct and accurate information about the commodity, such as production date, expiry date, ingredients, and price, in line with applicable legislation. (Iraqi Consumer Protection Law No. 1 of 2010, Article 3)

2.7.4 Productivity

Productivity is an indicator reflecting the efficiency of using human, material, and technical resources to achieve the greatest amount of output with the least possible input. (Al-Najjar, 2020: 12)

In this research, it refers to the extent to which the use of the barcode system contributes to improving the efficiency of production operations, reducing time and effort, and limiting human errors within business organizations. (Al-Fadl et al., 2025: 9)

2.7.5 Marketing Performance

Marketing performance is defined as the organization's ability to achieve its marketing goals by meeting consumer needs, achieving customer satisfaction, and increasing sales and market share. (Al-Hammadi, 2017: 44)

In this research, it refers to the impact of barcode use on improving sales speed, pricing accuracy, providing information to the consumer, and enhancing trust between the organization and the customer. (Al-Zahrani, 2017: 91)

2.7.6 Business Organizations

Business organizations are economic units that seek to produce goods or provide services by organizing available resources, aiming for profit or community service. (Al-Abadi, 2016: 30)

In this research, it refers to productive and marketing organizations operating in the Middle Euphrates region that rely or can rely on barcode technologies in managing their operations. (Al-Fadl et al., 2025: 11)

2.7.7 Consumer

The consumer is any natural or legal person who obtains a commodity or service for the purpose of satisfaction, whether for personal or commercial purposes. (Iraqi Consumer Protection Law No. 1 of 2010, Article 1)

The consumer in this research includes both the primary consumer (wholesale or retail trader) and the final consumer, who rely on the barcode as a regulatory means to obtain reliable information about the commodity. (Al-Fadl et al., 2025: 13)

2.7.8 Middle Euphrates Region

The Middle Euphrates region refers to a number of Iraqi governorates located in the central part of the country, which witness diverse economic and commercial activity and include productive

and marketing organizations that represent a suitable field for the practical application of the research. (Middle Euphrates Technical University, 2022: 5)

3. CONCEPTUAL FRAMEWORK

3.1 Concept of Barcode

The barcode is considered one of the most important modern technologies used for encoding data and converting information into codes that can be read automatically by specialized electronic devices. The term "Barcode" originates from English, composed of two parts: "Bar" meaning a stripe or column, and "Code" meaning encoding or cipher (Singh, 2022: 99). The barcode is defined as an encoding system that allows converting information into machine-readable visual symbols, often printed as black lines on a white background, varying in thickness and length, to be analyzed and processed by computers or specialized scanning devices (Raj, 1995: 99–105).

Barcode technology has evolved significantly to include different forms of encoding, most notably two-dimensional (2D) codes such as the QR Code, which stores information as a matrix of dots or squares, allowing for greater storage capacity compared to traditional barcodes, and enabling its use in various commercial, industrial, and administrative applications (TEC-IT, 2022).

The barcode is also defined as a visual representation of digital or textual data based on machine-readable optical encoding, widely used in management, commerce, libraries, healthcare, education, and other fields requiring accuracy and speed in information processing (Darmista, 1996: 1–10). The barcode is also considered an essential tool in automatic identification systems and control of goods and documents, as it contributes to raising performance efficiency, reducing human intervention, and limiting errors resulting from manual operations (Al-Awadhi, 2019: 120–135).

Historically, the idea of barcode encoding dates back to the late 19th century, but the modern practical application began in the 1970s after its official adoption in the Library of Congress in 1974 (Das & Singh, 2022: 435). Since then, the barcode has become an essential element in supply chains, inventory management, library systems, and healthcare and educational fields (Al-Harbi, 2021: 45–60).

Barcodes are read using Barcode Readers or smartphone cameras equipped with specialized applications, where these devices analyze visual patterns and convert them into digital data that can be processed and stored in databases. Barcode design relies on international standards that determine line thickness, spacing, and the encoding system used to ensure codes can be read across all different systems (ISO/IEC, 2006).

The role of the barcode can be summarized as a bridge between the physical and digital worlds, converting descriptive information into a machine-readable visual format, facilitating tracking, inventory, analysis, and accurate decision-making in various administrative and commercial fields (Rasool et al., 2025: 208–220).

3.2 Origin and Historical Development of the Barcode

3.2.1 The First Seeds of Ambition (Before 1930)

The first attempts to invent the barcode date back to 1880, when inventor Max Pack developed the idea of using linear codes to classify and track postal parcels. The goal was to automate postal sorting, which was time-consuming and resource-intensive. However, this project failed due to limited technical capabilities and lack of sufficient funding to turn the idea into a practical model (Brown, 2007: 22).

3.2.2 The Academic Idea and Theoretical Embodiment (1930–1950)

In the 1930s, a qualitative step towards the theoretical embodiment of the barcode occurred when graduate student Wallace Flint at Harvard University presented a research paper in 1932 titled "The Automatic Grocery Store." Flint proposed a system based on punch cards to automatically record purchases and manage inventory. Although Flint did not use the vertical lines we know today, he established a fundamental idea: visually representing information in a machine-readable way and converting it into understandable digital data (Flint, 1932; Leibowitz, 2009: 65).

3.2.3 Practical Invention and the Birth of the Name (1948–1970)

In the late 1940s, Bernard Silver and Norman Woodland developed a practical model of the barcode inspired by Morse code. They used thick and thin vertical lines with a high-intensity light and a tube scanner, obtaining a US patent in 1952 (Silver & Woodland, 1952). At this stage, the term "Barcode" emerged to accurately describe the technology, representing an encoded strip carrying machine-readable data (Singh, 2022: 99).

3.2.4 Commercial Transition and Standard Adoption (1970–1980)

The 1970s witnessed the adoption of the Universal Product Code (UPC) as a unified standard, driven by major companies like IBM, representing a commercial turning point in the use of barcodes in retail. The first commercial product was scanned using a barcode reader on June 26, 1974, at Marsh Supermarket in Ohio (Brown, 1997). Simultaneously, libraries began adopting barcodes to improve collection and patron management systems (Das & Singh, 2022: 435).

3.2.5 Development, Maturity, and the Dimensional Revolution (1980–2000)

The period from the 1980s to the 1990s saw the spread of 1D barcodes in all industries, including supermarkets, warehouses, factories, hospitals, and airports. New standards such as Code 39 and Code 128 were developed, allowing for encoding both letters and numbers together.

The major revolution came with the emergence of 2D barcodes such as the QR Code in 1994, developed by the Japanese company Denso Wave to accurately track automotive parts. The QR Code is characterized by its ability to store hundreds of times more data than traditional barcodes, resistance to dirt and partial damage, and ease of reading via smartphones (TEC-IT, 2022; Denso Wave, 1994).

3.2.6 The Modern Era: Integration and Intelligence (2000–Present)

With the turn of the 21st century, the barcode transformed into an intelligent, integrated tool, becoming a gateway to linking physical products with the digital world. The most prominent modern applications include:

- a. Integration with the Internet of Things (IoT): Linking products to websites or smart applications, facilitating sales and marketing operations.
- b. Big Data Analytics: Using data generated from scanning operations to study consumer behavior, improve supply chains, and manage inventory.
- c. Specialized Applications: In healthcare to track patients and medications, in tourism for travel tickets and identity verification, and in government services for bill payment and access to services (Al-Awadhi, 2019: 120–135; Al-Harbi, 2021: 45–60).

3.3 Evolution of Barcode Generations**3.3.1 First Generation: 1D Barcode**

Traditional linear codes (e.g., UPC and EAN) that are limited to storing the basic Global Trade Item Number (GTIN) (Uniform Code Council, 1973).

3.3.2 Second Generation: 2D Barcode

Two-dimensional codes, most notably the QR Code, which can store massive amounts of data, including web URLs, turning the package into an interactive digital gateway (Denso Wave, 1994).

3.3.3 Modern Trends: GS1 Digital Link

The latest standard that converts the traditional QR code into a dynamic web URI, allowing access to variable and up-to-date product information such as exact expiry date, certificate of origin, and laboratory test results in real time (GS1, 2023).

Research Note: According to GS1, it is expected that all point-of-sale systems worldwide will be capable of scanning 2D codes by the end of 2027, representing a radical shift in supply chain efficiency (GS1, 2023).

3.4 Smart Barcoding and Dumb Barcoding

Barcodes are classified according to their degree of database integration into two main types:

3.4.1 Smart Barcoding

An integrated encoding system that links the code directly to the database, where each code represents a unique key to access all information related to the item. The barcode is generated from within the system itself and contains supporting text data such as the institution's name, item number, date of issue, and a 2D code that can access the complete electronic record (Nelson, 1997: 87).

3.4.2 Dumb Barcoding

A simple system where the code is generated independently of the database, and linking is done later manually or semi-automatically. Label content is limited, often only the serial number and institution name. This type faces challenges in data updating, material tracking, and reducing human errors (Nelson, 1997: 87).



Wikipedia

3.5 Barcode Technology and Its Working Mechanism

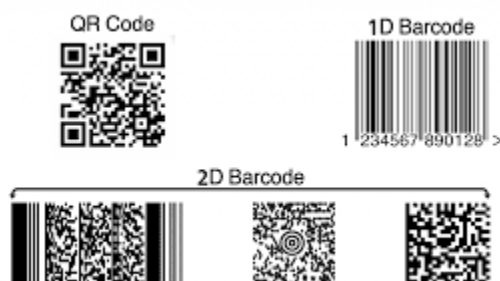
Barcode technology relies on visually representing data using lines or columns read automatically. Linear barcode is known as a binary system, where information is converted into binary digits (0 and 1) representing the difference between dark lines and spaces.

3.5.1 Basics of Visual Data Representation

1. Each bar or space represents a specific data unit.
2. Dark lines usually represent "1", and empty spaces represent "0".
3. Line thickness and length vary according to the standard to ensure reading accuracy (Hashim, 2013: 13–18).

3.5.2 Barcode Reading Technologies

1. **Laser Scanners:** Project a laser beam onto the code and convert reflections into electrical pulses.
2. **Digital Cameras (CCD & Imaging):** Capture the code and analyze the image programmatically.
3. **Mobile Devices:** Scan codes during inventory in warehouses and libraries (TEC-IT, 2022).



3.5.3 Most Famous Barcode Symbologies

1. **Code 39:** A common code for representing letters and numbers together, used in military and industrial applications.
2. **Code 128 and 2 of 5:** Advanced codes used to store larger amounts of data.
3. **QR Code:** A 2D code with large storage capacity and easy reading via smartphones (TEC-IT, 2022).



*3.5.4 Stages of Barcode Operation

1. **Encoding:** Converting data into a series of lines and separators according to a specific standard.
2. **Printing:** Using laser or thermal printers to print codes with high precision.
3. **Scanning and Digital Conversion:** Reading the code and converting it into processable digital data (Shara'a, 2007: 109).



3.5.5 Importance of Barcode Technology

1. Accelerating operational processes such as lending, return, and inventory.
2. Reducing human errors.
3. Providing accurate and immediate information for decision-making.
4. Enabling comprehensive tracking of each item.
5. Global compatibility allowing exchange between different systems (Al-Awadhi, 2019: 120–135).

3.6 Structural Composition of QR Code

The QR code consists of the following basic elements:

1. **Position Patterns:** The large squares in the three corners, determining the direction and position of the code for the reader.
2. **Alignment Pattern:** Helps correct image distortion.
3. **Timing Pattern:** Alternating black and white lines determining the data unit size.
4. **Format & Version Information:** Tells the reader about the error correction level and matrix size.
5. **Quiet Zone:** An empty margin around the code essential for successful scanning.
6. **Data & Error Correction Keys:** Contain encrypted information and allow data recovery even if the code is partially damaged (TEC-IT, 2022; ISO/IEC, 2006).



3.7 Areas of Barcode Use

1. Encoding commercial goods and products and organizing inventory processes.
2. Use in airlines for boarding passes and baggage tracking.
3. Employment in the healthcare sector to identify and monitor patients.
4. Organizing entry to sports and cultural events and transportation means.
5. Indexing electronic documents and files.

-
6. Linking information to electronic links accessible via smartphones (Shara'a, 2007: 109; Singh, 2002: 35–45).



3.8 Steps for Implementing Barcode

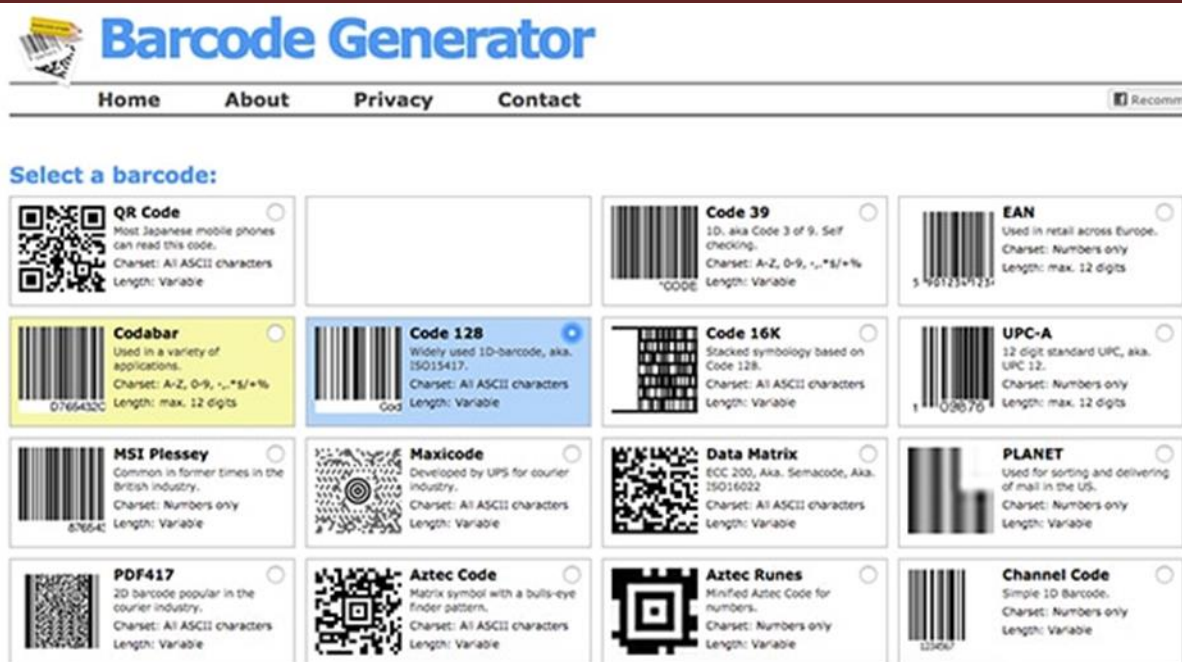
The process of implementing a barcode system in institutions goes through several stages to ensure tracking accuracy and data integrity:

1. **Obtain the institution identification code:** To assign a unique key to each item.
2. **Assign identification numbers for resources:** Sometimes called GS1 Keys.
3. **Choose the printing method:** Laser or thermal, or on different media.
4. **Determine the scanning environment and code location:** Choose a clear and easily readable location.
5. **Determine the code size:** According to the amount of information to be encoded.
6. **Ensure print quality:** Clarity of lines and separators, and test the reader before adoption.
7. **Use supporting text (Label):** To allow data access if the code is damaged (Shara'a, 2007: 109).

3.9 Methods of Creating Barcodes

Barcodes can be created using:

1. Specialized software for creating and exporting barcodes in various formats.
2. Software plugins for graphic design programs.
3. Websites that provide barcode creation services online, whether free or paid (TAL Technology, 2022).



4. APPLIED FRAMEWORK AND STUDY METHODOLOGY

4.1 Study Methodology

This study adopted the descriptive analytical method. The descriptive method aims to describe the phenomenon under study (the regulatory role of the barcode and ethical responsibility) as it is in reality, while the analytical method aims to analyze, interpret, and extract statistical results and indications from the collected data (Al-Abadi, 2016: 45).

This method was chosen for its suitability to the nature of the study, as it helps to:

1. Describe the reality of barcode use in business organizations in Babylon Governorate.
2. Analyze the relationship between barcode use and administrative control and ethical responsibility.
3. Measure the impact of the barcode on productivity and marketing requirements.

4.2 Study Population and Sample

4.2.1 Study Population

The study population consists of final consumers of food products in Iraqi markets, specifically in Babylon Governorate, which represents a model of the Middle Euphrates region (Middle Euphrates Technical University, 2022: 5).

Babylon Governorate was chosen for the following reasons:

1. Its central geographical location in the Middle Euphrates region.
2. The diversity of its economic activity between agriculture, industry, and commerce.
3. The availability of diverse marketing outlets (central markets, shopping complexes, small shops).
4. Ease of access to the study sample and distribution of questionnaires.
5. Food products were chosen because they are the most susceptible to problems of spoilage, expiration, and fraud, and thus are most in need of control through tracking technologies (Rasool et al., 2025: 215).

4.2.2 Study Sample

A simple random sample of consumers in Babylon Governorate was selected, with a sample size of (30) individuals. Questionnaires were distributed to them and collected during the period (March 1, 2026, to April 1, 2026).

The sample was distributed across the following marketing outlets in Babylon Governorate:

Marketing Outlet	Location	Number Respondents	of	Percentage
Babylon Commercial Complex	Central Hilla City	8		26.7%
Hilla Central Markets	New Hilla District	7		23.3%
Al-Jinsiya Food Stores	Al-Abrar Street	5		16.7%
Iskaan Markets	Iskaan Neighborhood	5		16.7%
Abu Jasim Stores	Old Hilla Market Area	3		10%
Al-Nakheel Commercial Complex	Al-Nakheel Area	2		6.6%
Total		30		100%

This table shows the distribution of the study sample members across a number of marketing outlets in Babylon Governorate, where the highest percentage was concentrated in the Babylon Commercial Complex and Hilla Central Markets, reflecting the intensity of purchasing activity in these locations. The diversity of data collection locations between modern and traditional markets is also evident, which enhances the sample's representation of the consumer market reality in the governorate.

4.3 Study Tool (Questionnaire)

A questionnaire was developed to survey customer opinions in Babylon Governorate, designed according to standard axes to facilitate statistical analysis. The questionnaire consists of two main parts:

4.3.1 Part One: Basic Data

This includes demographic data of the respondents (gender, age, occupation, marital status, educational attainment).

4.3.2 Part Two: Questions Related to the Study Axes

The questions were classified into four main axes:

Axis One: Awareness of Barcode Culture (Questions 1, 2)

Objective: To measure the extent of the Babylonian consumer's knowledge of the barcode's function (whether it is just a price or a product identity).

Axis Two: Trust, Security, and Regulatory Role (Questions 3, 4, 5, 6)

Objective: To directly measure the "regulatory role." Does reading the barcode (country, company, numbers) reassure the Babylonian consumer?

Axis Three: Purchasing Behavior and Reliance on Technology (Questions 7, 8, 9, 10)

Objective: To measure the gap between awareness and behavior. Does the Babylonian consumer actually look at the barcode before purchasing? And how available are reading devices in Babylon's markets?

Axis Four: Ethical Responsibility and Consumer Protection (Questions 6, 11)

Objective: To measure the extent to which the Babylonian consumer perceives the barcode as a tool to protect their rights and ensure product quality.

4.4 Questionnaire Validity and Reliability**4.4.1 Questionnaire Validity**

Questionnaire validity was verified through:

- **Face Validity:** The questionnaire was presented to a panel of arbitrators from professors at the University of Babylon and other universities in the Middle Euphrates region to ensure the appropriateness of the items for what they were designed to measure.
- **Content Validity:** Ensuring that the questionnaire covers all aspects of the subject under study.

4.4.2 Questionnaire Reliability

The reliability of the questionnaire was calculated using Cronbach's Alpha coefficient, which reached (0.87), a statistically acceptable value, indicating a high degree of internal consistency for the questionnaire items.

4.5 Description of the Study Sample (Babylon)**4.5.1 Distribution of the Sample by Gender**

Gender	Number	Percentage
Male	18	60%
Female	12	40%
Total	30	100%

The table shows that the percentage of males was higher compared to females, which may reflect the nature of society and the greater role of males in purchasing operations within local markets. However, the presence of a good percentage of females contributes to achieving some balance in representing consumer opinions.

4.5.2 Distribution of the Sample by Age

Age Group	Number	Percentage
Less than 20 years	2	6.7%
20 - 30 years	10	33.3%
31 - 40 years	9	30%
41 - 50 years	6	20%
More than 50 years	3	10%
Total	30	100%

The table shows that the age group (20–30 years) is the most represented in the sample, followed by the (31–40 years) group, indicating that the majority of respondents are from young and productive age groups. This enhances the reliability of the results, as these groups are more involved in markets and more aware of modern technologies such as barcodes.

4.5.3 Distribution of the Sample by Educational Attainment

Educational Attainment	Number	Percentage
Primary	1	3.3%
Middle School	2	6.7%
High School	8	26.7%
Bachelor's	14	46.7%
Master's	4	13.3%
PhD	1	3.3%
Total	30	100%

The table shows that the majority of the sample members hold a bachelor's degree, indicating a high educational level among respondents. This contributes to more accurate results, as more educated individuals are expected to be more aware of the concept of the barcode and its importance in consumer protection.

4.5.4 Distribution of the Sample by Occupation

Occupation	Number	Percentage
Student	5	16.7%
Employee	12	40%
Self-employed	8	26.7%
Retired	3	10%
Housewife	2	6.6%
Total	30	100%

The table indicates that the employee segment represents the largest percentage of the sample, followed by self-employed workers, reflecting good occupational diversity within the sample. This diversity helps obtain different opinions representing multiple segments of the consumer society in Babylon.

4.5.5 Distribution of the Sample by Marital Status

Marital Status	Number	Percentage
Single	8	26.7%
Married	20	66.7%
Divorced/Widowed	2	6.6%
Total	30	100%

The table shows that the majority of the sample members are married, reflecting the nature of the responsible consumer who supports the family and makes purchasing decisions. This enhances the importance of the results, as this group is often more concerned about product quality and safety.

4.6 Statistical Analysis Tools

The following statistical software was used for data analysis:

1. **SPSS (version 26):** For data entry and statistical analysis.
2. **Excel:** For creating tables and charts.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

5.1.1 Conclusions Related to Awareness of Barcode Culture in Babylon

The analysis results indicate that half of the sample members in Babylon Governorate have a good ability to identify the source of production through the barcode, reflecting an acceptable level of awareness of the importance of this technology among a segment of consumers. In contrast, the

other half of respondents do not have sufficient ability to accurately interpret barcode data, indicating a continuing need to enhance consumer culture and spread awareness of the importance of this tool in identifying products and their sources.

5.1.2 Conclusions Related to Trust and Regulatory Role in Babylon

The results showed that the majority of sample members feel a degree of reassurance when viewing the barcode, which reinforces its role as a regulatory tool contributing to consumer protection and enhancing trust in goods traded within Babylon's markets. It was also found that a significant proportion of consumers seek to know the country of origin and the producing company through the barcode, reflecting the importance of this technology in achieving commercial transparency. Furthermore, consumers' reliance on the identification numbers of producing companies gives them a sense of security, which aligns with legal legislation guaranteeing the consumer's right to obtain clear information about the product.

5.1.3 Conclusions Related to Purchasing Behavior in Babylon

The results reveal that consumer behavior in Babylon is characterized by a degree of health awareness, as a large number of them are keen to check the production and expiry dates before purchasing, indicating their awareness of the importance of product safety. However, reliance on the barcode as an alternative to traditional inspection remains limited for some, while a clear gap appears between theoretical knowledge of the barcode's importance and its practical application, as a number of consumers do not show sufficient interest in reading it. Additionally, the prevailing culture in the markets indicates a general lack of interest in the barcode, posing a challenge to establishing this practice more widely.

5.1.4 Conclusions Related to Availability of Reading Devices in Babylon

The results show a noticeable lack of availability of barcode reading devices in marketing outlets within Babylon Governorate, which represents a major obstacle to the effective use of this technology by consumers. Moreover, the use of these devices, when available, is mostly limited to knowing prices only, without benefiting from the other capabilities provided by the barcode, such as tracking production and expiry information, reflecting limited utilization of this technology.

5.1.5 Conclusions Related to Ethical Responsibility in Babylon

The results indicate that the majority of consumers in Babylon view the barcode as a means to ensure they receive quality products, reflecting a high level of awareness of consumer rights and the importance of transparency in commercial transactions. This also confirms the ethical role that business organizations should undertake in providing accurate and correct information about their products, thereby contributing to enhancing trust between them and consumers.

5.2 Recommendations

5.2.1 Recommendations Directed to Producing Organizations and Companies

Producing companies dealing with Babylon's markets should commit to placing a clear and approved barcode on all their products, including basic data according to international standards, ensuring easy reading of information by consumers. It is also advisable to develop traditional barcode systems into modern systems such as 2D codes that provide extensive product information. Additionally, it is necessary to invest in awareness campaigns to educate consumers about the importance of the barcode, as well as to provide reading devices at points of sale to enable them to easily access information.

5.2.2 Recommendations Directed to the Government and Legislative Authorities

Government authorities are required to activate consumer protection laws and enforce them strictly within Babylon's markets, especially regarding obliging producers to use barcodes. It is also suggested to issue modern legislation mandating the use of advanced barcode technologies, along with establishing local regulatory bodies to monitor compliance with these standards. Furthermore, supporting the development of national applications that allow consumers to read barcodes and verify product information easily via smartphones is recommended.

5.2.3 Recommendations Directed to Consumers in Babylon Governorate

It is important to enhance the culture of barcode use among consumers in Babylon by encouraging them to read it before making a purchasing decision, as an important source of information and not just a price identification tool. They should also demand their legal rights in the absence of a barcode or the presence of inaccurate information, in addition to benefiting from available digital applications to verify product data.

5.2.4 Recommendations Directed to Local Organizations and the Babylon Chamber of Commerce

Local organizations can play an important role in spreading the culture of the barcode by organizing training and awareness programs for shop owners on how to use and benefit from it. It is also advisable to support the establishment of specialized centers for printing barcodes for local products at reasonable prices.

REFERENCES

Books

1. Al-Abadi, Safaa Hussein. (2016). *Management of Contemporary Business Organizations*. Amman: Dar Al-Masirah for Publishing and Distribution.
2. Al-Hammadi, Nizar Rashid. (2017). *Fundamentals of Marketing and Customer Relationship Management*. Amman: Dar Al-Yazouri Scientific for Publishing and Distribution.
3. Al-Najjar, Haider Muhammad. (2020). *Productivity and Institutional Performance Improvement*. Beirut: Dar Al-Kutub Al-Ilmiyyah.
4. Al-Obaidi, Fadel Saadoun. (2018). *Business Ethics and Social Responsibility*. Cairo: Dar Al-Fikr Al-Arabi.
5. Al-Tayeb, Karim Mahmoud. (2015). *Information Technology and Its Administrative Applications*. Baghdad: University Publications.
6. Brown, Stephen. (1997). *Revolution at the Checkout Counter: The Explosion of the Bar Code*. Harvard University Press.
7. Brown, Stephen. (2007). *The Barcode Book: A Comprehensive Guide to Reading, Printing, Specifying, and Using Bar Code and Other Machine-Readable Symbols* (5th ed.). Helmers Publishing.
8. Nelson, Benjamin. (1997). **From Punched Cards to Barcodes: A 200-Year Journey**. Helmers Publishing.
9. Singh, Anil. (2022). *Automatic Identification and Data Capture Systems: Principles and Applications*. New Age International.

Research and Scientific Articles

1. Al-Saedi, Muhammad Abdullah. (2019). Administrative Control in Business Organizations: An Analytical Study. *Journal of Administrative Studies*, University of Baghdad.

2. Al-Fadl, Kadhim Hussein; Rasool, Hassan; Fadhel, Ali; Naji, Karim; Isa, Ahmed. (2025). The Use of Barcode System in Business Organizations: An Applied Study in the Middle Euphrates Region. *Journal of Economics and Business*, Middle Euphrates University, 22(3), 208–220.
3. Al-Zahrani, Abdullah Ali. (2017). The Impact of Technology on Marketing Performance. *Journal of Marketing Research*, 9(2), 85–95.
4. Al-Awadhi, Ahmed Saad. (2019). Applications of Barcode Technology in Improving Operational Efficiency. *Journal of Administrative Studies*, 41(2), 120–135.
5. Al-Harbi, Khalid bin Muhammad. (2021). The Role of Barcode in the Healthcare Sector: An Analytical Study. *Journal of Health Research*, 15(1), 45–60.
6. Shara'a, Atef. (2007). What is the Barcode? *Al-Qafilah Magazine*, 6(1), 105–120.
7. Das, S.; Singh, A. (2022). Barcode Technology and Its Applications in Libraries. *International Journal of Library Science*, 12(2), 430–440.
8. Darmista, P. (1996). Barcode System in Libraries: Uses and Importance. *Annals of Library and Information Studies*, 43(1), 1–10.
9. Raj, B. (1995). Barcode Technology and Applications. *Electronics Journal*, 27(4), 99–105.
10. Singh, Anil. (2002). Application of Barcode Technology in Libraries. *Library Journal*, 40(1),
11. Hashim, A. (2013). Barcode Recognition System. *International Journal of Computer Technology*, 2(4), 13–18.
12. Leibowitz, Ed. (2009). The Barcode: Reading Between the Lines. *Smithsonian Magazine*, 40(6), 64–71.
13. Brown, Stephen. (2001). The History of the Barcode. *Journal of Economic History*, 61(3),
14. Silver, Bernard; Woodland, Norman Joseph. (1952). *U.S. Patent No. 2,612,994: Classifying Apparatus and Method*. Washington, DC: U.S. Patent Office.
15. ISO/IEC. (2006). *ISO/IEC 18004: Information Technology – Automatic Identification and Data Capture Techniques – QR Code Specification*.

Theses and Dissertations

1. Flint, Wallace. (1932). *The Automatic Grocery Store System*. Unpublished Master's Thesis, School of Business Administration, Harvard University.

Laws and Legislation

1. Iraqi Consumer Protection Law No. (1) of 2010. *Official Iraqi Gazette*, Baghdad.
2. Middle Euphrates Technical University. (2022). *Statistical Report on Business Organizations in the Middle Euphrates Region*. Najaf.

Websites

1. TEC-IT. (2022). Barcode Basics: 1D vs 2D Codes. Retrieved from: <https://www.tec-it.com>
2. Denso Wave. (1994). QR Code Development Story. Retrieved from: <https://www.denso-wave.com>
3. TAL Technology. (2022). Software Solutions and Barcode Tools. Retrieved from: <https://www.taltech.com>
4. Uniform Code Council (UCC). (1973). *Universal Product Code Specifications*.
5. GS1. (2023). Global Barcode Usage Report. Retrieved from: <https://www.gs1.org>
6. Almaany website. (2019). Definition of Barcode. Retrieved from: <https://www.almaany.com>
7. Economic History Services. (2001). History of the Barcode. Retrieved from: <https://eh.net>