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Design Principles for Customer-Engaging Digital Service Systems:
An Action Research Study

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ABSTRACT

Digital services represent a business approach employed by organizations to operate in the digital environment. However, systematic development guidelines for developing quality digital service systems are lacking in the literature. The authors identified four general challenges for developing and implementing customer-engaging digital service systems (CEDSS). By employing the method of canonical action research in a digital service system project, they derived 10 design principles for developing high-quality CEDSS. They empirically evaluated the design principles in the development project and through follow-up focus group sessions. The design principles provide applicable and actionable guidelines for the development of CEDSS.

KEYWORDS

Design Principles, Digital service, Action Research, Customer-Engaging Digital Service Systems

1. INTRODUCTION

Digitization through modern information and communication technologies and rapidly advancing new technologies, such as generative artificial intelligence (e.g., ChatGPT, ChatGPT Atlas, DeepSeek, Gemini, Microsoft Copilot, Sora/Sora 2), agentic artificial intelligence, and metaverse, offer enormous opportunities and challenges to organizations worldwide (Baskerville *et al.*, 2020; Borhan & Bajaj, 2024; Gierlich-Joas *et al.*, 2024; Ma *et al.*, 2024; Peng & Bhaskar, 2023; Ponomarenko *et al.*, 2024; Qian *et al.*, 2024; Wang *et al.*, 2025; Zimmer *et al.*, 2023). Since the inception of the Internet, digital commerce has been pervasively adopted as a viable channel for buying and selling products and services, such as electronic gadgets, music, flight tickets, and insurance policies, online. While the first wave of digital commerce focused largely on reducing transaction costs through automation and increased efficiency, such a view is giving way to an emerging service-focused paradigm, namely digital service (Di Guardo & Cabiddu, 2015; Pemer, 2021). For instance, commercial airlines have developed websites and mobile apps that enable passengers to check in and print boarding passes from home. Similarly, large banks have adopted online banking transactions through their websites

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and mobile apps (Liu *et al.*, 2025). Government agencies have also embraced Web-Based Self-Service (WBSS), such as online tax filing and vehicle registration renewal (Rana *et al.,* 2015). In this paper, they are referred to as Customer-Engaging Digital Service Systems (CEDSS).

Advanced information technologies offer different interfaces, such as a Web browser running on a desktop computer, a mobile browser running on a tablet, or a native mobile app running on a smartphone, for digital service provisions (Nardelli, 2015; Katerattanakul & Siau, 2003). These technological interfaces replace traditional face-to-face service provisioning, as well as service delivered through telephones and kiosks (Holgersson *et al.*, 2018; Pemer, 2021). For organizations, the benefits of providing digital services to their constituents or customers include reducing operating expenses, increasing organizational effectiveness, allowing for personalization, improving customer satisfaction, and competitive advantages (Ayvaci *et al.*, 2021; Holgersson *et al.*, 2018; Rust & Kannan, 2002; Riedl *et al.*, 2011; Siau, 2003; Taherdoost, 2018; Zimmer *et al.*, 2023).

Recent advancements in artificial intelligence (AI) have become a driving force in business innovation in digital services, reshaping various industries (Siau, 2025). Such AI-enabled digital services have transformed multiple facets of business operations in marketing strategies, financial management, and customer acquisition, demonstrating their versatility and value across numerous business functions (Gonzales, 2023; Mhlanga, 2020; Yang *et al.*, 2022; Ziakis & Vlachopoulou, 2023). AI-enabled digital services have been recognized to have considerable potential in creating value for service organizations and customers alike (Manser Payne *et al.*, 2021; Mariani *et al.*, 2023).

Notwithstanding the various advantages of digital services, developing and implementing CEDSS are challenging tasks (Ponomarenko *et al.*, 2024; Riedl *et al.*, 2011). Some characteristics of CEDSS differ from those of other systems, such as decision support systems. First, CEDSS is used predominantly for self-service (Rowley, 2006), which may warrant more user involvement and consideration of cultural factors in the development and deployment stages (Diaz-Arancibia *et al.*, 2024; Holgersson *et al.*, 2018; Nardi *et al.*, 2020; Mustak *et al.*, 2013). Second, CEDSS provides an information service (Rowley, 2006; Nardelli, 2015), meaning the perceived system quality and success are largely dependent on information quality (Rahi *et al.*, 2021; Xu *et al.,* 2013). Third, the security of CEDSS will significantly affect users' perception of service quality and intention to use CEDSS (e.g., Li & Shang, 2020; Shankar and Datta, 2020; Taherdoost, 2018; Zhang *et al.*, 2021). Trade magazines and anecdotal observations have indicated that most CEDSS were developed with ad hoc procedures and methods. This is especially the case when digital services are delivered through emerging technologies, such as wearable devices and new AI-enabled equipment. Many such projects were plagued with unforeseen issues, such as scope creep, insufficient training for developers and users, and a lack of control (Riedl *et al.*, 2011; Herzfeldt *et al.*, 2017). While some existing IS literature (e.g., Featherman *et al.*, 2006; Xu *et al.*, 2013) identifies certain system qualities desired by users, a comprehensive or applicable set of guidelines for actual developmental efforts is missing. This study attempts to fill the void in the IS literature by prescribing a set of design principles for developing and implementing CEDSS. The design principles are derived through canonical action research, which was embedded in an actual project of designing, developing, and deploying a digital service system in an educational institution.

Although action research is rigorous and highly relevant in IS research (e.g., Avison *et al.*, 2018; Davison *et al.*, 2012), Zwass (2017) points out that not enough action research is done in IS research. The two special issues, one on MIS Quarterly (2004) and the other on Journal of Management Information Systems (2017), represent a call for more action research in the IS field. In this paper, we report an action research on a digital service system development project. We follow the action research methodology to describe the (1) issues faced by the development team for developing the digital service system in the real-world setting, (2) action planning guided by the research team, (3) solutions implemented through interactions between the researchers and the project organization, and (4) reflections in an iterative manner. This study adds to the action research study in the information systems (IS) literature. In addition, it provides empirical data to the IS literature on the development of