DOI: https://doi.org/10.34137/jilses.1367970

Geliş Tarihi: 28 Eylül 2023	**Received: 28 Eylül 2023**
Kabul Tarihi: 17 Ocak 2024	**Accepted: 21 Ocak 2024**
Makale Türü: *Araştırma Makalesi*	**Research Type: *Research Article***

SEVER, M. M. (2024). Service Supply Chain Management (SSCM) in an Old Town of Mardin: Service Routing. *The Journal of International Lingual Social and Educational Sciences,10*(1), *92-101. https://doi.org/10.34137/jilses.1367970*

Service Supply Chain Management (SSCM) in an Old Town of Mardin: Service Routing

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Abstract

Service Supply Chains (SSCs) differ from the supply chain in manufacturing. In SSCs, customer orders trigger the SSCs. The supply chain process starts after customer demand. Most often customers are not in the same destinations and orders do not arrive one by one. Hence service providers should manage the ordering process effectively to serve in time. If the orders are widespread and there is a limited service provider the service route should plan carefully and precisely. In this study, service routing is constituted under three main scenarios for the most visited destinations of the old town city of Mardin, Turkey. 3D visual representations of specified regions visual representations were taken from Google Earth. Calculations between chosen touristic attractions and a total length made on Google Earth. The study is novel for being an ex-ante of the tourism supply chain utilizing a digital map, in a very tough area of an old city. The scenario-based approach is used as a method of deciding the route for the service supply chain.

Keywords: *Service Routing, Service Supply Chain, Supply Chain*

Eski Mardin için Hizmet Tedarik Zinciri Yönetimi: Hizmet Rotalaması

Öz

Hizmet sektörü tedarik zinciri süreçleri üretimdeki tedarik zincirinden farklıdır. Hizmet sektöründe tedarik zincirini müşteri talebi tetikler. Müşterinin talebinden sonra tedarik zinciri süreci başlar. Tüketiciler aynı destinasyonda toplanmamakta ve talepler hizmet sağlayıcıya tek tek sırasıyla gelmemektedir. Bu nedenle hizmet sağlayıcılar, zamanında hizmet verebilmek için sipariş sürecini etkili bir şekilde yönetmelidir. Siparişlerin dağınık bir alana yayılmış olmaları ve hizmet sağlayıcının sınırlı sayıda olması durumunda hizmet rotasının dikkatli bir şekilde planlanması gerekmektedir. Bu çalışmada, Türkiye'nin tarihi bir kenti olan Mardin'in en çok ziyaret edilen destinasyonları için üç ana senaryo altında servis rotaları oluşturulmuştur. Belirtilen bölgelerin 3 boyutlu görsel anlatımları Google Earth'ten yararlanılarak hazırlanmıştır. Seçilen turistik yerler arasındaki mesafeler ve toplam rota uzunluğu Google Earth üzerinden hesaplanmıştır. Çalışma, eski bir şehrin, engebeli bir bölgesinde dijital harita aracılığıyla turizm tedarik zincirinin planlanmasında ön aşama olması açısından önemlidir. Hizmet tedarik zinciri rotasına karar verirken senaryo tabanlı yaklaşımdan yararlanılmıştır.

Anahtar Kelimeler: *Hizmet Rotalama, Hizmet Tedarik Zinciri, Tedarik Zinciri*

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Introduction

Digital technologies are becoming a daily routine of our lives. Virtual reality, augmented reality, Internet of Things (IoTs), sensors, Cyber-Physical Systems (CPSs), virtual maps, and any kind of virtuality have become a real-world phenomenon in recent years.

The service sector is also one of the most labor-intensive sectors and has suffered the most from the recent pandemic. On the other hand, there has been a rapid recovery after the COVID-19 pandemic, especially in leading countries in tourism such as Türkiye. For instance, after a sharp decrease in 2020 with 15.971 visitors, in 2022 number of inbound tourists rose to 51. 388 in Türkiye (TUİK, 20.08.2023). This situation shows that the service industry is very sensitive and eager to become a part of this so-called digital world. By numbers, digital-intensive sectors' contribution to value-added growth of 28 OECD countries for 2018 is 51.2%. (OECD Report, 2018). Besides, it is reported that spending on digital transformation technologies and services increased from $0.96 trillion to $3.4 trillion globally from 2017 to 2026 (Statista, 2023). These numbers are important to show that after the pandemic period, digital investments were focused on human-intensive sectors such as tourism.

Unlike manufacturing, the supply chain in the service sector begins with the customer's demand. In other words, customer demand triggers the Service Supply Chain Management (SSCM) process. Unfortunately, because of the structural characteristics, it is difficult to predict demands in advance. Considering last-minute sales, last-minute reservations, etc., businesses are faced with situations where demand forecasting and material supply must be made very quickly. In the tourism industry, material supply is important to avoid disruptions in processes. Disruptions in the supply chain during busy seasons in historical cities can affect all tourism operations. Therefore, planning with digital tools other than traditional methods will accelerate and facilitate all processes. Especially in old cities, it is not possible to use new vehicles and technologies because the architecture of the city does not allow it. However, it is possible to use basic applications in these areas. For example, remote access images, and maps provide 3D realistic information about places.

In this study, route planning was conducted to facilitate the provision of services and goods at the tourist attraction points of the old city of Mardin. A scenario-based approach was used in the study. Service routes are proposed for 3 basic scenarios. In the study, route planning was explained to service providers using visual plans of the region according to possible scenarios.

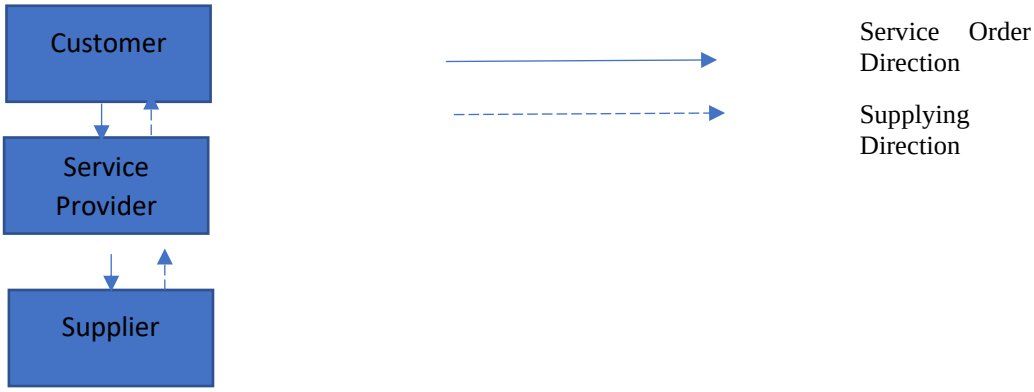
1. Service Supply Chain &Tourism Service Supply Chain

Service supply chain management deals with managing the orders, processes, information flow, capacity, and demands, customer and supplier relations from the beginning to, the end of the processes (Arlbjørn et al., 2011; Baltacioglu et al., 2007; Ellram, Tate & Billington, 2004).

Service Supply Chains (SSCs) are categorized as Service Only Supply Chains (SOSCs) and Product Service Supply Chains (PSSCs). In SOSCs, service is the only product, and physical products do not occur (Wang et al., 205). Consulting, hotel reservations, medical, mobile operators, and public services are examples of SOSCs. In PSSCs, there are also physical product flows from the original provider to the service provider to meet customer needs (Ellram, et al., 2004). If a doctor's online consultation is SOSCs; surgery operations are the PSSCs. In the second case (PSSCs), they also need product flow to improve the overall operation. If online ordering in a restaurant is a SOSC, preparing orders in a restaurant can be considered a PSSC. The service provided in this study is considered an SOSC.

In SSCs, the process begins after the customer has used a service. It is the first step that triggers the process of service delivery. The service provider becomes an actor in the process of meeting his needs. This is the main difference from general supply chain management. In supply chain management the products are already ready for the potential customers. Moreover, in the service supply chain, there are not always physical products as in SOSCs.

Figure 1: *Service Supply Chain Mechanism*



The main difference with the supply chain is that the SSC process begins as the customer receives orders, as shown in Figure 1. As soon as the customer order or demand arrives, the service provider starts delivering goods & and materials to provide the services. As the supplier sends the anticipated demand to the service provider, the service provider is ready to provide the service.

Customer orders trigger the SSCs. In most cases, customers are not in the same locations and orders do not arrive sequentially. In addition, in most cases, there are only a limited number of service providers. Therefore, service providers should manage the ordering process so that they can serve at one time.

The tourism industry, as a major actor in the service industry, has different supply chain characteristics and needs a barrier-free intermediary service network. Besides, there are regional tourism industry cooperation associations for managing and monitoring tourism in designated regions. These associations also manage the supply chain of tourism. Additionally, tourism consumers are very sensitive to the quality of service they take. Thus, listening to customers and giving feedback in a very short period needs a quick supply chain mechanism. Also, tourists are mobile in tourist destinations, and in most of them their attitudes and consumption behavior are unpredictable (Chen, 2009; Lee & Fernando, 2015). Tourism, as a bundle of different varieties of products and services, supply chain management in this industry becomes complicated in most cases. The supply chain is an under studied subject not only in tourism but also in many service branches (Zhang et al., 2009). However, delays in material supply will result in the disruption of many processes.

2. Literature Review

Supply chain management problems fall between routing, scheduling, and operations management (Palang & Tippayawong, 2018), sustainability (Font et al., 2008; Jermsittiparsert et al., 2019; Adriana, 2019; Schwartz et al., 2008; Sigala, 2008), workforce and resource allocation, supplier relations (Silveira & Arkader, 2007; Prajogo & Olhager, 2012; Gonz´alez-Torres et al., 2021; Lee & Fernando, 2015, Fong et al., 2021) in the tourism industry. The tourism industry because of its characteristics such as coordination-intensive, perishable, information-intensive, product complexity, demand uncertainty, and complex dynamics needs a well-established and coordinated network between suppliers and tourism enterprises (March & Wilkinson, 2009; Zhang et al., 2009).

Since the variety in demand of customers creates a variety of tourism services and products, it creates a huge network between tourism service providers and enterprises (Sigala, 2008). In this case, the supplier chain management mechanism and network become crucial under these circumstances. However, there are a limited number of studies and the literature lacks of draw a framework for the tourism supply chain and its characteristics.

The main criterion to select or unselect the supplier is performance. To evaluate the performance indicators should be assessed. Some performance indicators of tourism suppliers were classified under order process, supplier relations, service performance, capacity and resource, customer relations, demand, information and technology management, and service supply chain finance themes (Palang & Tippayawong, 2021). After depending on themes, they decide the performance metrics for each theme. Those metrics are evaluated and weighted under the Analytical Hierarchy Process (AHP) Method.

To Redesign a TSCM, risks, collaboration, performance measurement, and Information Technologies (IT) should be criticized carefully (Piboonrungroj & Disney 2009). One of the Tourism Supply Chain Management (TSCM) concerns is suppliers and hotels (Gonz´alez-Torres et al., 2021). Scholars concerned about how to heal the relations and coordination between two parties in such a devastating last pandemic conditions case of hotel chains for Spain the country which is world's top tourist destination as the country itself. This two-party relations TSC study was conducted concerning qualitative data gathering principles and results themed under f governments, tour operators, and competitors' relationships utilizing software Atlas.it.

The structural equation model was constructed on TSCM for testing relations between drivers of medical tourism practices, medical tourism supply chain practices, medical tourism supply chain practices, and organizational performance (Lee & Fernando, 2015). In another study, the relations in a TSCM are classified as horizontal, vertical, competitive, cooperative, and diagonal (Fong, et al., 2021).

Sustainability is another issue investigated in supply chain management in tourism (Font et al., 2008). They try to explore the prior areas for improvement in sustainable supply chain management in four main sectors of tourism: accommodation, transport, ground handlers, excursion & and activities, and food & and craft.

Supply chain management in tourism is positively related to the success of marketing campaigns. Weak discrepancies between the travel agents and destination suppliers resulted in a bottleneck in tourism development (Zhang & Murphy, 2009). In other words, the effectiveness of the supply chain in tourism has a positive impact on regional development.

Considering the studies carried out, it can be said that SSCM studies in the service sector are limited to the health sector and medical tourism fields, and the studies conducted in these fields are concentrated in the field of supplier performance evaluation. This study, differs from other studies in terms of method and approach, as the facilitation of the SSC process for service providers with the help of digital tools will be discussed with a scenario-based approach.

3. Methodology

In this study visual representations of the real world were taken from Google Earth. After measuring distances between tourist places, routes for each scenario were generated. The steps of the study are given below:

- Decisions for main tourist places were subjected to in this study
- Measuring the distance between tourist places
- Generating alternative scenarios (Table 1)
- Routing considering generated scenarios

In this study, the most visited destinations of an old town are chosen as a unit of analysis. Depending on the cases investigated scenarios are generated

Assumptions

There is one beginning point and if all destinations need service, the provider will start to serve from the beginning point.

Limitations

To simplify the study some of the designated criteria are listed as follows:

- Only old towns have been considered in this study
- The most visited and popular destinations are selected
- Service time and route time are not considered in this study

The old town of the city contains the most visited destinations and places. Thus, in this study, only the old town is selected as a unit of analysis. The old town of the city itself as a whole area is like an open-air museum. To simply study and to facilitate utilization for individuals some of the places were selected. The selection process was realized with the help of experts, residents, and indigenous. After informal interviewing, some of the most visited tourist attractions were subjected to this study. The total area is shown in Map 1.

Map 1: The Total Area in This Study

The area subjected to this study is a total of 90.673,89 m² by feet. Map 1 shows the total area. This area includes the most important and visited destinations in the old town of the city. Since it is the most populated area during the season, the provision of services to this area becomes important For concreteness, some cases are taken into consideration. In this study, there are three types of scenarios.

In order to give some examples and clarify the topic, some scenario-based approaches were followed. Scenarios can be used to predict the system's behavior and observe how the system works according to the set goals. The roles of people in the system and what procedures can be adapted to the system can be identified through scenarios. Similarly, the possible consequences of changes in the system can be made concrete with a scenario-based approach (Carroll, 2000). In other words, by implementing a scenario-based approach, abstract models become more perceptually and understandable (Weidenhaupt, Pohl, Jarke, & Haumer, 1998). A scenario expresses an imitation of a system (Achour, 1998). The scenarios in this study are shown in Table 1.

4. Results

Under three scenarios the main route and route length are measured and the main results are summarized in this part of the study. The service provider and supplier should first decide the route. In this case, the demands of each destination should be assessed. If there is a shortage of services or goods at more than two destinations, the routing will be redefined.

Table 1: *Scenarios*

Cases	Scenarios
Case 1. All destinations must be served	**Scenario 1.** In this scenario route is calculated according to the starting point and all points are ordered at once. In this case, the service provider accepts that they are at the starting point, and the provider calculates the closest point and begins and begins service according to the order they have.
Case 2. Two neighboring destinations need to be served	**Scenario 2.** Routes are calculated according to the closest point to the service provider. In this case, the provider may not be able to reach the starting point calculated between two adjacent points and the service provider starts serving from that point and does the rest accordingly.
Case 3. More than two destinations need to be served	**Scenario 3.** It is similar to the second scenario. In this case, more than two points need to be served, which are located in a wide area.

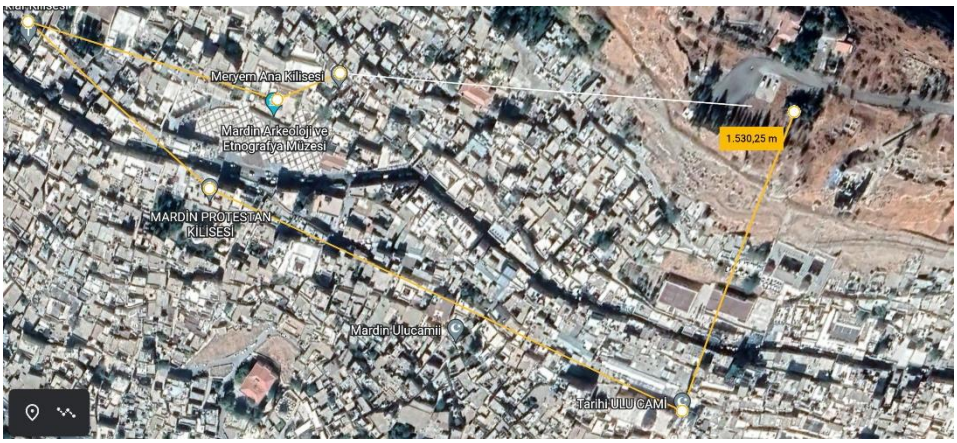
To illustrate the example three scenarios were written. In the first scenario, all destination needs service. To actualize scenarios, the distances between destinations should be calculated. Distances between adjacent points starting from the Kale (Castle) are measured and shown in Table 2.

Table 2: *Distances Between Places*

Places (with original names)	Distances (m)
Kale -Ulucami (Castle- Grand Mosque)	329.24
Kale- Arkeoloji Müzesi (Castle - Archeology Museum)	429.64
Arkeleoji Müzesi- Ulucami (Archeology Museum- Grand Mosque)	415.91
Arkeloji Müze-Meryem Ana Kilise (Archeology Museum-Virgin Mary's Church)	62.55
Arkeloji Müzesi- Protestant Kilisesi (Archeology Museum- Protestant's Church)	90.92
Meryem Ana Kilisesi – Kırklar Kilisesi (Virgin Mary's Church- Forty Church)	223.31

In Case 1 all the destinations need service. According to Scenario 1, the service provider will start from the beginning point and serve till to the endpoint and finish the route. The visual representation is shown in Map 2.

Map 2: *Case 1: All Destinations Need Service*



As summarized in Table 2 total distances of each point were visited measured as 1530 m as birth fly. The service provider sets off with the needs of all service points that need to be taken into consideration at once. Another important issue is deciding the starting point. By its nature, the service provider should choose the closest point to their business. However, the starting point can also be chosen depending on which service is more urgent. This varies depending on the type of service provided in that region. The white dot shows the starting and finishing point in this route on Map 2 as a case in this study. In the second case, there are only two destinations that need service.

Map 3: *Case 2. Two Destinations are Waiting for Service*

The logic in the second scenario is that the service provider chooses the tourist destination closest to it and reaches the other destination waiting for service. In this case, Meryem Ana Kilisesi (Virgin Mary Church) and Arkeoloji Müzesi (Archeology Museum) is chosen as an illustrative example of destinations waiting for the service. The service provider is in Kale (Castle) at that time. According to the distance calculation, the service provider will go directly to the Virgin Mary's Church and then will go to the Archeology Museum. In the third case, more than two destinations were waiting for the service. It was shown in Map 4.

Map 4: *Case 3. More than Two Points in Different Regions Wait for the Service*

In the last case, more than two destinations were waiting for service. In this case, the closest point to the service provider is calculated and the neighboring point is then the available service point for that case. The process

continues until the last destinations are served. In this study, we illustrate an example of scenario 3 with three selected tourist attraction points. Also, in this case, the starting point is shown as a white dot in Map 4.

After visiting the Ulu Camii (Mosque), the next point to wait for service is the Protestan Kilisesi (Protestant

Church). After delivering the service at the second point of this route (Protestant Church), the next service point for the supplier is Arkeoloji ve Etnografya Muezesi (Museum of Archeology and Ethnography). The examples shown in this study serve to illustrate the scenarios. Depending on the individual case, other points may also be calculated.

5. Conclusion

This study is based on the use of digital maps to support service provision in the old city of Mardin, which has a difficult geographical location for logistics with cars and large vehicles. The practical significance of this study is that it presents a scenario for routing services in a specific area using digital maps. It can be concluded that the visual representation of the designated area facilitates route planning for service providers. In addition, the scenario-based approach was used as a tool to help service providers visualize alternatives and plans.

In examining tourism supply chain management studies, it is apparent that they focus on issues of sustainability, performance, and design. Although the issue of service routing occupies an important place in the supply chain, this topic has not yet been found on a tourism scale. Therefore, in this study, we wanted to address the issue of routing for the service supply chain in a specific area in a destination. Moreover, this article aims to open a theoretical discussion on the applicability of service routing for tourism stakeholders. The aim is to flesh out the concept with examples using the three scenarios developed.

Thus, the study was not conducted for a specific provider or product. In this study, municipalities, institutions, organizations, and private companies can be considered as providers in this context. In other words: In this study, the term provider has a general meaning. Not only the subject matter of the study, but also the approach taken, e.g., routing of service offerings, and the fact that a scenario-based approach to routing services was used for the first time, make the study novel.

6. Discussion

Service companies rely on a well-developed supply chain network to conduct business on time. A potential disruption in the supply chain can lead to a delay in delivery and consequent customer dissatisfaction, which can affect the reputation of the company and lead to customer loss.

The services supply chain is different from the traditional manufacturing supply chain. In the service supply chain, the mechanism is triggered by the customer order. Since there is more than one order and only one service provider, it is important to plan and manage the process as a whole on time. In this study, scenarios were created for the likely cases. The case and scenarios shown in this study are some examples of the anticipated situations. The study will be expanded and more than one service provider will be involved in the process.

With some digital technologies such as virtual reality (VR) and augmented reality (AR), it is also possible to plan the routing of services with real-time data. Real-time maps and visual representations can also be useful for such a routing problem. This is because, in real-time data, service providers can see traffic conditions (closed roads, traffic jams, etc.)

The old town of the city which is subjected to this study is a tough region and streets and roads are too narrow and rugged. There are so many steps inside the old town. Most of the streets are not accessible by vehicles. In this region, non-engine vehicles, and animal power, are used for transportation, usually donkeys and horses. Duration and distance calculations can be made considering this situation. By its nature, there are bundles of goods and services under the tourism supplier chain. Accordingly, the study should handle the subject in a limited destination and a limited number of scenarios. The study can be expanded by studying alternative routes and destinations and many more scenarios. This study can be repeated for a specific type of product or service. The time of routing and service time for suppliers is not subject to this study. Because of the fluctuations in demand time and amount, time and demand uncertainty can be considered in other studies including forecasting and real-time data collection methods.

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