

Leveraging Geographic Information Systems for Value Co-Creation: A Conceptual Framework for Location-Specific Service Systems

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Service Science, Location Information, Geographic Information System, Location-Based Service, Location-Contextualizing Service

Abstract

Value creation through service is integral to our society, and Geographic Information Systems (GIS) play a crucial role by leveraging location information to contextualize value propositions and establish new location-based service. Despite the significance of GIS, their role in value co-creation within service systems has not been thoroughly conceptualized. This paper develops a conceptual framework for location-specific service systems utilizing GIS, based on the smart service systems framework and six case studies from both B2B and B2C markets. By examining GIS's dual perspective in B2B and B2C contexts, we highlight their unique contributions across various service settings. Our framework advances service science by introducing a novel perspective on the role of GIS, emphasizing their strategic and operational benefits. Identifying GIS as boundary objects, we demonstrate their potential to enhance service quality and efficiency through local usefulness and shared identity among service system actors. The framework shows how GIS facilitate value co-creation by mediating information transfer and knowledge sharing between stakeholders. This study provides actionable insights for service providers and proposes a comprehensive model to guide future research and practical implementations, enhancing both the theoretical and practical understanding of GIS in service systems.

1. Introduction

Services represent a significant component of the global economy, accounting for more than two-thirds of the global Gross Domestic Product (GDP) and generating the majority of new job opportunities worldwide (OECD, 2022). Service systems provide a framework for understanding how services are designed and consumed within different contexts and environments (Li et al., 2019). As socio-technical systems (Beverungen et al., 2018; Böhmman et al., 2014), service systems are traditionally conceptualized as comprising “people, technology, internal and external service systems connected by value propositions, and shared information” (Spohrer et al., 2007, p. 73) as their major components. Referring to dynamic configurations of human, technological, or informational resources, service systems create mutual benefits for service customers and service providers (Maglio et al., 2009; Spohrer et al., 2007).

The ongoing digital transformation is reshaping service systems to evolve new value propositions enabled by digitization through technologies like Artificial Intelligence (AI), the Internet of Things (IoT), Machine Learning (ML), and Cloud Computing (Dinh et al., 2017; Genennig et al., 2018; Moghadamnia & Hasan Abadi, 2024). Customization also plays a crucial role in modern service and has been shown to enhance customer-perceived value, thereby driving value co-creation (Kleinaltenkamp et al., 2017). Within this evolving landscape, the integration of location information as a resource in service systems has gained popularity, particularly for analytics and marketing purposes (McKenna et al., 2014; Uphaus et al., 2021). Location-Based Services (LBS) are services that use location information. They have rapidly gained popularity in recent years with the global market expected to grow significantly from \$31.17 billion in 2024 to \$129.71 billion by 2032 (Fortune Business Insights, 2025).

LBS enable personalized, real-time decision-making through spatial proximity and device

locatability features, being used in navigation, mapping services, and location-based advertising (Bärsch et al., 2019; Dinh et al., 2017; zur Heiden et al., 2023). For instance, mobility services, like Uber, rely on information on the exact locations of customers and drivers. The key characteristics of LBS include the spatial proximity of service customers to the service location and the capability of devices to determine their location (locatability) (Junglas et al., 2008). Besides LBS, the concept of Location-Contextualizing Services (LCS) emerged in recent academic discourses on services utilizing location information. LCS use location information to enhance service value but do not depend on it as a core element. For example, a hotel booking website uses location data to help users find hotels near points of interest, but the service can still function without location data. LCS employ static location information to support customer decision-making through spatial contextualization (zur Heiden et al., 2023).

Geographic Information Systems (GIS) are an essential technology for services integrating location information, such as LBS and LCS. GIS functionalities include the acquisition, management, analysis, and presentation of location data (Breunig et al., 2020; Ehlers & Schiewe, 2012). These systems serve as boundary objects within service systems, facilitating value co-creation between providers and customers by enabling the use and analysis of geospatial information (zur Heiden et al., 2023). By fostering new configurations of actors and activities, GIS promotes an iterative design of innovative value propositions (Genennig et al., 2018). Despite the growing relevance of location information in digital services, its role is often reduced to a simple variable. As highlighted by Haj-Bolouri et al. (2024), the conceptualization of “space” in IS research lacks the theoretical maturity found in other disciplines. Our work challenges this perspective by showing that spatial data are context-giving and essential for the effectiveness of many services. For example, predictive maintenance suffers in quality when geospatial information is not considered (zur Heiden et al., 2022). This underscores the

need to move beyond simple data integration toward a more structured understanding of how location contributes to value creation.

To fully understand the role of GIS in enhancing value co-creation, it is crucial to consider how these services operate within different market contexts. B2B and B2C services differ significantly in their complexity, decision-making processes, and relationship dynamics, with B2C services focusing on individual consumers and shorter cycles, while B2B services often involve complex organizational interactions and long-term partnerships (Atanassova & Bednar, 2023; Chen, 2020). Customization through GIS-enabled services provides a powerful mechanism to adapt service delivery in B2B and B2C contexts, particularly through the flexible integration of customer-specific location data (Kleinaltenkamp et al., 2017). In B2B contexts, businesses use GIS to manage and analyze location data for strategic decision-making and operational optimization. For instance, energy grid operators might use GIS to monitor and optimize the placement of grid assets. In B2C contexts, end consumers interact with GIS-enabled services for personal benefits, such as finding the nearest public transportation options or selecting a hotel based on location. For instance, Dong et al. (2009) demonstrated the effectiveness of a spatial decision support system in optimizing facility networks for customer-oriented service industries. Their study highlights how GIS can integrate spatial and business data to support strategic transformations, such as site location and performance evaluation, thereby driving value co-creation in B2C contexts.

We introduce a novel framework that conceptualizes GIS as boundary objects in service systems and distinguishes their roles in B2B and B2C contexts. This dual perspective is essential for understanding how GIS can be tailored to different market needs, which has not been addressed in prior research. Given this context, our research seeks to answer the following questions: What is the role of GIS in value co-creation in service systems, and what are the contributions of their unique properties in B2B and B2C contexts? This question aims

to uncover the specific contributions of GIS to value co-creation, highlighting their strategic and operational benefits across different market environments. Value co-creation refers to the significant enhancements and efficiencies that GIS bring to service systems, beyond basic operational improvements, such as decision-making through real-time data integration and analysis or improving customer experiences by providing detailed and relevant location-based information.

We build on the smart service systems framework by Beverungen, Müller, et al. (2019), which illustrates how service customers and service providers interact through boundary objects. Boundary objects facilitate the transfer of information and knowledge across different communities (Becker et al., 2013; Star & Griesemer, 1989) and are flexible enough to be locally useful for both service customers and providers, while maintaining a shared identity across these groups (Beverungen, Müller, et al., 2019; Star & Griesemer, 1989). While the smart service systems framework defines smart products, such as smart washing machines, as boundary objects, it is important to recognize that boundary objects can be either physical or virtual (Becker et al., 2013; Star & Griesemer, 1989). GIS, although not physical objects like smart products, can also serve as boundary objects through their ability to facilitate the acquisition, management, analysis, and presentation of location data (Ehlers & Schiewe, 2012). These functionalities enable GIS to mediate the transfer of information and knowledge between different stakeholders, thereby fostering value co-creation in service systems. Our investigation focuses on the roles of GIS within two types of location-specific services: LBS and LCS. These types of services operate in both B2B and B2C contexts.

To frame our study, we introduce two critical aspects of value propositions in service systems, drawing on the properties of boundary objects: local usefulness and shared identity (Beverungen, Müller, et al., 2019). Local usefulness refers to the immediate, practical benefits derived from using GIS within specific operational contexts, enhancing efficiency and

decision-making for both service customers and providers. This includes benefits, such as improved asset management for businesses or better service experiences for end consumers. Shared identity involves the common understanding and collaborative benefits that arise from the mutual use of GIS, fostering a unified platform for information exchange and value co-creation. Shared identity ensures that both service providers and customers can effectively communicate and collaborate, leveraging GIS to create mutual value.

The remainder of the paper is structured as follows. In Section 2, we summarize the theoretical background of service systems, services using location information, and GIS. In Section 3, we explain and justify our conceptual research approach and describe six cases before presenting the extended location-specific service systems framework in Section 4. After discussing the theoretical implications of the framework in Section 5, we conclude the paper in Section 6.

2. Theoretical Background

2.1. Service Systems and Boundary Objects

Service is defined as “the application of specialized competences (operant resources—knowledge and skills), through deeds, processes, and performances for the benefit of another entity or the entity itself” (Vargo & Lusch, 2008, p. 26). Digital services integrate information technology to enable value co-creation (Beverungen et al., 2017). Value co-creation highlights the collaborative process through which benefits are generated via resource and competency integration between providers and customers (Vargo & Lusch, 2004). Instead of being embedded in products, value is determined by the beneficiary during the consumption process, emphasizing the concept of value-in-use (Lusch & Nambisan, 2015;

Lusch & Vargo, 2006). Thus, service “can only be created with and determined by the user in the ‘consumption’ process and through use or what is referred to as value-in-use” (Lusch & Vargo, 2006, p. 284). Value-in-use is a central concept in service science that recognizes that the value of a service is determined by the beneficiary’s reception of the benefits received and depends on the customer’s needs, preferences, and context (Vargo & Lusch, 2008).

Actors can embody different roles, perspectives, and knowledge, interacting with each other and creating a need to be orchestrated (Li et al., 2019). This need for coordination is addressed through service systems—a basic abstraction in service science—which function as socio-technical systems (Beverungen et al., 2018; Böhmman et al., 2014) that integrate people, technologies, and other resources to create mutual value through interactions and shared information (Maglio et al., 2009; Spohrer et al., 2007). The goal of service systems is to enhance service quality, efficiency, and innovation by effectively coordinating these components (Böhmman et al., 2014). The digital transformation has reshaped service systems by incorporating IoT devices, AI-driven analytics, and Cloud Computing to enable real-time decision-making and adaptive service delivery (Breibach & Maglio, 2016; Lim & Maglio, 2018). The systematic design and development of service systems are performed by service systems engineering (Böhmman et al., 2014).

Recent research has expanded this understanding by integrating service ecosystems into service systems theory. Service ecosystems emphasize how actors interact within institutional arrangements to co-create value across organizational boundaries (Akaka & Vargo, 2015; Vargo & Lusch, 2016). Service ecosystems highlight interdependence among actors and recognize institutions, such as norms and rules, as critical enablers of service interactions. This perspective broadens traditional service systems by focusing on dynamic configurations of people, technologies, and resources within broader ecosystems (Vargo et al., 2020). Service-dominant logic (S-D Logic) provides a theoretical foundation for understanding these

ecosystems by emphasizing the role of resource integration and institutional arrangements in value co-creation. Service ecosystems are dynamic and adaptive systems in which actors continuously exchange resources and coordinate their actions through shared institutional logics (Vargo et al., 2020).

IT artifacts or concepts facilitating communication and collaboration between service providers and service customers in service systems and enabling their value co-creation can be viewed as boundary objects (Star, 2010; Star & Griesemer, 1989; Vargo & Lusch, 2008). Boundary objects can be physical or virtual and enable the transfer of cross-border information and knowledge (Becker et al., 2013; Bowker & Star, 1999). Examples of boundary objects are prototypes, plans, or information systems (Becker et al., 2013). In service systems, boundary objects can foster collaboration and coordination between service providers and customers, leading to better service quality, customer experience, and overall system efficiency. For example, digital platforms, such as dashboards or APIs, can act as boundary objects in modern ecosystems by standardizing interactions between actors while remaining adaptable to specific contexts (Breidbach & Maglio, 2016; Lim & Maglio, 2018).

Boundary objects also bridge the line of interaction, which separates the activities of service providers and customers and describes the value-in-use, the activities, and the resources for each of the two sides of the service system (Beverungen, Breidbach, et al., 2019). On the one hand, a boundary object must be robust enough to maintain a shared identity across communities, and on the other hand, it must be flexible enough to be locally useful for each of the communities by being interpreted in different ways (Beverungen, Breidbach, et al., 2019; Star & Griesemer, 1989).

2.2. Smart Service Systems

Smart service systems are “service systems in which smart products are boundary objects that integrate resources and activities of the involved actors for mutual benefit” (Beverungen,

Breidbach, et al., 2019, p. 12). Smart products are physical goods that are digitally networked, like smartphones, production machinery, or smartwatches, and enable the interaction between service providers and service consumers through a set of properties (Beverungen, Breidbach, et al., 2019). In a smart service system, smart products are boundary objects that offer a shared identity for the actors involved as well as local usefulness for each of the actors alone (Beverungen, Breidbach, et al., 2019). Smart products act as enablers within broader digital ecosystems. For instance, IoT-connected devices combined with AI analytics allow smart products to adapt dynamically to user needs while facilitating real-time data exchange across actors in a system (Akaka & Vargo, 2015; Lim & Maglio, 2018). The smart service systems framework (Figure 1) conceptualizes how service consumers and service providers establish their interactions by building on the properties of a shared identity and local usefulness provided by a boundary object. The smart service systems framework (Beverungen, Müller, et al., 2019) focuses on smart products as physical boundary objects. For example, a smart product could be a smart washing machine that may utilize sensors and connectivity to optimize its wash cycles based on the load and fabric type, receive remote commands, and send alerts when maintenance is required. The properties of smart products are sensors, connectivity, unique id, location, data storage, processing, actuators, and interfaces. Smart products can acquire location information but do not provide the functionalities needed to operate these data, especially with static location information comprehensively. Regarding integrating location information as a resource in service systems, like LBS or LCS, through GIS, the role of the boundary object differs. GIS provide a rich set of tools to acquire, manage, analyze, and present location information. However, the role of GIS for service systems has not been investigated yet (Priefer, 2023), especially within a framework that constitutes the different actors of the services—customers and providers—as well as the co-creation of value, enabled or enhanced through GIS.

2.3. Services Including Location Information and GIS

Services including location information as an operand resource have gained increased attention lately and are being used for purposes, such as analytics and marketing (McKenna et al., 2014; Uphaus et al., 2021). One type is Location-Based Service (LBS), “a class of service utilizing location information of identified, proximal, and locatable entities and/or users, aiming to provide personalized, up-to-date information for better and informed real-time decisions” (zur Heiden et al., 2023, p. 5065). Examples of LBS include location-based advertising (Molitor et al., 2018), location tracking of products (Pei Chin, 2012), and applications for public transportation (Lehrer et al., 2011). Location information is the most crucial element for LBS, mandatory for the services to operate. There are different characteristics defining LBS. For example, the spatial proximity of service customers and the service location, e.g., POI, are relevant for the services’ functionalities (zur Heiden et al., 2023). Locatability—a device’s capability to determine its location—is another crucial element of LBS (Junglas et al., 2008). In LBS, customers’ locations can be either static or dynamic (Lehrer et al., 2011),

and the entities that customers interact with include devices, products, services, or places (zur Heiden et al., 2023).

Another type of service, including location information, is Location-Contextualizing Service (LCS). Here, location information is not mandatory for the value co-creation. LCS is a service that “utilizes location information of entities with a static location to co-create superior value-in-use and, ultimately, support customer decision-making by spatial contextualization” (zur Heiden et al., 2023, p. 5067). An example of LCS is hotel booking websites. When an existing service is augmented with location information—becoming an LCS—GIS or at least GIS functionalities must be included (zur Heiden et al., 2023). Although GIS are not the only existing systems that enable the inclusion of location information, they provide a diverse set of tools and functions to analyze location information and, thus, allow service providers and service customers to co-create value (zur Heiden et al., 2023). Therefore, GIS are an enabling technology for both LBS and LCS.

GIS can be defined as “a system of hardware, software, data, people, organizations and institutional arrangements for collecting, storing, analyzing and disseminating information

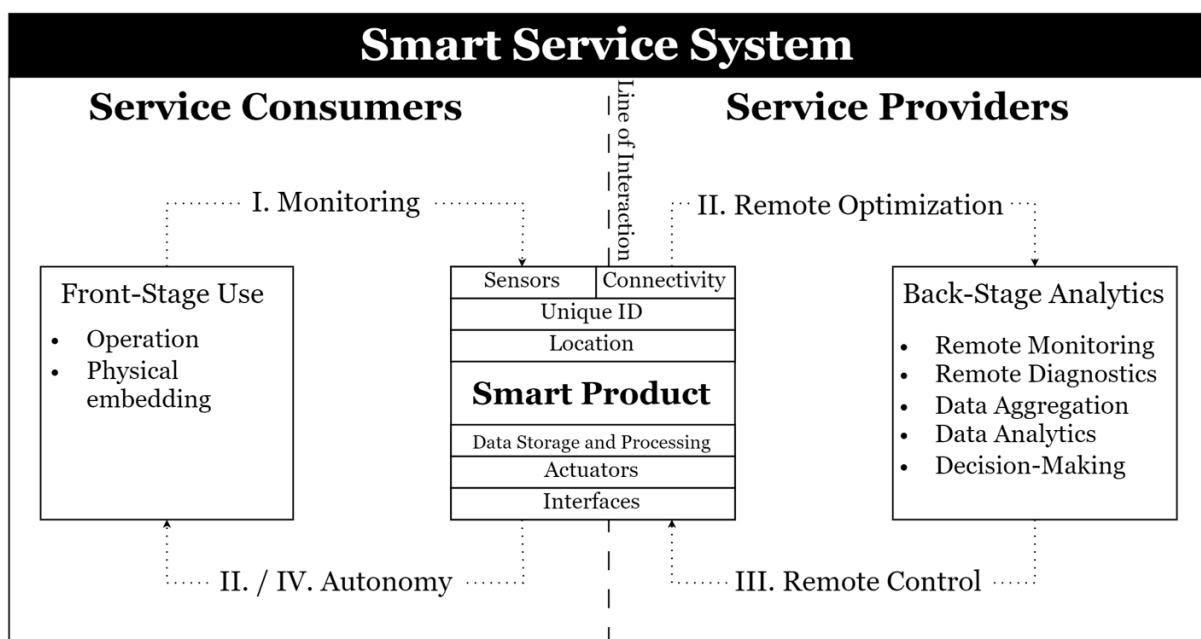


Fig. 1 Smart Service Systems Framework (Beverungen, Müller, et al., 2019)

about areas of the earth” (Dueker & Kjerne, 1989, pp. 7–8). GIS provide means to integrate location information as a resource in service systems through their unique properties: **acquisition**, **management**, **analysis**, and **presentation** (Ehlers & Schiewe, 2012) (Figure 2). Although this classification was introduced over a decade ago, its relevance persists in current research and practice. As highlighted by Breunig et al. (2020), these foundational properties continue to provide a meaningful structure for describing GIS functionality, even within today’s increasingly modularized service ecosystems. While these properties are fundamental components of any information system, their specific implementation within GIS enables unique spatial functionalities, which are essential for handling geospatial data. The ability of GIS to acquire precise location data, manage complex spatial databases, perform detailed spatial analyses, and present geospatial information in an accessible manner sets them apart from other information systems.

First, GIS allow the **acquisition** of location information, e.g., with technologies like GPS or laser-scanning (Hahulina et al., 2019). Second, the **management** of location information becomes feasible through GIS. Activities, like transformations or aggregations, help manage the location information, and external GIS services can be integrated through open data initiatives like INSPIRE (European Commission, 2007). Third, the **analysis** of the preprocessed location information can be performed as GIS offer a multitude of different tools, like buffer or overlay analyses (Srivasa & Khot, 2018). Finally, the **presentation** of location information integrated into service systems, like the locations of consumers or assets, becomes feasible through GIS, e.g., in the form of maps, being an essential means to communicate results from analyses.

Location information as operand resources in service systems has been regarded from an application-oriented perspective, primarily referring to LBS (Priefer, 2023; zur Heiden et al., 2023). However, a conceptual consideration of GIS’s roles in service systems is missing,

referring to their built-in functionalities for acquiring, managing, analyzing, and presenting location information. Though GIS enable the interaction between service customers and service providers in LBS (Bärsch et al., 2019) and enhance the co-creation of value in LCS (zur Heiden et al., 2023), until now, GIS have mostly been seen as boundary objects in LBS scenarios only (zur Heiden et al., 2023). Comprehensive knowledge about how GIS can contribute to superior value co-creation when integrating them into service systems is scarce in the IS knowledge base (Priefer, 2023). More specifically, there is a missing conceptual perspective on GIS’s role in value co-creation in service systems.

3. Research Method and Summary of Cases

We employ a conceptual research approach to develop our framework for understanding the role of GIS in location-specific service systems. This method integrates evidence from various sources to generate new insights, allowing for a comprehensive understanding of the problem, identification of knowledge gaps, and development of a refined conceptual model to guide future research and practice. Our framework is informed by six illustrative case studies selected for their innovative use of GIS in both B2B and B2C contexts, providing practical insights and validating our theoretical propositions. Conceptual research has been successfully applied in IS research and involves the assimilation and combination of evidence from different sources to generate new knowledge, gain a deeper understanding of a particular problem or topic, identify knowledge gaps or inconsistencies, and develop new or improved conceptual models to guide further research and practice (Hirschheim, 2008; Jaakkola, 2020). According to Mora et al. (2008), there are two types of conceptual research: conceptual behavioral research “accounts for the explorative,

descriptive (review) and scholastic (tutorial) research purposes on conceptual entities related with real things” (Mora et al., 2008, p. 5), and conceptual design research “accounts for the explorative and conceptual artifact design research purposes” (Mora et al., 2008, p. 6). Artifacts, in this context, can include constructs, frameworks, methods, or systems (Mora et al., 2008).

The six cases (Table 1) represent diverse applications of GIS across B2B and B2C contexts, covering both LBS and LCS. These cases offer real-world examples and practical insights that support our theoretical propositions, illustrating the unique contributions of GIS to value co-creation in service systems. Each case study highlights specific GIS functionalities and their role in enhancing value propositions. For instance, the condition monitoring case demonstrates how the capabilities of **acquisition** and **analysis** provide significant value by enabling detailed environmental assessments and predictive maintenance. We conceptualize GIS as boundary objects since they enhance value co-creation through their built-in functionalities, enabling the actors to integrate location information as operand resources in service systems. The smart service systems framework by Beverungen, Müller, et al. (2019) is a well-established framework that offers means to identify properties of boundary objects, like smart products, and clearly shows the local usefulness and shared identity of service providers and customers. We use this framework as our starting point but modify it for location-specific service systems for two reasons.

First, GIS are not (physical) smart products but a class of information systems. Smart products include sensors, connectivity, a unique ID, location, data storage and processing capabilities, actuators, and interfaces. Though smart products can feature location information, they do not provide the tools needed to comprehensively manage, analyze, and present this data. In contrast, the core properties of GIS are **acquisition, management, analysis, and presentation**, enabling a comprehensive interaction with location information. Further, smart products are physical objects, and until now, the smart service systems framework has only included physical objects as boundary objects (Beverungen, Müller, et al., 2019). However, boundary objects can simultaneously have a physical and a conceptual instantiation (Lim & Maglio, 2019). GIS are conceptual instantiations that handle location information without using physical properties.

Second, different types of services integrating location information as a resource, like LBS and LCS, differ in B2B and B2C contexts. The two sides of the market imply a significant conceptual difference since a B2B service uses different GIS functionalities than a B2C service and uses GIS differently for their specific value co-creation. Thus, we change the perspective of the framework to a location-specific context by exploring the role of GIS in B2B and B2C service systems. Value co-creation is not limited to integrating two actors but often includes a multi-sided perspective (Beverungen et al., 2021).

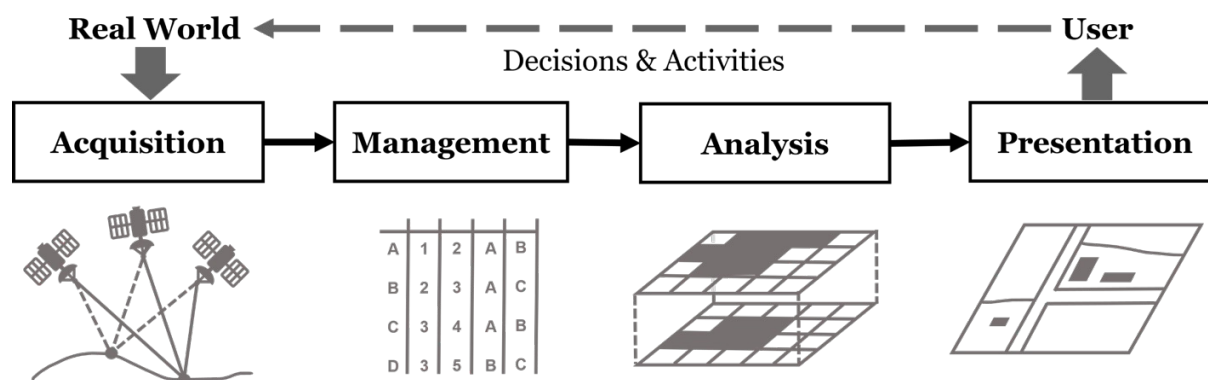


Fig. 2 Properties of GIS (Breunig et al., 2020; Ehlers & Schiewe, 2012)

However, we draw on the smart service systems framework by Beverungen, Müller, et al. (2019) as an inspiration for our conceptual artifact, rather than strictly applying theory adaptation as defined by Jaakkola (2020). While Jaakkola (2020) outlines theory adaptation as changing an existing theory to fit a new context, our approach involves adapting elements from the original conceptualization of smart service systems and tailoring them to the context of GIS. This means that we primarily reinterpret and extend key ideas related to boundary objects and smart systems, rather than relying on a fully developed theory. In doing so, we create a new artifact that integrates GIS as boundary objects within service systems, offering insights into both B2B and B2C contexts. By focusing on the core properties of GIS—acquisition, management, analysis, and presentation—our conceptual framework advances the understanding of GIS’s role in value co-creation without strictly adhering to an existing theoretical foundation.

By turning to conceptual design research (Mora et al., 2008), we aimed to design a conceptual framework that includes GIS as boundary objects on two sides of the market—B2B and B2C—through an iterative, non-empirical process of knowledge discovery and justification (Mora et al., 2008; Yadav, 2010). The discovery phase involved gathering information and ideas from six diverse cases covering both LBS and LCS. These cases were selected based on their relevance in illustrating GIS functionalities (**acquisition, management, analysis, and presentation**) and their role in value co-creation across different industries, time periods, and contexts. In the justification phase, the insights from the case analysis were synthesized and iteratively refined to develop the framework. The cases were analyzed systematically by identifying service providers, service customers, and the role of GIS in each service. Key criteria included service type (LBS or LCS), context (B2B or B2C), service providers, service customers, and core GIS functionalities. This iterative process allowed us to evaluate how GIS contributes to local usefulness and shared identity within service systems and

refine the framework accordingly. Unlike previous studies that focused primarily on the technical aspects of GIS, our analysis highlights how GIS functionalities create unique value propositions and can be strategically applied in different market environments.

To conceptualize our framework, we refer to six cases (Table 1). The selection of these cases followed a targeted approach, aimed at capturing diverse applications of GIS in both B2B and B2C contexts while ensuring relevance to the research questions. For the LBS cases, we reviewed established literature to identify key examples that illustrate the foundational role of GIS in enabling location-specific services. In contrast, the LCS cases were derived from recent, relevant studies, reflecting their emerging importance and the growing body of work in this area. The variation in the cases, including differences in their age, is intentional and viewed as a feature rather than a limitation, allowing for a broader understanding of how GIS has evolved across contexts and time. For instance, older cases like fleet management (Küpper, 2005) capture foundational applications of GIS in LBS, a research field that developed earlier and more extensively compared to LCS. More recent cases, such as EVCS placement (Priefer & Steiger, 2022), highlight novel applications within LCS. This variety enables comparisons across settings and supports the generalizability of our conceptual framework. Each case was selected for its relevance in demonstrating how GIS can enhance value co-creation in service systems and illustrate core GIS functionalities, including acquisition, management, analysis, and presentation. Together, these cases form a coherent set, enabling us to capture both established and innovative practices and identify patterns of GIS-enabled value co-creation.

3.1. B2B Cases

The first example of a B2B context is an LCS for condition monitoring on the energy distribution grid (zur Heiden et al., 2022). This case was selected due to its innovative application

Tab. 1 Example cases of LBS and LCS for B2B and B2C contexts

Example case			Characteristics	
B2B	LCS	Condition monitoring on the energy distribution grid (zur Heiden et al., 2022)	Provider:	Asset manufacturer
			Customer:	Energy grid operators, industrial customers
			Role of GIS:	Map asset locations, include environmental data
		Spatial decision support system for EVCS placement (Priefer & Steiger, 2022)	Provider:	City management
			Customer:	EVCS operator
			Role of GIS:	Map suitable areas for EVCS placement
	LBS	Fleet management (Küpper, 2005)	Provider:	LBS provider
			Customer:	Fleet management office
			Role of GIS:	Map current locations of vehicles
B2C	LCS	Real estate platform (Kucklick et al., 2021)	Provider:	Real estate platform provider
			Customer:	End consumer searching for a house
			Role of GIS:	Enhance predictive performance for house prices, map locations of houses
		Hotel booking website (zur Heiden et al., 2023)	Provider:	Hotel booking website provider
			Customer:	End consumer searching for a hotel
			Role of GIS:	Map locations of hotels
	LBS	Public transportation planner (Lehrer et al., 2011)	Provider:	Public transportation provider
			Customer:	End consumer searching for public transportation
			Role of GIS:	Map current locations of public transportation

of GIS to map static assets and contextualize their use with additional environmental data, thereby enhancing both front-stage and back-stage analytics. The service provider, a manufacturer of switch gears, supplies energy grid operators or industrial customers. Although a GIS is not mandatory for this service, its use can significantly enhance value-in-use by enabling detailed environmental influence **analysis** and early warning detection for potential failures. For instance, GIS allows for the integration of environmental data, such as weather conditions and pollution levels, to predict and prevent potential equipment failures. This proactive approach not only improves operational efficiency but also extends the lifespan of grid assets, illustrating a novel use of GIS for optimizing asset **management** and maintenance strategies.

The second LCS example for a B2B context is a spatial decision support system for Electric Vehicle Charging Stations (EVCS) placement (Priefer & Steiger, 2022). This case provides an

innovative application of GIS in urban planning and strategic decision-making. Within this service, city **management** takes the role of service providers, providing customers, like EVCS operators with information about suitable areas for EVCS. GIS can help to map these areas, optimize city planning, and enhance business value for both the city **management** and EVCS operators. Although GIS are not mandatory for this service, they can augment value-in-use by providing a spatial context that improves decision-making. Further, this case illustrates a novel application of GIS in optimizing urban infrastructure, highlighting how GIS can be used not just for real-time location tracking, but for strategic planning and decision-making.

The third example is fleet **management**—an LBS in a B2B context (Küpper, 2005). This case exemplifies the fundamental role of GIS in managing dynamic location data. The service provider delivers the IT infrastructure and acquisition technology needed by fleet **manage-**

ment offices. GIS is essential for acquiring and presenting current vehicle locations, predicting arrival times, and dynamically allocating new orders. Real-time data management enhances operational efficiency and decision-making capabilities. For example, service providers can perform back-stage analyses on how the system enhances or improves service, thus enhancing business value. The example highlights the ongoing importance of GIS in real-time fleet **management**, a common practice across the industry.

3.2. B2C Cases

The fourth example is an LCS, specifically a real estate appraisal service, in a B2C context (Kucklick et al., 2021). This case was chosen for its relevance in demonstrating how GIS can enhance predictive accuracy in real estate by integrating environmental data. It highlights the novel implication of improved accuracy and user decision-making through spatial data integration. Providers of real estate websites can improve the accuracy of house price predictions with the help of GIS to present more accurate values for their customers, which are end consumers searching for a house. While GIS are not mandatory for price predictions, their use significantly enhances business value by providing better estimates and considering environmental data, such as safety and urban green spaces within the neighborhood, which can enhance the livability for end consumers (Leby & Hashim, 2010; Zhang et al., 2012). This service can be classified as LCS due to the enhancement of service value through contextual information rather than it being essential to the service itself.

The fifth example of an LCS in a B2C context is a hotel booking service (zur Heiden et al., 2023). This case illustrates how GIS can enhance the user experience by providing location-based information that helps end consumers find suitable hotels. Hotel booking websites use GIS to display hotel locations on a map, enhancing value-in-use by considering proximity to points of interest or other

amenities. The service provider can also perform back-stage analyses, such as identifying frequently booked areas to improve service provision. Although the core functionality of booking a hotel can exist without GIS, the integration of location information significantly enhances the user experience and decision-making process, making it an LCS. The novel implication here is that GIS enhances the service by providing valuable contextual information that improves the customer's booking experience.

The sixth example is an LBS in a B2C context, specifically for public transportation planners (Lehrer et al., 2011). Despite being an older example, it remains relevant as it showcases the critical role of dynamic location data in public transportation. GIS enables real-time tracking of buses and prediction of arrival times, which is essential for the services' functionality. This example highlights the real-time efficiency and improved user satisfaction provided by GIS. Additionally, service providers can perform back-stage analyses to optimize routes and coverage. This case demonstrates the indispensable role of GIS in managing and enhancing public transportation services.

4. Conceptualization of Location-Specific Service Systems using GIS

In all six cases, GIS play a critical role as boundary objects in enabling or enhancing value co-creation between providers and customers within a service system. GIS take the role of boundary objects—artifacts that exist at the boundaries between different communities, allowing them to transfer information and knowledge across these boundaries (Becker et al., 2013; Carlile, 2002). However, these examples demonstrate that location-specific services differ between B2B and B2C contexts for two key reasons.

First, the local usefulness differs between these contexts. In all cases, service providers operate in the back-stage, delivering their services and

analyzing location information, such as patterns or geographical relations. While tasks of service providers vary across different sectors, their core function remains similar – they focus on the **presentation** of location information to their customers (e.g., in the form of maps) and the **acquisition** of their customers' locations for **analysis**. Providers can aggregate the location information from their customers, whether businesses or end consumers, and use this **analysis** of location information to gain insights into spatial patterns, the usage of services, and customer behavior. However, customers behave differently in B2B and B2C contexts. B2B customers expect increased value from using GIS as a tool that enables the **management** of location information for their benefit. For instance, energy grid operators can use GIS to manage the location information of their grid assets, obtaining an overview of the grid layout and facilitating grid planning. In contrast, B2C customers are end consumers who do not use GIS for activities but rather use devices like smartphones to view the location information presented by the service provider. For example, a person searching for a hotel online will use the maps provided by the hotel booking services rather than independently managing hotel location information in GIS. Second, the shared identity and local usefulness of the cases indicate that the properties of GIS differ in their value propositions for B2B and B2C contexts. Primarily, the GIS properties of **presentation** and **acquisition** enable the shared identity of service providers and customers by acquiring and presenting location information, such as through maps. Service providers also perform data **analysis** of aggregated location information for their local usefulness. In contrast, **management** of location information mainly applies to B2B customers, who manage the aggregated location information of their business objects to increase business value.

Building on these insights, we identified how the core properties of GIS—**acquisition**, **management**, **analysis**, and **presentation**—enable enhanced value propositions for the local usefulness and shared identity in B2B and B2C

contexts. These enhanced value propositions illustrate how GIS serve as a boundary object, facilitating superior value co-creation through their unique functionalities in service systems (Table 2). While each enhanced value proposition may involve multiple GIS properties, we focus on the most relevant aspects of each proposition.

4.1. Enhanced Value Co-Creation in B2B Contexts

The value propositions I and II of location-specific services are situated in a B2B context. Here, customers include companies, such as energy grid operators, EVCS operators, and fleet **management** offices, while service providers consist of organizations like asset manufacturers and city **management**.

Local Usefulness

The local usefulness of GIS as a boundary object in B2B contexts stems from the enhanced value propositions I and II. Firstly, service customers can manage the location information of multiple objects through GIS, enhancing the value proposition via the GIS property of **management** (I. Enhanced Value Proposition). The ability to manage the location information of business objects efficiently provides higher business value by ensuring that the information is stored and processed in a consistent, standardized format, allowing objects to be considered in relation to one another. For example, energy grid operators benefit from managing their assets with GIS, enabling them to integrate location information for future analyses and include external data sources in a standardized format. For condition monitoring on the energy distribution grid, the location information of grid assets can be combined with environmental data, to identify circumstances that may further stress the assets, such as heat, dust, or humidity. Thus, GIS enable customers to enhance their value-in-use by managing these data effectively from the outset. Secondly, service providers can analyze the location of

Tab. 2 Local usefulness and shared identity in location-specific service systems

	Enhanced value proposition	Local usefulness	Shared identity
B2B	I.	Management of multiple objects and their locations	Consolidated presentation of multiple objects and their locations (e.g., map)
	II.	Consolidated analysis of multiple objects and their locations	Acquisition of multiple objects and their locations (e.g., collecting data)
B2C	III.	(no use of GIS functionalities)	Simplified presentation (e.g., map)
	VI.	Consolidated analysis of multiple objects and their locations	Acquisition of isolated personal locations

multiple objects in a consolidated manner to gain insights into their services and improve them, thereby increasing business value. This enhances the value proposition through the GIS property of **analysis** (II. Enhanced Value Proposition). The ability to analyze the location of multiple objects can reveal previously unknown spatial relationships and dependencies. For example, asset manufacturers can analyze aggregated data provided by service customers to determine in which areas their assets perform reliably. They may then offer information to customers about the ideal placement of their assets according to environmental conditions, thereby enhancing asset longevity and reducing maintenance costs.

Shared Identity

The shared identity in B2B contexts also results from enhanced value propositions I and II. First, providers enhance the value proposition for customers by presenting location information with the help of GIS functionalities. Thus, the value proposition is enhanced through the GIS property **presentation** (I. Enhanced Value Proposition). For service customers, spatial relations and environmental circumstances become visible even before analyzing the location information. Thus, service customers gain knowledge about which areas might be worth taking a closer look at through spatial analyses. For example, in the context of condition monitoring on the energy distribution grid, energy grid operators gain knowledge about the spatial configura-

tion of their grid, e.g., which areas need to be expanded or which sites have sufficient coverage. Second, service customers enhance the value proposition for providers by acquiring their location information. In turn, providers receive valuable information from their customers, being able to analyze spatial relations of businesses' location information, improving their services and ultimately gaining higher business value. Thus, the value proposition is enhanced through the GIS property **acquisition** (II. Enhanced Value Proposition). When acquiring the location information of their objects, service customers give service providers the possibility to gain knowledge about how service customers place their objects or which services they might need, such as additional services for customized placement recommendations or automatic analyses for particular areas. For example, asset manufacturers can enhance their services by knowing how energy grid operators plan the spatial arrangement of their assets by using GIS for a consolidated presentation of multiple objects and their locations on a map. Thus, they might support service customers by developing further services, e.g., asset placement recommendations.

4.2. Enhanced Value Co-Creation in B2C Contexts

Value propositions III and IV of location-specific service systems refer to B2C contexts.

Here, customers are end consumers, like people searching for a house, a hotel, or public transportation.

Local Usefulness

The local usefulness of the GIS as a boundary object in B2C contexts results from the enhanced value proposition IV. In a B2C market, value proposition III offers no local usefulness for service customers because end users do not use the functionalities of GIS without interacting with service providers. End consumers mostly perform individual queries or searches on location information but do not acquire, manage, analyze, or present multiple objects and their location information. They rather expect service providers to offer them services based on this information. For example, in public transportation planning, end consumers search for a single bus connection at a time and do not aggregate the location information of buses to analyze or present these data.

These services focuses on increasing the local usefulness of service providers. They can analyze aggregated location data for multiple objects to recognize spatial relations and enhance their services to provide superior value-in-use. Thus, the value proposition is enhanced through **analysis** (IV. Enhanced Value Proposition). Having the opportunity to analyze the locations of multiple objects can—just like in B2B contexts—reveal spatial relations and dependencies. For example, real estate platform providers can analyze real estate data and combine it with location information to obtain a more accurate price prediction. Further, they may explore neighborhoods with higher demand than others to improve services, e.g., by optimizing the predictions or collecting more data in these areas. By offering higher accuracy, providers may attract new customers and increase user satisfaction.

Shared Identity

The shared identity in B2C contexts results from the enhanced value propositions III and IV. First, providers enhance the value propo-

sition for customers by presenting simplified location information with the help of GIS functionalities. Thus, the value proposition is enhanced through the GIS property **presentation** (III. Enhanced Value Proposition). For service customers, the **presentation** of the location information provides relevant information and enables customers to see spatial relations at a glance. For example, consumers might find hotels faster, with location information like the proximity to the city center or public transportation available on a map. Thus, consumers receive an enhanced service from the provider, resulting in higher value-in-use. On the other hand, customers enhance the value proposition for providers by acquiring their personal location information. Thus, the value proposition is enhanced through **acquisition** (IV. Enhanced Value Proposition). When providing information about locations that service customers search for, they offer service providers the opportunity to gain knowledge about how the services are used and in which areas end consumers search for objects. For example, consumers searching for public transportation provide location information about their start and destination. Providers can analyze these data and determine in which areas the offering of public transportation can be enhanced or identify areas where public transportation is not needed. Thus, providers can use and analyze consumers' location information to improve their services.

4.3. Conceptualizing the Role of GIS in Location-Specific Service Systems

As the enhanced value propositions evidence, GIS can enable interactions between service providers and service customers in two ways: when service customers use the location information provided by the service to enhance their value-in-use, and when service providers use the location information to gather information about their customers' behavior. Against this background and building on the definition of smart service systems (Beverungen, Müller,

et al., 2019), we define location-specific service and location-specific service systems as follows:

- I. Location-specific service is the application of specialized abilities enabled or enhanced by location information.
- II. In location-specific service systems, GIS can take the role of a boundary object that integrates resources and activities of the involved actors for mutual benefit.

Drawing on the knowledge gained from the different examples and the key premises of service science, the resulting framework is illustrated in Figure 3.

The original framework by Beverungen, Müller, et al. (2019) integrates the four concepts monitoring, remote optimization, remote control and autonomy focusing on smart products. However, they are not entirely aligned with the specific needs of location-specific service systems. These concepts were designed with a focus on using physical products in the front stage of a service system. Our framework shifts the focus to value propositions enhanced by GIS. Integrating these concepts would complicate the framework and reduce its readability. More importantly, unlike smart products, GIS are not physical objects but sophisticated information systems that manage spatial data. Our focus on enhanced value propositions allows us to show how the unique properties of GIS enable superior value co-creation in both B2B and B2C contexts. While these components are integral to any information system, their application within GIS is particularly crucial for managing spatial data, facilitating real-time decision-making, and providing detailed spatial analyses that enhance service delivery. For example, GIS can provide detailed spatial analyses that optimize urban planning or real-time location tracking that enhances service delivery. By focusing on these enhanced value propositions, our framework more effectively highlights the novel contributions of GIS in service systems, emphasizing their role as boundary objects that facilitate value co-creation through specialized spatial data capabilities. Building on the insights from the different cases, the framework consists of two

different sides – B2B and B2C. On both sides, service providers act in the back-stage of the service system, e.g., asset manufacturers or real estate platform providers.

The left side represents B2B service, where service customers are businesses that act in the front-stage, e.g., energy grid operators or fleet **management** offices. The interaction between the two sides is enabled by GIS, which serve as boundary objects. Through all four of its unique properties, **analysis, management, acquisition, and presentation**, GIS provide local usefulness for each of the actors and a shared identity on this side of the framework, enhancing non-location-specific value propositions with geospatial data. Thus, this side includes the enhanced value propositions I and II (Table 2). The right side of the framework represents B2C service. In this case, service customers are end consumers who might be searching for a hotel or public transportation in the front-stage. GIS also enables the interaction between both sides. However, on this side, only three of the properties of GIS are relevant for the local usefulness and shared identity of the actors: **analysis, acquisition, and presentation**. Thus, the B2C side includes the enhanced value propositions III and IV (Table 2).

The framework also enables the mapping of more complex location-specific service systems, in which service providers offer services for both sides of the market. An example is providing location information for neighborhood food retail in open geodata portals, like opendataphilly.org (OpenDataPhilly, 2011). Here, location information for neighborhood food retail, like supermarkets, is provided by the city administration and can either be viewed in an online GIS application or downloaded as geodata for integrating it into other GIS applications. End consumers in B2C contexts are, for instance, people searching for the nearest supermarket or information about how many supermarkets are available in a certain neighborhood. These end consumers can open a simplified visualization of these data on their devices (**presentation**), like a smartphone, by choosing the visualization in a web-based GIS. Service providers, such as local governments,

can use the data acquired from service customers (**acquisition**) (e.g., to find out in which areas of the city they are searching for food retail) and analyze this location information to gain knowledge about how to improve their service (**analysis**) (e.g., by updating location information of the stores more frequently in specific areas to provide up-to-date data). On the other side of this location-specific service system, service customers in B2B contexts are businesses like supermarket chains. These customers can manage the location information of their supermarkets (**management**) and acquire these data to provide them to service providers (**acquisition**). In turn, providers can visualize all stores and provide this location information as open geodata in files or direct visualizations (**presentation**) for service customers. Service providers can also analyze where new stores are built frequently or in which areas stores are closed to gain knowledge about the current urban structure and the balance between different neighborhoods (**analysis**) to simplify city planning, especially when integrating more location information, like income data. In addition, through GIS and the role of service providers, data might also flow from one side to the other. For example, B2B customers provide their location information to end consumers to enable them to gain knowledge about the stores. In exchange, end consumers in B2C contexts provide information about where they are searching for specific information, which apply to B2B customers, for

instance, to find out where people live or shop to build new supermarkets in these areas.

This example and the insights from the literature evidence that GIS are useful boundary objects enabling enhanced value propositions for both service providers and service consumers in B2B and B2C contexts by enhancing non-location-specific value propositions with geospatial data. Location-specific service systems can have a B2C, B2B, or two-sided context, and thus, mirroring the framework is relevant to map all these types of location-specific service systems.

5. Implications for Research and Management

Our resulting framework shows that non-location-specific value propositions within service systems can be enhanced by integrating GIS and their specific properties of **acquisition**, **management**, **analysis**, and **presentation** (Ehlers & Schiewe, 2012) as a boundary object that is located at the intersection of service providers and service customers in both contexts—B2B and B2C. This is particularly important as today's service ecosystems are increasingly complex, requiring a shift from traditional, encounter-based models towards more holistic, ecosystem-oriented perspectives (Akaka & Vargo, 2015). Our framework highlights how GIS can be actively used to design

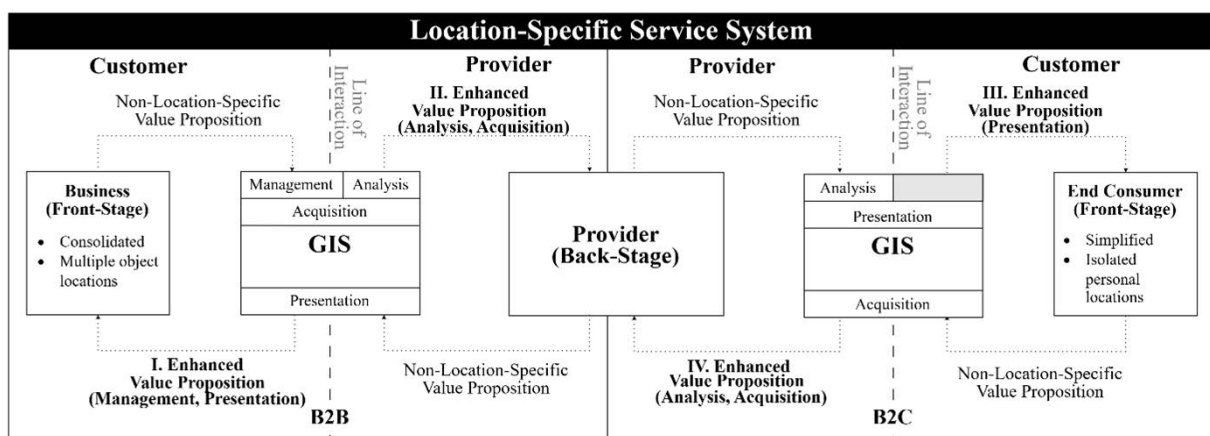


Fig. 3 Location-Specific Service System Framework (based on Beverungen, Müller, et al. (2019))

and steer location-specific service systems by enabling and structuring value co-creation through spatial data. It offers a practical tool for identifying which GIS properties are most relevant in different service contexts and how they contribute to local usefulness and shared identity in service systems. For researchers and practitioners, this means that the framework can be used to analyze, compare, or even design service systems based on their degree of GIS integration and their B2B or B2C orientation. In B2B contexts, the framework supports the configuration of strategic, data-intensive GIS use (e.g., for planning, optimization, infrastructure). In B2C contexts, it helps to structure how GIS can enhance services interacting with end consumers. Subsequent research could build on our framework by empirically testing these propositions across different industries and service contexts to validate and refine the theoretical model. For example, future studies could investigate how value creation mechanisms differ across B2B and B2C services when specific GIS functionalities are activated.

The scientific contribution of our research is threefold. First, we address a critical research gap regarding a conceptual perspective on the role of GIS for the co-creation of value in service systems (Priefer, 2023). Service systems involve multiple actors, like businesses or end consumers, with different roles and knowledge, who interact with each other to create mutual value (Maglio et al., 2009). The value of a service is determined by the value-in-use for service customers (Vargo & Lusch, 2008). Until now, IS research has lacked a conceptual service science perspective on the role of GIS in facilitating superior value co-creation (Priefer, 2023). With our framework, we fill this gap by demonstrating how services integrating location information as a resource can be improved using GIS as a boundary object. Although other systems may integrate location information in service systems, GIS offers a unique set of location-specific functionalities that are highly effective as a boundary object for services using location information. Boundary objects enable value co-creation in service systems and are flexible enough to be locally useful for

both actors of the service system and robust enough to provide a shared identity amongst them (Beverungen, Breidbach, et al., 2019; Star, 2010; Star & Griesemer, 1989). This is particularly relevant in B2B and B2C contexts, where the strategic agility of organizations can be significantly enhanced by leveraging technology such as GIS (Atanassova & Bednar, 2023). GIS can enable service providers and both customer segments—businesses, and end consumers—to co-create superior value when interacting with GIS. For service providers, GIS mainly serve to contextualize technical objects of customers. Customization enhances this contextualization by aligning service offerings to meet specific customer needs to enhance effective collaboration and value co-creation (Kleinaltenkamp et al., 2017). For service customers, in contrast, GIS customize generic value propositions and make the services more valuable. This conceptual perspective is crucial for understanding and advancing how GIS can be utilized effectively, which is a significant step towards more sophisticated and responsive service design.

Second, our framework white-boxes the inner workings of GIS in the context of service science. Since we analyzed which specific properties of GIS enhance the value propositions for local usefulness and shared identity, we did not consider GIS as a black-box but took a closer look at its core properties **acquisition**, **management**, **analysis**, and **presentation** (Ehlers & Schiewe, 2012) and their specific role for value co-creation. While GIS is often treated as a black-box in IS research (Priefer, 2023), we are among the first to deepen the knowledge about GIS' inner workings for service systems. Our four identified enhanced value propositions show that the properties of GIS can create and enhance mutual value for service providers and service customers in service systems when GIS are integrated as boundary objects. White-boxing GIS revealed that they enhance the local usefulness for service providers and service customers in B2B contexts and for service providers in B2C contexts. This white-box view demystifies GIS functionalities, offering action-

able insights into how each GIS property can be leveraged for strategic value creation.

Third, our framework integrates a B2B and B2C perspective by mirroring the initial smart service systems framework, connecting the two market sides through service providers, which have the same role in both cases. Our cases indicate that the roles and goals of customers differ in B2B and B2C service systems. B2B customers have business relations with service providers, like energy grid operators (zur Heiden et al., 2022) and tend to aim for higher business value. Customization in B2B services through GIS allows service providers to enhance value propositions to meet varying customer needs, increasing perceived value without necessarily increasing costs (Kleinaltenkamp et al., 2017). B2C customers are consumers using service, like users looking for a house on a website (Kucklick et al., 2021), and their goal is capturing superior value-in-use. Service science research has recognized that integrating both B2B and B2C contexts into service systems studies can be beneficial and emphasizes a broad perspective (Anke et al., 2020). Further, technology is a driving factor for value co-creation in service systems, which often includes a multi-sided perspective (Beverungen et al., 2021; Breidbach & Maglio, 2016). In service science, the context of B2B and B2C has been found to be relevant for recombinant digital innovation in service systems (Waltermann & Hess, 2022), smart service systems in manufacturing (Heuchert et al., 2020; Neff et al., 2012), customer involvement in data-driven service (Azkan et al., 2021), and Web-based self-service (Cooper et al., 2005). For all these areas of application, the co-creation of value on both sides of the market is conceptually different. For location-specific service systems, B2B service uses different properties of GIS as a boundary object for their specific value co-creation than B2C service (Table 2). Further, integrating a two-sided perspective related to a two-sided market enables mapping more complex service systems. For example, there are service providers that provide service for both market types, such that house prices might be calculated and provided for end consumers

and for real estate agencies. Our framework allows mapping both sides of the market. Furthermore, the exchange of information among the market sides can be modeled based on existing systems or integrated into the design of new service systems building on location information and GIS. This dual-market perspective is crucial as it recognizes the distinct needs and value creation mechanisms in B2B and B2C contexts, providing a comprehensive framework that can be applied to various service systems. This integration enhances the applicability and relevance of our framework, making it a significant contribution to the field of service science.

In this regard, our framework can also support service systems engineering, which emphasizes the structured and iterative design of socio-technical service systems (Beverungen et al., 2018; Deutsches Institut für Normung e.V [DIN], 2019). It provides a conceptual basis for identifying and operationalizing the spatial dimension of service value co-creation. By offering a structured lens on the contribution of GIS, the framework supports service designers in integrating geospatial capabilities purposefully, whether as a boundary object for actor interaction, a source of contextual information, or a tool for real-time coordination.

Besides implications for research, our paper also provides managerial contributions. Our findings provide important guidance for managers on how to integrate GIS as boundary objects to enhance value co-creation in both B2B and B2C service systems. In B2B contexts, GIS can help firms optimize asset placement, resource allocation, and supply chain collaboration by sharing geospatial data with partners, such as suppliers, logistics providers, or infrastructure operators. For example, energy grid operators can use GIS to collaboratively plan grid maintenance, ensuring operational efficiency and minimizing disruptions. In contrast, in B2C environments, GIS can drive customer-centric service innovations by enabling real-time, personalized interactions, such as location-based marketing, transportation updates, or personalized travel recommendations.

We call on managers to recognize that GIS-enabled services thrive when embedded within scalable, platform-based business models. For instance, real estate platforms can provide both B2C services (e.g., helping individuals find homes) and B2B services (e.g., enabling real estate agencies to optimize property listings by targeting relevant areas). Platform ecosystems foster dynamic customization and cost-effective scaling of services, making them ideal for firms integrating GIS to support diverse customer needs (Matzner et al., 2021). To achieve this, managers should promote flexible service architectures, foster collaboration among stakeholders, and design adaptive service ecosystems where GIS function as the core enabler of real-time data exchange, strategic decision-making, and enhanced customer engagement. Building on these implications, our framework is not only intended as a conceptual structure but also as a practical tool. It supports both the analysis of existing GIS-enabled service systems and the design of new services that integrate GIS functionalities strategically. By mapping how GIS contribute to local usefulness and shared identity across B2B and B2C contexts, the framework helps to identify application-specific configurations. This enables a more systematic approach to design location-specific services in line with the requirements of different market settings.

6. Conclusion

Our framework provides a novel conceptualization of GIS as boundary objects in service systems, addressing both B2B and B2C contexts. By demonstrating how GIS functionalities (**acquisition, management, analysis, and presentation**) enhance value co-creation, we offer new insights into their strategic and operational benefits. This conceptual perspective fills a gap in existing literature, providing a deeper understanding of how GIS can propel modern service systems. Until now, this conceptual perspective was missing in the extant

literature (Priefer, 2023), even if it has recognized the positive effect of GIS on different value propositions, such as in decision support (Dong et al., 2009). Additionally, we contribute to research on service science by illustrating how B2B and B2C contexts differ in using location information. Our dual-market perspective broadens the application scope of GIS and sets a new direction for future research and practical implementations in service systems. This integration enhances the applicability and relevance of our framework, making it a significant contribution to the field of service science. Our framework can be applied both as an analytical lens for understanding existing service systems and as a design-oriented tool to support the development of new GIS-enabled services with regard to the specific requirements of B2B or B2C contexts. By elucidating the inner workings of GIS in the context of service science, our study also contributes to bridging the research gap between GIS and service science. The integration of empirical insights from case studies further validates our framework, making it a valuable tool for future research and practical applications. This white-box view is essential as it gives deeper understandings of GIS functionalities and provides actionable insights into how each GIS property can be leveraged for strategic value creation, making it a critical tool for practitioners and researchers aiming to optimize service delivery. A limitation of this study is that the number of cases used in the analysis is limited, and the cases were not identified based on theoretical or statistical sampling, which means there is no statistical evidence for our results yet. While conceptual research relies on theoretical constructs and case analysis rather than empirical data, it is invaluable for developing new theoretical frameworks, such as our location-specific service framework. This approach allows for in-depth exploration and synthesis of existing knowledge but inherently limits the extent to which the findings can be generalized. To address this limitation, we conducted a thorough review of relevant literature and examined six exemplary LCS and LBS cases from both B2B and B2C contexts. These cases were

carefully chosen to illustrate the practical applicability of our framework in diverse settings, including B2B and B2C (Anke et al., 2020). Future research should aim to validate and extend these findings through empirical studies and a broader range of cases to enhance the generalizability and applicability of the framework. Though conceptual research relies on the interpretation and synthesis of existing literature, subjectivity can be a limitation. We acknowledge that other researchers may have different interpretations of the same literature, leading to different results. We attempted to address this limitation in several ways. First, we reviewed and synthesized existing literature from different fields, including service science, GIS, and smart service systems, to develop a comprehensive conceptual framework. Second, we employed a rigorous methodology to develop the framework by integrating six example cases to examine the application of GIS in different B2B and B2C service systems. We then used the findings from these case studies to refine and validate the framework.

We propose that future research needs to focus on the design of location-specific services with GIS in both B2B and B2C contexts. In B2B contexts, GIS offers means to enhance strategic planning and resource optimization, while in B2C contexts, it has the potential to improve user satisfaction and personalized service delivery. Researchers could investigate how the properties of GIS (acquisition, management, analysis, and presentation) contribute to decision-making, operational efficiency, and customer satisfaction, e.g., through empirical studies that measure the impact of GIS integration on decision-making outcomes by comparing service systems with and without GIS. From a practical perspective, our framework offers applicable insights for designing and implementing GIS in service delivery. Service providers can use the framework to identify critical GIS functionalities for their needs, such as real-time data integration and contextual analysis to enhance decision-making processes.

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