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## Rethinking Baghdadi Coffee Shops and Their Sustainability Through Digital Technology

### إعادة النظر في المقاهي البغدادية واستدامتها في ظل التكنولوجيا الرقمية

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#### KEY WORDS

Coffee Shops,  
Sustainability, Digital  
Technology, Information  
& Communication  
Technology.

#### ABSTRACT

Baghdadi Coffee Shops have been a foundation for building interconnected social and cultural relationships over time and have been considered spatial behavioural patterns that express the culture of Baghdadi society. The current research focuses on integrating emerging digital technology into their physical structure to keep pace with life's developments and changes, raising the following question: "What are the transformations that Baghdadi Coffee Shops are witnessing as a result of emerging digital technology, and what is its impact on their sustainable role?" To answer this question, the research adopted an analytical approach that included revealing the architectural features of the transformations that they have witnessed, as well as people's relationships with them. Therefore, the research focused on building a theoretical framework and then applying it to three types of cafes (heritage, modern, and contemporary). This was based on a questionnaire surveying two groups (expert architectural academics and cafe patrons). The results were analyzed and interpreted, leading to conclusions that confirmed the existence of a transformation in the characteristics and features of Baghdadi Coffee Shops to varying degrees, reflected in the connection of Baghdadi society to them, witnessing improvements in their environmental, economic, and social sustainability indicators.

#### الكلمات المفتاحية

المقاهي، الاستدامة، التكنولوجيا  
الرقمية، تكنولوجيا الاتصالات  
والمعلومات.

#### الملخص

استمت المقاهي البغدادية على مر الزمن لبناء العلاقات الاجتماعية والثقافية، واعتُبرت أنماطاً سلوكية مكانية تُعبر عن ثقافة المجتمع البغدادي، يركز البحث الحالي على دمج التكنولوجيا الرقمية الناشئة في بنيتها المادية لمواكبة تطورات الحياة وتغيراتها، ليثير التساؤل الاتي (ما التحولات التي تشهدها المقاهي البغدادية بفعل التكنولوجيا الرقمية الناشئة، وما انعكاسها على دورها في الإستدامة؟)، للإجابة على التساؤل البحثي، اعتمد البحث منهجه التحليلي والمتضمن الكشف عن السمات المعمارية للتحولات التي شهدتها المقاهي فضلاً عن علاقة الناس بها. لذا ركز البحث على بناء إطار نظري ثم تطبيقه على ثلاثة أنواع من المقاهي (تراثية، حديثة، معاصرة) بالاعتماد على استبانة لفئتين (أكاديميين معماريين خبراء ومرتادي المقاهي)، ليتم تحليل نتائج وتفسيرها وصولاً إلى الاستنتاجات التي أكدت وجود تحول خصائص وسمات المقاهي البغدادية بدرجات مختلفة وانعكست على ارتباطية المجتمع البغدادي بها لتشهد جوانب التحسين في مؤشرات استدامتها البيئية والاقتصادية والاجتماعية.

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## 1. Introduction

The importance of the research is highlighted in Coffee shops that represented centers of social gathering and interaction within the fabric of the city in general (L. Chen, 2017), Traditional coffee shops in Baghdad were considered the most important tool for creating social and cultural bonds to the point that they represented architectural symbols of Baghdad through their architectural characteristics and features, and a testament to local cultural activities (Nadera, 2021). Through the researchers' study, it became clear that digital technologies and information and communication technology were being introduced into the physical structure of cafes. This raised the research question about the extent of the transformations in Baghdad's cafes and how this was reflected in aspects of their sustainability.

The research adopted an analytical approach focused on reviewing the evolution of the coffee shop space as a physical space with functions and activities, as well as its sustainable and societal role, leading to the digital age after the integration of digital technologies. The research focused on clarifying these technologies, their integration into the physical structure of the cafe, the aspects of change achieved in the cafe space, their impact on patrons and visitors, and their relationship with the cafe after the transformation. It also reviewed the most prominent literature related to the topic to enrich the research further and develop a theoretical framework that articulates measurable values for the coffee shops' characteristics and indicators of their sustainability. To examine the theoretical framework, the researcher conducted a survey of Baghdad's cafes, visiting traditional and modern cafes in areas known to be the most active and busy due to the large number and variety of their patrons and the long hours of their operation throughout the day. Three cafes were then selected, varying in terms of temporal and spatial limitations within the city of Baghdad but introducing digital technologies in different ways. The research relied on documenting them by recording a video during peak hours, then presenting it to groups of architectural specialists who were surveyed about the theoretical framework indicators related to measuring coffee shop characteristics (Vitality, Continuity, Correlation, Interactivity, Flexibility. To measure sustainability indicators (environmentally, socially, and economically), the research relied on a questionnaire of the patrons and workers of the selected coffee shops, arriving at the presentation of the survey results in statistical tables and then analyzing them. The research concluded with the presentation of conclusions, which showed that the introduction of digital technologies into Baghdad's cafes took varying degrees, from simple within the traditional coffee shops to large within the modern coffee shops, confirming differences in the degree of transformation, architectural characteristics, type of use, and achieved human experiences, which proved the role of digital technologies in improving the sustainable role of cafes within the Baghdad community.

## 2. The Concept of Coffee Shops

Oldenburg defined coffee shops as third social places with the ability to enhance socialization and interaction and described them as neutral between (formal and informal) and (home and work), as they are crowded with individuals who leave their homes and workplaces to an environment with a lifestyle different from other environments for the purpose of improving people's lives through the sequential activities and non-selective actions that enhance life. Therefore, coffee shops are characterized by being places that can be adapted to new developments such as (sitting, playing, shopping, eating, entertainment, conversation and dialogue) (Oldenburg & Brissett, 1982). Coffee shops were also described as spaces that carry the characteristics of (neutrality, democracy, inclusiveness, openness, the ability to achieve equality, conversation, contemplation, fun and welcoming others). He also focused on the importance of their users experiencing a transformative sense of self, identity and relationship with others (L. Chen, 2017; Al-arab, 2023)

## 3. Coffee Shops' Sustainability Aspect (A historical review)

Sustainability is a planned process that focuses more on the social aspect due to its role in nurturing society (Abdulahaad, 2023). It also represents an inevitable solution to the degradation of the urban environment (Abood, 2020), increasing community participation and expanding communication options between its various segments (Jabar, 2025). They succeed in facing social challenges at the level of education, training, practice, or application in the social profession (Mohammed, 2024). Therefore, in order for cafes to continue to achieve their sustainable role, they have developed with the developments and

innovations of the era to ensure comfort for patrons. The focus has been on adapting and modifying the characteristics of the coffee shops as a space in terms of space, activities, events, furnishings, and service in order to achieve the quality of life of individuals and their individual and collective well-being, in addition to focusing on aspects that increase the connection of individuals to the place as a whole (Saffron, 2014). Therefore, concepts such as (fairness and social justice, respect for traditions, customs, and social identities) constitute a source of their enrichment to enhance their infrastructure in a way that supports aspects of life (Nagim, 2024). Thus, they increase the number of patrons and continue their occupancy for the longest possible period, which is reflected in the financial return (Fekri, Aloisia & Youssef, 2008).

The first official appearance of coffee houses was in Istanbul in 1511 AD for the purpose of drinking coffee. Then it spread westward, and its purpose evolved to include (reading newspapers, meeting friends, and exchanging conversations). In Baghdad, the first coffee house was established in 1590 AD and was called "Çağlazade Coffee House." The coffee houses that were established later merged with the market annexes and represented covered spaces usually located in the middle of the market or on the side of the road (Yoon, Woo & Hae, 2015), then Baghdadi coffee shops were attached to the markets as they completed the life cycle of the market, they were distinguished by their roofing, the use of heating and cooling equipment, and their wooden furnishings. Their importance in stimulating community life emerged when they became like social clubs (Makkia, 2005). Then they turned into something resembling commercial centres for banking transactions, especially Al-Bonook Street and Al-Kadhimiya in Baghdad, then they began to host students during exam seasons, and poets and writers gathered there until the Baghdadi coffee shops took their names from them, such as Al-Biruni and Al-Zuhawi coffee shop (Al-Waili, 2017).

With the advancement of coffee-making technology, coffee houses began serving breakfast meals and became open spaces where people from diverse backgrounds met and where newspapers were sold. They were the origin of revolutions and innovations. Therefore, coffee houses were considered "cultural centres" in European capitals during the nineteenth century, especially after the first film was shown in the Grand Café in Paris (Harun, Endang & Yunita, 2022). Coffee shops continued to evolve throughout the twentieth century, but the most significant leap in their development was achieved by communications and digital technology, which merged them (laptops, tablets, mobile phones, or screens). Thus, coffee shops transformed into internet centres, conference halls, educational spaces, and spaces for presenting digital presentations. Thus, the importance of the coffee shop changed, becoming a space for contemplation and meeting for individuals who wanted to develop beyond their work and home activities. This was a result of people's changing connection to the physical space and its cultural specificity, which was originally determined by its original characteristics. Coffee shops now focus on providing a common ground for those who engage in recreational and entertainment activities, such as electronic games and board games, as well as hobbies, such as public gardening. Contemporary coffee shops have adopted names such as "Science Fiction Café" to reflect this shift in their characteristics and activities (Aydin, 2022). This transforms coffee shops into a means of expressing lifestyle and identity, as they represent a symbol of luxury, exclusivity, and prestige in the era of globalisation. By 2023, coffee shops will be supported by artificial intelligence technologies so that smart coffee shops can announce the power of technology. Transforming the space, represented by technologies (Wi-Fi, Bluetooth, ZigBee, Z-Wave), where everything is connected to the Internet with the aim of improving and developing cafe operations by improving the customer experience, increasing their comfort, simplifying operations, maximizing energy efficiency, and creating amazing solutions that are environmentally friendly and more sustainable. Thus, cafes in the digital age have become a brand or identity for a certain social class. For example, the famous technology company Huawei has turned into a coffee and tea brand to distinguish its unmanned nature to the point that it has become an innovative approach that achieves a smooth and self-sufficient human experience (Nemanja, 2014).

A historical review of the sustainability position of coffee shops has confirmed that they represent the lifestyle of society as a whole, as they represent a symbol of the culture of society as well as a symbol of a communicational culture that the transformation in the sustainability position of coffee shops must be based on the technological factor which represents the fourth dimension, as shown in Figure (1):

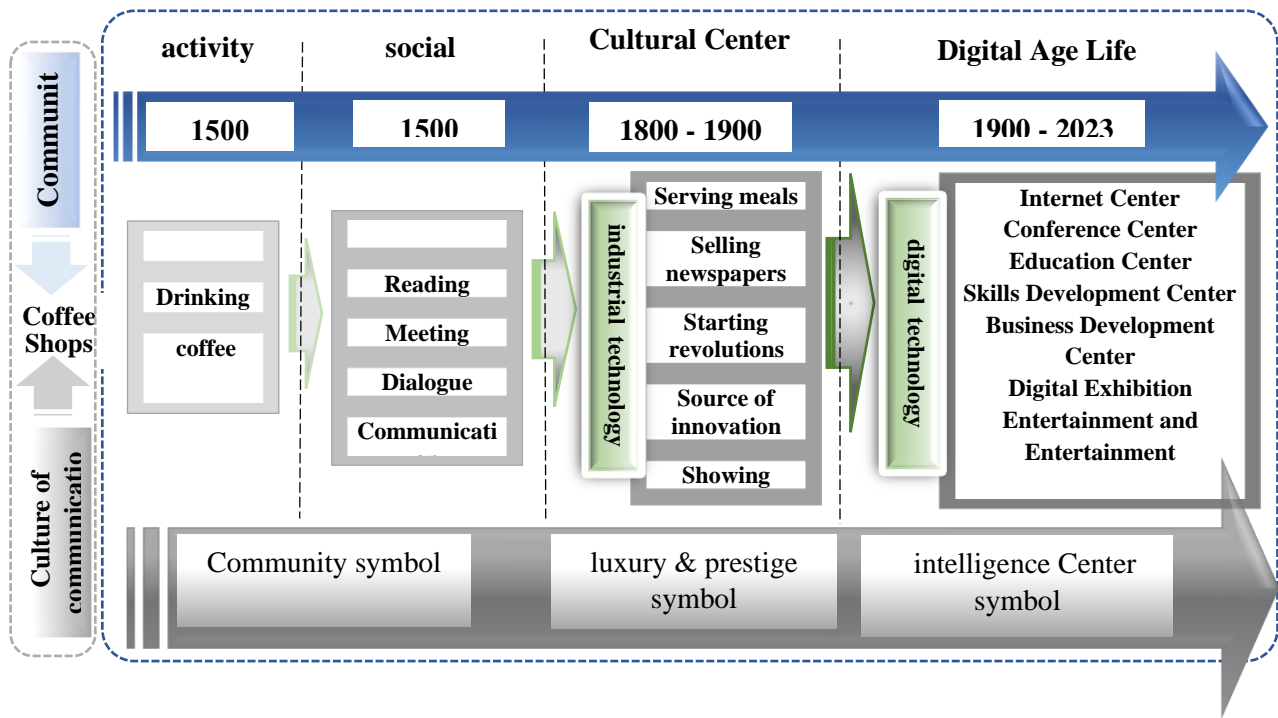


Figure 1. Defines the sustainability position of coffee shops (Source: Authors).

#### 4. Information and Communications Technology in Coffee Shops

Information and communications technology (ICT) can be defined as all technologies used in communications, broadcasting, smart building management systems, audio-visual processing and transmission systems, and other means of data transmission of various types and forms, such as internet services, telephones, and television. This technology contributes to shaping the culture of communication and technology in popular coffee shops through the use of all types of technology. Information technology has changed the relationship between space and function, altering the forms of communication and dialogue taking place there. This is a major reason for attracting specific age groups of different ages, professions, educational levels, and cultural and social backgrounds (Maksud, 2022). Technology has improved the customer experience and, consequently, the operational efficiency them by increasing the frequency of visits, thanks to improved café design (particularly functional aspects), the adoption of digital ordering and menu systems via mobile phones, and digital payment methods in the field of electronic service. Customers also use interactive digital screens and interactive tablets to browse menus, view attractive images, place orders easily, and continuously update and customize menus according to customer preferences. Communications technology has enhanced the efficiency of coffee shops by introducing NFC-enabled payment devices, simplifying the payment process and reducing waiting times, increasing customer convenience. Wireless charging stations are also provided and installed on tables and counters, allowing customers to charge their devices while enjoying their coffee. The application of information and communications technology also improves people's comfort levels and encourages them to stay longer, allowing them to work and socialise without worrying about battery power (Dwi, 2024).

#### 5. Digital Techniques in Coffee Shops

Coffee shops, as a "living and sustainable entity where community members come together", have been influenced by the introduction of digital technologies and methods, which have been reconstructed sufficiently to influence social and human experiences and provide innovative feelings and practices, thus contributing to the enhanced use of these spaces (R F P Hadi & E Ellisa, 2019). Digital technologies have created a more welcoming and attractive atmosphere in cafés. The use of smart lighting systems to adjust and control lighting characteristics creates different atmospheres in coffee shops throughout the day. For example, adopting soft and comfortable lighting during morning coffee breaks versus using exciting

lighting during evening events creates a vibrant and lively atmosphere throughout the day. Furthermore, adopting and adjusting smart lighting to add diverse artistic touches enhances the surrounding atmosphere, in addition to its role in improving the aesthetics of the café space, enhancing visual comfort, and creating innovation and interaction to achieve an attractive, interactive environment (Heather & Daniel, 2012). The strategic installation of digital screens in cafes to display menus, promotions, and upcoming events also contributes to attracting customers and creating a dynamic environment that serves as a visual focal point. The use of audio systems also encourages customers to stay longer, which results in increased sales (V F Levshin, 2016).

Smart technology plays an important role in monitoring and improving air quality in cafes, especially with regard to smoking. These technologies use advanced sensing and data analysis to provide real-time information on indoor air quality. The air quality monitoring technology sensor network, the Integrated Indoor Air Quality Sensor Network, is capable of detecting pollutants such as carbon monoxide (CO), fine particulate matter (PM<sub>2.5</sub>), and volatile organic compounds (VOCs). These sensors are essential in environments where smoking is common, such as cafes, as they can identify dangerous levels of tobacco smoke components (Suresh, 2024). Internet-based applications enable continuous air quality monitoring. Systems can collect data from various sensors and transmit it to the user, enabling proactive measures to combat pollution. The design and development of a web application using AI-based sensors aims to improve air quality indicators. This technology incorporates the internet to create a platform for real-time air quality tracking. The platform includes a web server, sensors for detecting pollutants, and an LTE modem. It also integrates edge computing for data analysis and visualisation, along with an air quality tracking application. Artificial intelligence plays a key role in improving the air quality index through various applications and processes (Taufik, 2022). Digital culture has driven coffee shops to evolve and change functionally to keep pace with the evolution of social and cultural lifestyles, thus changing the coffee shop's interior structure, particularly space and furniture. Interior furniture and acoustics have been categorized to fit the spatial structure after the introduction of functions in them, including the addition of discussion and debate rooms and the availability of technological means for displaying screens, audio, demonstration, and control devices, which have become more attractive and aesthetically pleasing due to the influence of today's lifestyle (Putu, 2024).

Coffee shop furniture has become an artistic canvas upon which to paint the atmosphere, from the selection of materials to the design and organisation style. Each element contributes to the overall aesthetic appearance of coffee shops; lighting control enhances colour schemes, achieving visual appeal and creating a space that invites customers inside and makes them want to stay for a while. Comfort is key to ensuring that customers fully enjoy the coffee-drinking experience (Youssef, 2019). Ergonomic design principles also play an important role in shaping comfortable seating. Furniture design should be easy to move and use and meet the needs of customers of all ages and abilities. Optimal use of space should be used to maximise the use of every square foot. Considering a comfortable coffee shop's design with limited floor space, by choosing compact tables and stackable chairs, the café can accommodate a steady flow of customers without feeling crowded. Adopting flexible seating arrangements (such as movable partitions and folding tables) allows for a smooth transition from informal gatherings to larger events (R F P Hadi & E Ellisa, 2019).

The integration of ICT and digital technologies into the physical entity of coffee shops has caused transformations in their architectural characteristics and their performance as sustainable spaces, as shown in Figure (2).

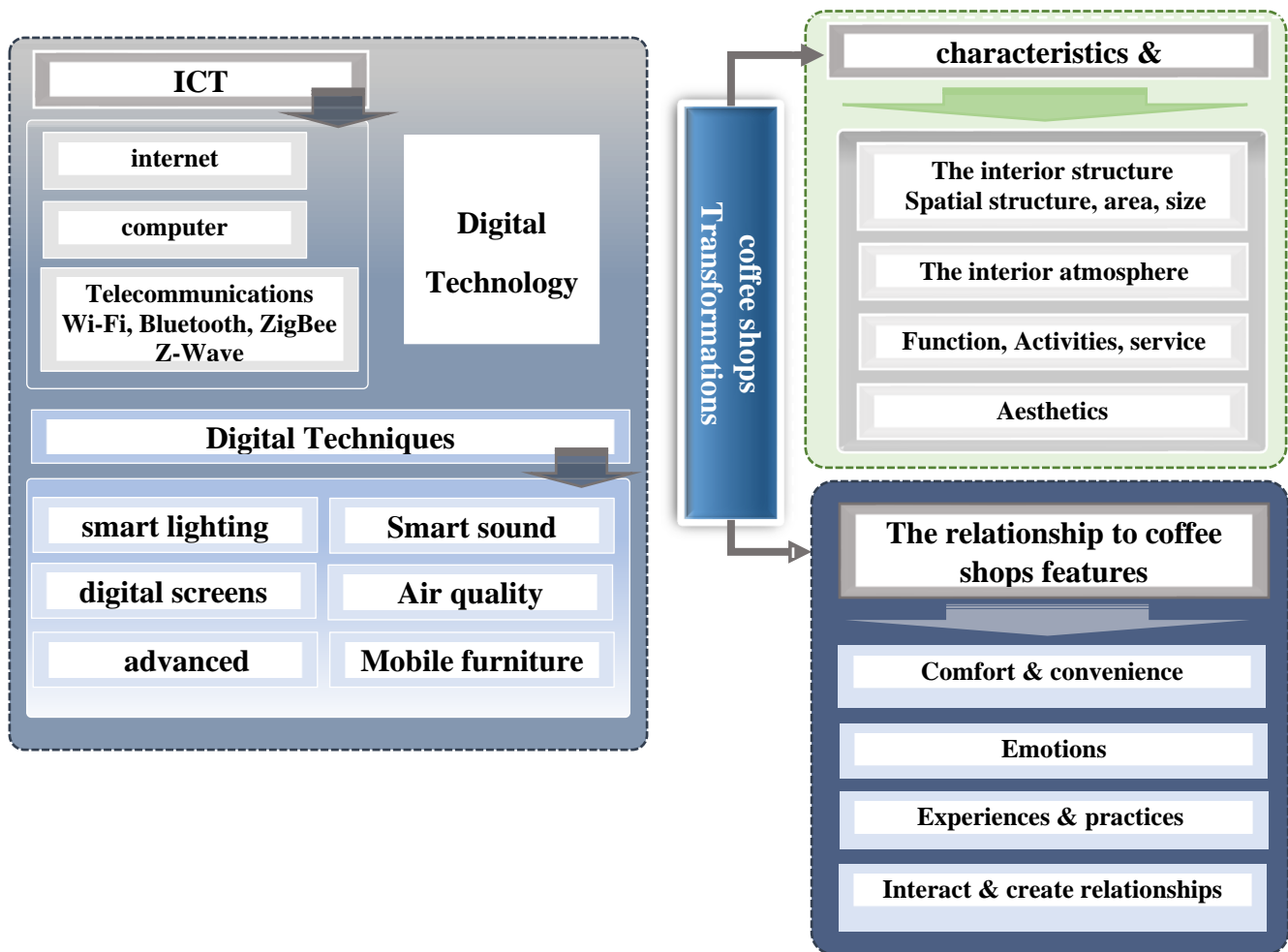


Figure 2. Digital Technology in coffee shops & its Transformation indicators (Source: Authors).

## 6. Review Specialised Studies

In order to enrich the indicators of transformation in coffee shops and their sustainability in the digital age, some specialised studies will be reviewed with the aim of building a more comprehensive theoretical framework.

### 6.1. Study of Nemanja Memarovic<sup>1</sup>, Sidney Fels, Junia Anacleto, Roberto Calderon, Federico Gobbo, John M. Carroll

The study focused on clarifying the post-internet and globalization effects on the third place, particularly coffee shops, addressing information and communication technology (internet, mobile phones, smartphones, and social networking services) and its potential to create a virtual world and simulate real-life, to the point where social media sites, particularly Facebook and Twitter, have become substitutes for coffee shops, fulfilling people's needs for conversation and discussion, as if the third place now exists within those sites, and while they are physical spaces that still retain their characteristics and provide the same social functions and cultural privacy, the essence of today's life, which blends physical and virtual, makes technology the tool that weaves our daily lives and is a basic feature of all its facilities, including coffee shops. This requires stimulating and supporting coffee shops to empower the communities they occupy. The study chose nine coffee shops and bars in different locations in Paris to collect information, where movement charts were drawn, photos and video clips were taken, and architectural drawings were made to document the design characteristics, techniques, and media present in the places with the aim of extracting the implications of information and communication technologies in supporting the characteristics of third places. The study concluded that technology has become an essential part of the design of the third place, as well as its furniture contents.

The architectural nature of cafes, such as space, furnishings, and seating dynamics, has changed as the arrangement of seats has shifted. Now, the arrangement focuses partly on observing the street and partly on watching people and their activities inside the place, rather than in one direction as before. The tables facilitate group conversations, as people pile on top of each other while watching screens or isolating themselves in closed conversations to meet people through social media. Thus, their interaction with the virtual world makes their presence closer to a digital presence. Some eavesdrop on them to see what they are doing on their phones to monitor visitors and their activities. Thus, the nature of activities within the third place has changed, making it more virtual than physical, especially the desire to take photos and record videos of all activities (mixing, romance, work, contemplation, conversation, searching for others' activities online, online games, comments, likes, and functions not available in the physical dimension of the space to support social activities). The integration of multimedia in specific locations also altered the third place's form and the processes occurring within it. There is a choice between isolation and choosing online group games. There is also a sense of belonging and privacy that is negatively affected by the entry of technology. The study concluded four effects resulting from integrating technology into the third place that affected the development of its role in society, represented by (the type of surveillance in the place, boundaries of the third place, characteristics of the place, and relationship with the place).

## **6.2. Study of RF P Hadi and E Ellisa**

The study addressed the need for third-world countries to develop in light of telecommunications technology capabilities. Internet and network services are prevalent, but people demand new requirements to complete their activities, especially those related to how they connect and the place they are in to achieve a better quality of life. The study showed that people today seek relaxation and stress reduction, which is why they need to hang out informally in a comfortable and friendly environment, which is supported by today's cafes through the integration of information and communication technologies in physical environments and third places, which have become focused on incorporating digital features that support activities such as (power outlets – Wi-Fi – surveillance cameras – LCD screens with projectors) to enhance their presence and popularity on one hand, as well as becoming a means to promote the café. The study clarified some indicators of cafés today that enhance interaction, such as providing comfort, imaginative images, a comfortable space, and sufficient facilities.

The study also confirmed that different cultures create different characteristics for third places, and there are two stances for cafés today regarding the use of technology: In the case of an open community, members like to reveal their presence and feel comfortable in discovery, and they enjoy attracting the attention of strangers to draw more members. Therefore, there is a greater focus on the digital features of communication, and people concentrate on using computers, tablets, mobile phones, and even digital drawing tools, arranging seating areas with unclear boundaries due to the flexibility of interactions and activities for different backgrounds, where people move chairs as they wish, making the café more vibrant. However, in the case of a closed community, it differs as its visitors seek more privacy and are not willing to disclose, adhering to clear boundaries and high privacy.

## **6.3. Study of Shelly Farnham, Joseph F. McCarthy, Yagnesh Patel, Sameer Ahuja**

The study addressed measuring the impact of adopting technology represented by electronic technologies on the third place in general and cafes in particular, especially online social networks that have affected increasing community awareness and interaction with the third place. The study clarified the change in the unified measures of attachment to the place and the psychological sense of society due to the technological power that has become the key to achieving social development and developing social relations in cafes exclusively through synchronous and asynchronous interactions from all members of the cafe community, as priority is still given to those who are actually present in the cafe and who have begun to use their computer screens and mobile phones to participate in recording content in the cafe, announcing it and interacting with it, which increases the popularity of the cafe and increases the connection in it. The community's understanding of current cafes has also become better, and they have acquired a deeper understanding, thus strengthening the connection to the cafe, in addition to increasing interest in meeting others in cafes and expanding the community through cafes.

A review of the three specialised studies clarified the common indicators of aspects of change in coffee shops due to digital integration, as shown in Table (1).

**Table 1. Comparative analysis: common points between previous studies in coffee shops changing indicators (Source: Authors).**

Monitoring method	Both directions (inside-outside)
Space characteristics	Shape - area - boundaries –Furnishing - Seating Dynamics – Immaterial space structuring
Space features	Vitality
Space operations	Taking photos - Recording videos - Business - Sending comments and likes - Online gaming –Posting content - advertising - interaction
Relationship with space	belonging – privacy – isolation - Connectivity –sense of space - Expanding

## 7. Theoretical Framework for Indicators of Coffee Shop Transformation Through Digital Integration

The theoretical framework was developed through the research analysis of the previous paragraphs (4, 5 and 6), as shown in Table (2), which includes detailed indicators for three main terms (the digital structure of coffee shops - the architectural characteristics and features - the relationship of individuals to coffee shops which reflects its sustainable role).

**Table 2. Theoretical framework (Source: Authors).**

Main Indications	Secondary Indications	Indications	
<b>Digital structure of coffee shops</b>	<b>Smart lighting systems</b>	Digital ordering systems - Digital menus via Mobile - Digital payment Interactive digital screens, Interactive tablets	
	<b>Smart display screens</b>	Order lists - Account payment lists	
	<b>Sound systems</b>	Recording - Speakers - Loudspeakers	
	<b>Safety and security systems</b>	Fire systems - Surveillance cameras	
	<b>Temperature and ventilation control systems</b>	Central cooling and heating devices	
<b>Architectural features of coffee shops</b>	<b>Vitality</b>	Functional	Cultural - Social - Scientific - Economic - Imaginative - Innovative Advertising Media
		Sensory	Excitement - Desire - Competition - Narrative Relaxation - Play Remembrance
	<b>Continuity</b>	Spatial (Inside - Outside) - Contextual (Spatial-Temporal) Functional (Familiar - New)	
	<b>Correlation</b>	Semantic (Spirit of Place - History of Place ) Identity of Place - Symbolic - Personal Culture - Collective Culture Age Group - Special Needs Group	
	<b>Interactivity</b>	Dialogue - hospitality - work - watching - communication - competition - learning - meditation - browsing - advertising - media.	
	<b>Flexibility</b>	<b>Operational</b>	Diversity of functions (Internet Centre Conference Hall, Coffee Distribution, Drinking Experience Learning Space, Conversation Space Play and Hobbies Space)
		<b>Performance</b>	Functional spaces - Furnishing - Atmosphere - Sound - Lighting - Attractiveness - Expressiveness
<b>Sustainable Improvement of Coffee Shops</b>	<b>Environmental</b>	Air – Pollution – Heat – Lighting – Health Aspects	
	<b>Economic</b>	Increased frequency - Increased retention rates for longer periods - Facilitating payment and costs and customer requests – Updating, customising, and detailing customer orders.	
	<b>Social</b>	People's quality of life - individual well-being – public well-being - development of intellectual and cultural capabilities - development of human skills - social justice – privacy – participation – sense of cultural identity – belonging – human experiences.	



## 8. Survey Study

In order to apply the theoretical framework, the research relied on surveying coffee shops in Baghdad on both sides of Karkh and Rusafa. Then, selection criteria were determined, namely (temporal context, spatial context, style, number of patrons, patron category - service). Accordingly, three cafes were selected that belong to different temporal and spatial contexts (heritage coffee shops, modern coffee shops, and contemporary youth coffee shops), but they are the most popular and frequented in Baghdad.

### 8.1. The First Sample is Al-Shabandar Coffee Shops in Al-Mutanabbi Street (Heritage Coffee Shop)

Al-Shabandar heritage coffee shop, as shown in Figure (1) is strategically located on the banks of the Tigris, on Al-Mutanabbi Street, and tops the heritage and cultural scene in it as it belongs to an ancient Baghdadi family famous for trade and one of its sons assumed the position of Minister of Foreign Affairs in the Iraqi government in 1941. It is frequented by many writers and intellectuals from all governorates of Iraq and the Arab world, as it represents a distinct and unique Baghdadi heritage case among the rest of the well-known coffee shops, which numbered 98 for preserving the original cultural character. The Shabandar coffee shop is one of the social centres for meeting and spending time in discussions and entertainment, and one of the important elements in the process of reviving the memory of the city, as coffee shop is characterized by its heritage physical characteristics, especially its architectural form, construction elements and local materials, as well as its other features such as attractive smell, adequate lighting, comfortable furniture and the view of the outside and its human characteristics related to people, their activities, feelings, and attitudes towards the café, which gave it social and cultural characteristics, especially a sense of belonging, inclusion, productivity, and personal growth.

This coffee shop represents an opportunity for social upbringing, communication, and positive connection with the place as a whole, even though the café still maintains its heritage environment in terms of shape and formation (interior design and decoration, including locally made wooden furniture, Baghdad antiques, and hospitality tools represented by serving coffee, tea, and various hot and cold drinks), and the use of traditional materials and devices in preparing Iraqi coffee and tea Figure (1) and the use of the traditional request and payment mechanism, as well as the traditional methods of managing employees, time, money and necessary materials, but there were attempts to develop it through technical additions in the café, which were (TV screen, internal and external surveillance cameras, cooling devices and activation of the Internet wife) Figure (5), but it did not affect the heritage scene as a whole nor the organization of its internal space, but it increased the operational efficiency of it. After adding electronic screens, the turnout of young people, adults and children increased after it was limited to patrons and the elderly only, especially when there was a cultural or social event such as live broadcasting of football championships or the Baghdadi Jalgi show on Ramadan evenings with a large attendance of different ages.



Figure 1. Installing surveillance cameras and display screens in Al-Shabandar coffee shops (Source: Taken by Authors).

### 8.2. The Second Sample: Reda Alwan – Al-Amirat Branch (Modern Coffee Shop)

The coffee shop is shown in Figure (2). belongs to the modern architecture in Baghdad, as it was established in 1960 AD and included reading books, newspapers, and magazines to track news. The building witnessed renovations that focused on expanding the interior spaces and enhancing the place experience through visual and physical occupancy, as the effect of movement in the interior space was used not only as a subject for physical movement but also embodied the principle of compatibility with the goals and objectives of the café, in addition to saving time and energy through the quality of design of its

comfortable interior spaces, providing requirements that meet the desires of café space users. The field visit to the café showed the extent of users' satisfaction with the café's internal environment and the quality of the services it supports in terms of the facilities required for operation, which is linked to temporal and spatial performance, in addition to the effective spatial organization that made café users part of the events taking place within the café space, and fostering social relations and effective and interactive participation among them, which enhanced social upbringing aspects. Individuals and groups also learned behavioural patterns and attitudes within the coffee shop.

Furthermore, the organisation of individual activities versus group activities encouraged competition. The café was divided into three seating areas: the first area was specifically for relaxation, enjoying conversations and the coffee and beverages offered to customers; the second area was for working with friends in a group; and the third area was for meetings and was located on the first floor, with a closed space available for workshops, seminars, or evening events. Technology has been used in the cafe in terms of providing free internet networks, using technological tablets (iPads and computers) for customer orders, which relied on (online ordering and delivery services - smart tables with charging points - POS point of sale systems for cafe management - electronic menus with numerous features), as well as providing power outlets for charging mobile phones and computers for customers if they wish to work. In addition to creating websites for the cafe, it made the cafe a platform for communication between customers.



**Figure 2. Reda Alwan coffee shop – Al-Amirat Branch (Modern coffee shop), (Source: Taken by Authors).**

### **8.3. Sample 3: 404 Coffee Shop in Zayona (Contemporary Youth Coffee Shop)**

The coffee shop shown in Figure (3) Is One of the contemporary youth coffee shops in Baghdad; recently implemented technology and artificial intelligence in aspects such as (personalized order lists - intelligent customer service for receiving reservations and answering customer questions - customer face recognition, and greeting, and presenting preferences - predictive analytics to predict customer behaviour and personalize the customer experience - order automation - automated table service for automated table allocation), which enhances the customer experience and improves overall service, in addition to adding new functions and features to the place and improving the cafe's performance.

Customer experience has been personalised, data from the surrounding environment has been absorbed, consumer preferences, order history, comments and ratings have been identified, and this information has been used to generate suggestions, personalised recommendations and predictive analysis. Technology has improved inventory management, making it easier to monitor the safety and quality of cold and hot drinks, automate customer service tasks, such as answering common questions, handling reservations, creating automated chatbots and answering machines that can interact with customers, respond to their inquiries at any time, speed up order submission, and customize the needs of customers who have confirmed that the coffee shop gives them control over their orders, in addition to reducing costs by automating the order and booking process, reducing the possibility of miscommunication through the ordering process through devices, and reducing errors during service provision.

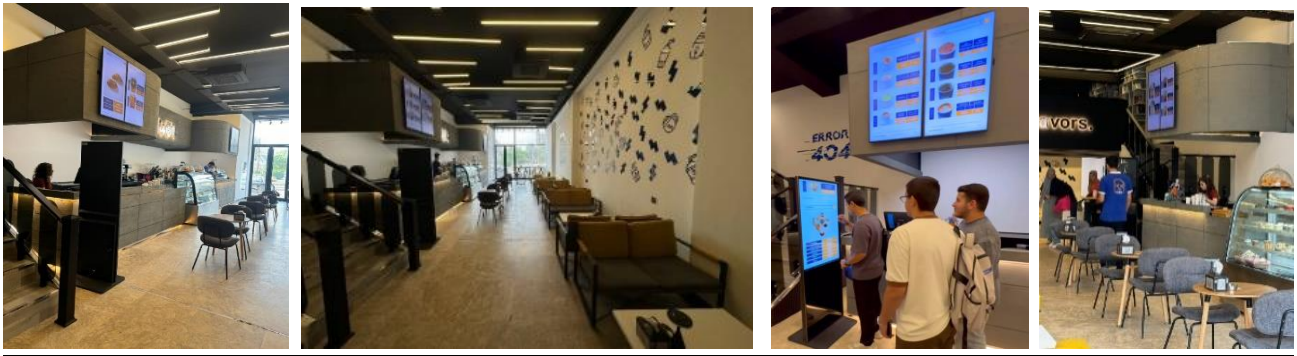


Figure 3. 404 coffee shop in Zayona (Source: Taken by Authors).

## 9. Questionnaire

A questionnaire was used in selected coffee shops to validate the theoretical framework indicators. The questionnaire questions were designed on two levels:

### 9.1. The First Level

Focused on achieving a clear understanding of the architectural characteristics of coffee shops after the digital integration of technologies. A questionnaire containing, as shown in Table (3), detailed indicators measuring their characteristics was distributed to a group of experts from well-known academic architects. Meetings were held, and videos of them were shown using a data show. The research was careful to highlight the style and details of the digital integration with the physical structure of coffee shops to illustrate the overall atmosphere.

Table 3. Experienced Architects' questionnaire (Source: Authors).

<b>Dear Experienced Architect:</b>					
Thank you for participating in this survey for my research entitled "Rethinking Baghdadi Coffee Shops & Their Sustainability Through Digital Technology", I look forward to your help in uncovering the resulting transformations in the café and the changes in its architectural features following the integration of information and communication technologies and digital technologies into its physical structure."					

Architectural Features of Coffee Shops			Shah-Bandar Coffee Shop	Bin Reda Alwan Coffee Shop	404 Coffee Shop
Vitality	Functional	Cultural			
		Social			
		Scientific			
		Economy			
		Fictional			
		Innovative			
		Advertising			
		Media			
	Sensory	Excitement			
		Desire			
		Competition			
		Narrative			
		Relaxation			
		Play			
		Remembrance			
Continuity	Visual (Inside - Outside)				
	Functional (Familiar - New)				
	Contextual (Spatial-Temporal)				
Correlation	Semantic (Spirit of Place - History of Place)				
	Identity of Place				
	Age Group				
	Symbolic				

Architectural Features of Coffee Shops			Shah-Bandar Coffee Shop	Bin Reda Alwan Coffee Shop	404 Coffee Shop
	Personal Culture				
	Collective Culture				
	Special Needs Group				
Interactivity	Dialogue				
	hospitality				
	work				
	watching				
	communication				
	competition				
	learning				
	meditation				
	browsing				
	advertising				
	media				
Flexibility	Operational	Diversity of functions			
		Play & Hobbies Space			
		Internet Center			
		Conference Hall			
		Coffee Distribution and Drinking			
		Experience Learning Space			
		Conversation Space			
	Performance	Functional spaces			
		Furnishing			
		Atmosphere			
		Sound			
		Lighting			
		Attractiveness			
		Expressiveness			

## 9.2. The Second Level

Focused on achieving a clear understanding of the relationship between customers and coffee shops (physical-digital) structure, as well as the relationships among customers themselves in the atmosphere, revealing their sustainable role in society. The research relied on conducting interviews with customers to clarify the purpose of the questionnaire and distributing questionnaires containing questions about detailed sustainability indicators, as shown in Table (4).

**Table 4. Customers' questionnaire (Source: Authors).**

<b>Dear-Customer:</b>	
Thank you for your participation in this survey for my research titled " Rethinking Baghdadi Coffee Shops & Their Sustainability Through Digital Technology", which explores the changes you have observed in Coffee Shops' characteristics through the integration of information and communication technology and digital technologies, and the extent to which they have impacted your relationship with other customers.	

The Question		Options			The Question		Options		
1	<b>What are the architectural features of the coffee shop?</b>	Vitality			6	<b>Identify operational flexibility in the coffee shop.</b>	Work		
		Continuity					Watch		
		Relationalism					Communicate		
		Interactivity					rivalry		
		Flexibility					playing		
2	<b>What activities can you observe in a coffee shop?</b>	Cultural					Narrative		
		Social			7	<b>What activities take place in the coffee shop?</b>	Calls for something		
		Scientific					Internet Center		
		Economy					Motor Show		
		Fictional					Distribution and drinking of coffee		
		Innovative					Learn experiences		
		Advertising					Talks		



The Question		Options			The Question		Options		
3	How does a coffee shop make you feel?	Media			8	What aspects of environmental comfort do you feel in a coffee shop?	Toys & Hobbies		
		Thrills					Air		
		Desire					Thermal comfort		
		Competition					Lighting level		
		Relax					Pollution level		
		Remember					Health aspects		
4	How would you describe your connection to a coffee shop?	Spirit of the place			9	In your opinion, what aspects make a coffee shop a social space?	The quality of life of people		
		History of the place					Individual well-being		
		Place Identity			10	How would you describe the continuity of a coffee shop?	Mass welfare		
		Personal culture					Visual (inside-outside)		
		Cultural Association					Contextual (spatial-temporal)		
		A certain age group					Functional (familiar - new)		
5	How does a coffee shop encourage interaction?	special category			11	In your opinion, what are the aspects achieved in a coffee shop that contribute to increasing the financial income?	Increase customers number		
		Dialogue					Stay longer		
		welcoming					Payment facilitation & costs		
		Work					Facilitate customer orders		
		Watch					Update and customise the customer order list.		
		Communicate							
		rivalry							
		playing							
		Narrative							
		Calls for something							

## 10. The Results of the Survey Study

The statistical analysis of the questionnaire was carried out based on percentages using Excel, which includes the possibility of representing these results in statistical tables. The results were at the two levels:

### 10.1. Results of the Experienced Architects' Questionnaire

The results of the architects' survey showed that the transformation of the selected cafes differed due to the different features achieved as a result of the diversity and differences in the style and degree of digital integration within their physical entity, as shown in Figures 4, 5, 6, 7, 8, 9, 10 through using Excel program. The traditional Al-Shabandar Coffee shop maintained its original characteristics, showing some features of transformation as a result of the subtle digital integration. In contrast, the modern Ben Reda Alwan Coffee shop showed a kind of balance between its local modern characteristics and digital characteristics to highlight digital technologies within its physical entity clearly. As for the 404 coffee shop, it showed a striking transformation in its characteristics due to the dominance of the use of digital technologies and the deliberate style of highlighting technology in it.

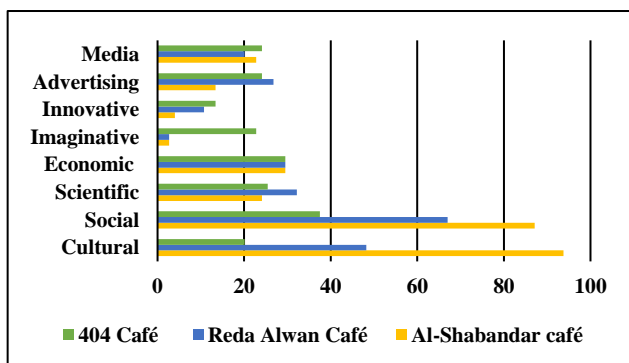


Figure 4. Results of measuring the functional vitality feature of selected Baghdadi coffee shops (Source: Authors by Excel program).

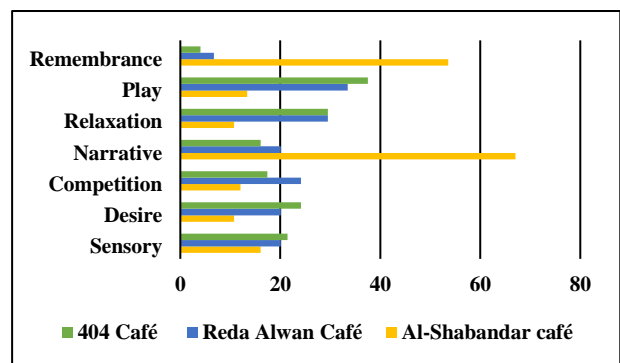


Figure 5. Results of measuring the sensory vitality feature of selected Baghdadi coffee shops (Source: Authors by Excel program).

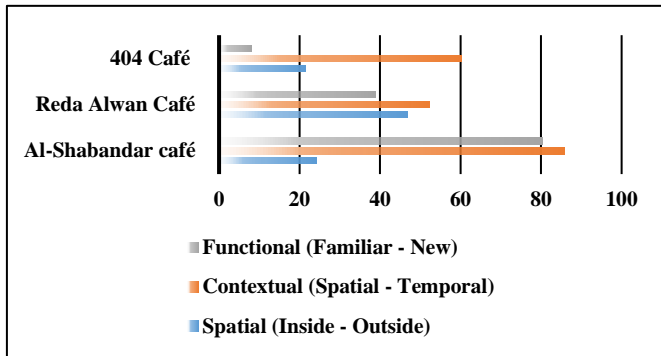


Figure 6. Results of measuring the Continuity feature of selected Baghdadi coffee shops (Source: Authors by Excel program).

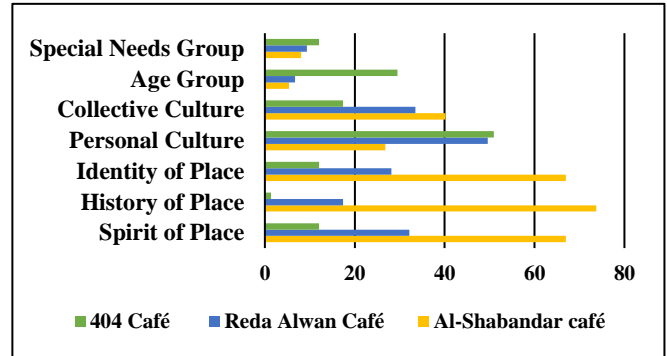


Figure 7. Results of measuring the Correlation feature of selected Baghdadi coffee shops (Source: Authors by Excel program).

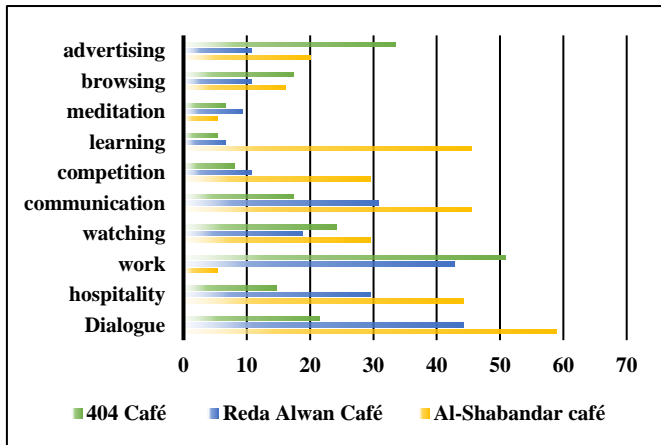


Figure 8. Results of measuring the Interactivity feature of Baghdadi coffee shops (Source: Authors by Excel program).

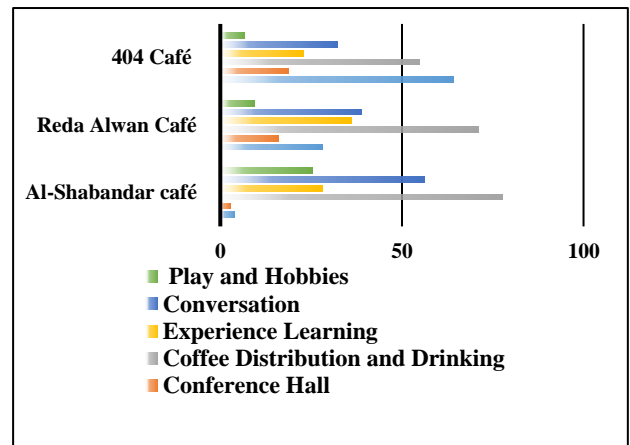


Figure 9. Results of measuring the Operational Flexibility feature of Baghdadi coffee shops (Source: Authors by Excel program).

## 10.2. Results of the Customers' Questionnaire

The results of the Customers' questionnaire confirmed a difference in their relationship with them in light of the different characteristics after the integration of digital technology into its physical structure, as shown in Figure (11). The traditional Al-Shahbandar coffee shop maintained its original relationship (a sense of belonging due to its traditional identity), as the change in its characteristics was slight due to its heritage value, for the modern Bin Redha Alwan coffee shop developed its relationship with patrons by developing intellectual and cultural aspects due to the shift in its modern characteristics towards the characteristics of the digital age, As for 404coffee shop, its sustainability indicators were diverse and varied, as it contemporary coffee shop, located close to the educational institutes in Zayouna, as it focuses on attracting young segments of society and their educational needs first and foremost. Despite the difference in the type of relationship between coffee shops and customers, and among customers themselves, they demonstrated an improvement in indicators of sustainability by modifying their characteristics and features by introducing technological techniques, especially environmental ones, to achieve thermal comfort, as shown in Figure (12), in addition to the economic improvement through increasing the number of patrons, their frequency, and the length of their stay in the café thanks to the allocation of events and activities and the type and ease of requests, as shown in Figure (13).

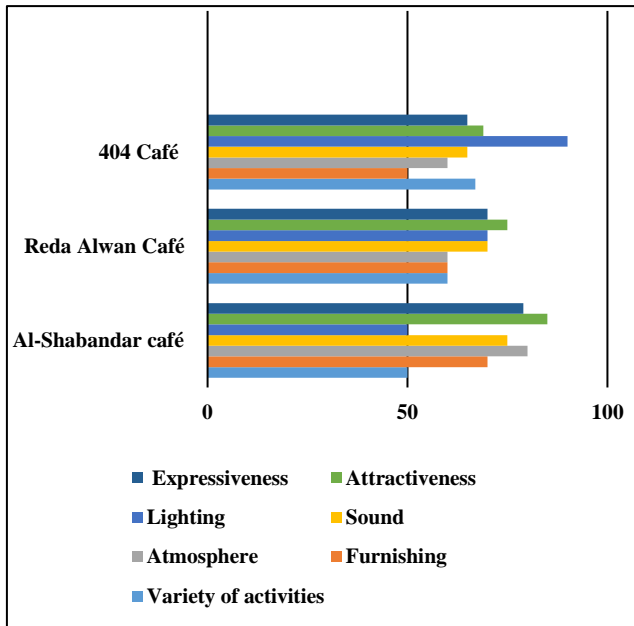


Figure 10. Results of measuring the Performance Flexibility feature of Baghdadi coffee shops (Source: Authors by Excel program).

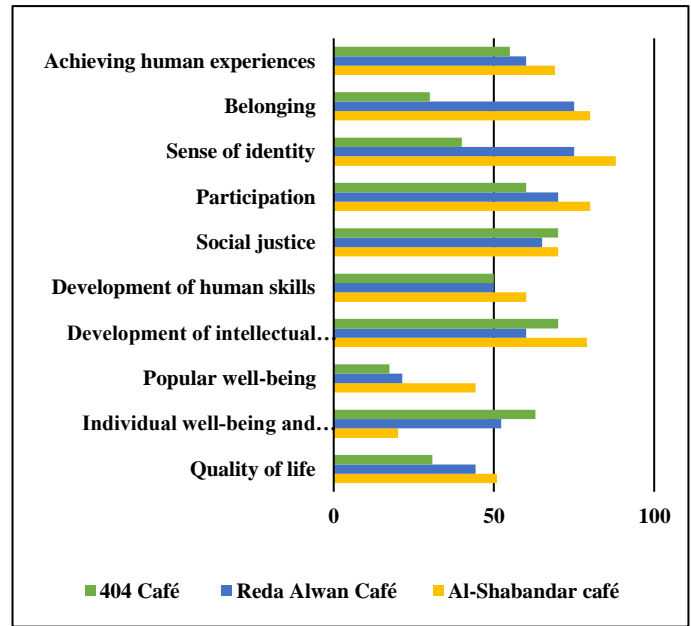


Figure 11. Results of measuring Aspects of Social Sustainable Improvement of Baghdadi coffee shops (Source: Authors by Excel program).

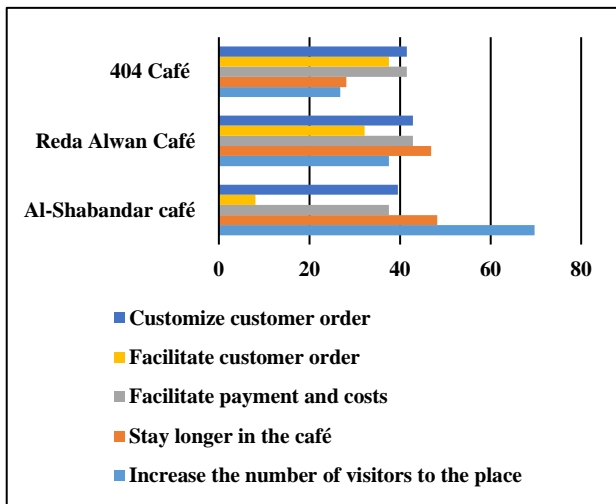


Figure 12. Results of measuring Aspects of Economic Sustainable Improvement of Baghdadi coffee shops (Source: Authors by Excel program).

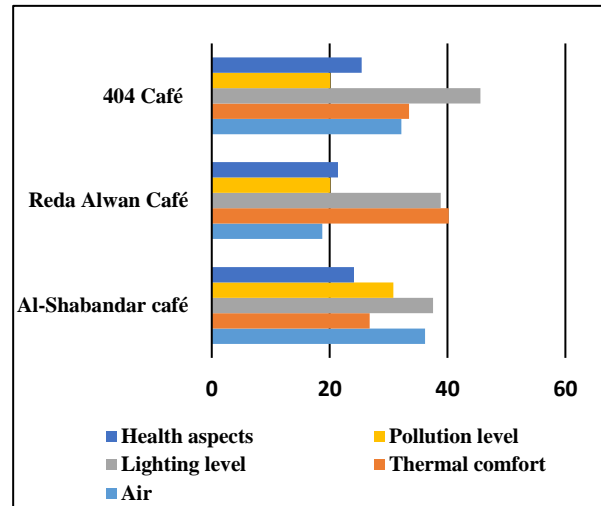


Figure 13. Results of measuring the Improvement in the environmental sustainability of Baghdadi coffee shops (Source: Authors by Excel program).

## 11. Conclusions

Throughout the ages, coffee shops have represented a community lifestyle, particularly Baghdadi coffee shops, which represent societal behaviours in the city. Their development has been linked to the evolution of societal needs on the one hand and to the development of technology on the other. The greatest transformation they have witnessed now is the digital integration within their physical structure, which has reflected diverse repercussions for the diversity of styles themselves, as follows:

- The digital integration of a coffee shop's physical structure relies on its style. Heritage and traditional coffee shops have incorporated digital technologies in a subtle manner that harmonises with the heritage characteristics of the place, enhancing features associated with cultural and local identity and strengthening the sense of belonging of their patrons. They have maintained their physical characteristics by incorporating plasma screens into heritage coffee shops and creating diverse seating dynamics to attract young people, particularly during the broadcast of events and activities such as matches “for example” has attracted a wide range of ages (groups, improving its functionality, operations, and economy). Locally, coffee shops dating back to the modern era adopted a more

explicit and significant integration of digital technologies, resulting in a greater transformation as their intangible characteristics became more apparent. They also created new activities within them, such as business meetings, workshops, and educational seminars. These activities allowed patrons to stay longer to complete work while also increasing their vitality, which boosted the coffee shop's operational performance, improved its financial returns, and expanded its community.

- The contemporary coffee shops were implemented with highlighted technological features to a greater extent, giving them the highest degree of transformation in their characteristics, which were dominated by intangible characteristics. They clearly emphasised the vitality, particularly through the allocation of individual spaces with privacy and seclusion for work, transforming into an institution for skill development. They also played an advertising and media role for their customers through taking and sharing photos and recording videos. Furthermore, the seclusion of the cafe was emphasised by adopting individual furnishings equipped with personal computers and tablets, which made the atmosphere more attractive, especially for young people, thanks to their new features.
- The digital integration of Baghdadi coffee shops, despite the diversity of its methods and levels, has created a more attractive and welcoming atmosphere, creating diverse feelings and emotions, as well as diverse human experiences and practices, strengthening individuals' connection to them and one another.
- Baghdadi coffee shops have demonstrated improvements in their sustainability indicators through the digital integration of their physical structure. On the environmental level, digital technologies have been able to control thermal comfort indicators to satisfy customers.
- The social improvement in Baghdadi coffee shops through digital integration of their physical structure has been represented by expanding the community within them and connecting them through the diversity of spaces, furnishing styles, activities, and events, as well as enhancing diverse feelings according to the coffee shops' context, emphasizing feelings of belonging, safety, security.
- The improvement in the economic sustainability of Baghdadi coffee shops has been represented by increasing their financial returns following the increased demand from diverse social groups, extended stays, and 24-hour occupancy through service allocation and speed.

The study presents a set of recommendations for developing cafes as a cultural pillar of Baghdadi society, enhancing their sustainability aspects to support and promote sustainable development.

## **12. Recommendations**

- Integrating digital technology into their physical structure to enhance environmental and psychological sustainability through the use of heat- and sound-absorbing, sensible materials and remote-controlled ventilation devices to enhance the comfort of cafes according to customer preferences.
- Enhancing the economic and social sustainability of cafes through digital integration into their operating mechanisms, means, and devices, particularly touch panels, digital displays, ordering devices, cameras, and everything else that ensures interaction, sensation, and activity (mental and physical) (group and individual) for all groups and ages, which increases their economic returns.

## **13. Future Prospects for Research**

The diversity and diversity of Baghdadi coffee shops, attitudes toward integrating digital technology, and their characteristics transformation prove that technology is a key tool for their continued sustainability over time. The idea of abandoning them as physical structures and replacing them with electronic communication sites, as some literature has noted, has not yet been witnessed in Baghdadi coffee shops due to the architectural designer's awareness of ways to integrate technology according to its temporal, spatial, social, and cultural limitations. Therefore, the research proposes, among its prospects, the possibility of developing design strategies for digital integration in coffee shops and other types of third spaces, such as Barbershops and libraries, due to their role in the sustainability of architecture and society.



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