Leveraging Digitalization of Services for Performance: Evidence from the Credit Union Industry

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Completed Research Paper

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Abstract

We investigate contingent effects of digitalized B2B transactions (DBT), digitalized customer access (DCA), and digitalized core services (DCS), on performance of service firms. We theorize positive moderation effects of DBT and DCA on the relationship between DCS and performance. We also argue that advertising investment complements the moderating role of DCA on the relationship between DCS and firm performance. Further, we posit that participation in an inter-organizational network enhances the moderating role of DBT on the relationship between DCS and performance. Our empirical analysis of archival data from annual reports and publicly available information of 7,000 credit unions across the United States over a nine-year period largely supports our theoretical model. An important, albeit counter-intuitive finding, is that DCA has a negative moderating effect on the DCS-performance relationship. Overall, we uncover contingencies in the link between digitalization of services and firm performance, and demonstrate how investment strategies influence these relationships.

Keywords: Firm performance, digitalized services, IT enabled services, financial service firms
Introduction

Firms are always on the lookout for better ways to leverage IT to digitalize their services. The integration of digital and physical experiences is creating new ways for businesses to interact with customers by using digital information to augment individual experiences with products and services. The evolution of IT-enabled services is reducing entry barriers and opening new revenue streams to a range of companies. For example, online services facilitate rentals in various industry sectors from designer clothing to trucks. Having IT capabilities in place that can track service usage makes these digital models possible. Thus, embracing digital technologies to enhance services is of great importance to businesses, especially considering the increasing number of opportunities for digitizing the provision of services (Bitner et al. 2000). For example, firms can use IT to provide customers with a variety of basic services, for example, an airline can use IT to book tickets to fly from one place to another. At the same time, firms can partner with other business-to-business (B2B) firms using technology to digitize their service offerings, for instance, the airline partnering with an internet service provider to provide in-flight Wi-Fi services. The myriad strategic decisions involved in the digitalization of services present managers with challenges of how to leverage IT enablement of services and how to complement digitalized services with auxiliary investments.

Academic research suggests that service firms need to embrace IT to improve the efficiency and effectiveness of their processes (Lusch et al. 2010; Menor and Roth 2008; Rai and Sambamurthy 2006). IT can enable process-oriented activities for service firms and can provide an avenue to greater customer value (Allen and Boynton 1991; Sambamurthy and Zmud 2000). IT capabilities can improve the quality of services and customer outcomes (Mithas et al. 2005; Ray et al. 2005). IT-enabled service strategies stem not only from a firm’s IT service quality but also from how customer-related strategies and perceptions are incorporated with the firm’s internal strategies (Barrutia and Gilsanz 2012). Research has argued that IT strategies provide service development opportunities through exploitation and exploration avenues, thereby enhancing the outcomes from the firm’s business activities (Andrade Rojas et al. 2015; Kathuria and Konsynski 2013). Recent literature suggests that IT helps augment service-rendering activities with differential value creation contingent on different service contexts and environments (Khuntia et al. 2013; Setia et al. 2013). Notwithstanding the important contributions from this literature, a number of questions remain related to the digital enablement of services. First, it is not clear to what extent digitalized provision of services will benefit firms. This is because digitalization of services may result in reluctance of customers in using services due to reasons such as preference for personal contact or risk (Walker and Johnson 2006). Second, service digitalization consists of digitalization of not only core services, but also digitalization of complementary services related to B2B partners and customer access. How these three interact is not known. Third, given that the effect of service digitalization on firm performance is not straightforward, how firms can make investments to more effectively leverage digitalized services is not understood. In sum, a more complete understanding of the nuances associated with the influence of digitalized services on firm performance remains a gap in existing literature. Our study addresses this gap.

A framework that guides our key theoretical arguments for this study is as follows. First, we argue that the value of digitizing a firm’s services depends on the firm’s transaction digitalization efforts with its B2B partners and on its customer access digitalization efforts. Second, we argue that through a set of strategic investments, a firm can leverage its transaction digitalization and customer access digitalization efforts to create value from digitalized services that is greater than what the firm would otherwise generate from its services. In other words, the proposed theoretical complementarities can be further influenced to create even greater value for the firm, thus resulting in a more intensive effect of the digitalization on service value creation. We use this theoretical framework to address the following research questions: (1) How do digitalized services influence firm performance? (2) What investment strategies can help a firm leverage its digitalized services to achieve superior performance?

Thus, we examine the digitalization of services and how this digitalization is complemented by digitalized B2B transactions (DBT) and digitalized customer access (DCA). We first posit a positive relationship between digitalized services and performance. Then, we argue that DBT and DCA complement the role of digitalized services in generating value for the firm. We further posit that specific investment strategies—Advertising, and Participation in an Interorganizational Network (PIN)— can strengthen these moderation effects.
To examine our research questions, we collected archival data from different sources for over 7000 credit unions in the United States. The credit union industry is suitable for our study for at least four reasons. First, credit unions have been recognized as an exemplar of service-oriented firms (Allred and Addams 2000). Second, the credit union industry and the financial industry more broadly are large investors in IT, and they are industries in which IT has had a measurable impact on performance (Francalanci and Galal 1998; Franke 1987; Krishnan et al. 1999). Third, there is a significant need for and variation in the infusion of IT in processes in the credit union industry (DeYoung et al. 2007; Furst et al. 2000). Finally, the use of credit unions enables us to use two different measures of performance and triangulate our results. First, we use net income as a performance measure because a key goal of credit unions is to accrue higher revenue to sustain operations, service levels, and growth (Goddard et al. 2008; Jackson 2011). Second, in an exploratory analysis, we use loans as a measure of performance because loans reflect intermediate operational performance.

Our empirical analysis provides a set of key findings. We find a positive relationship between digitalized services and performance. In addition, we find that DBT positively moderates the link between digitalized services and performance. However, counter-intuitively and contrary to our hypothesis, we find a negative moderating effect of DCA on the relationship between digitalized services and performance; we offer theoretical explanations for this counter-intuitive finding in a subsequent discussion in this paper. Furthermore, we find that advertising investment positively influences the moderating effect of DCA and that PIN strengthens the moderating effect of DBT.

Our results offer two primary contributions to the literature. First, we demonstrate how the digitalization of services affects firm performance, in combination with DBT and DCA. Importantly, our results show that increasing digital customer access may not always be the best approach for service firms. In addition, the results suggest that specific investment strategies can influence the relationships between digitalization of services and performance. For managers, our findings provide a better understanding of and guidance for how firms can make better use of IT in the digitalization of services.

Theoretical Background and Hypotheses Development

We theorize how DBT, DCA, and business investments complement digitalized core services (DCS) to create value for service firms. We draw on the theoretical perspective of complementarities in information systems research (Bush et al. 2010; Melville et al. 2004; Khuntia et al. 2014) and the stream of research that explores the complementarities between the use of IT in services and investment strategies to improve firm performance (Devaraj and Kohli 2003).

Digitalization of Services

Existing research suggests that a firm’s services consist of several attributes and processes in combination (e.g., basic, peripheral, and supporting service provisions) that cumulatively create value for the firm (Anderson et al. 2008; Butcher et al. 2003). Accordingly, we define three types of digitalized services.

We define digitalized core services (DCS) as the use of IT to enhance core service offerings of the firm. We note that our focus in this study is on the service provision specifically and not the entire service process. For example, in our empirical context of credit unions, core services are creation of deposit accounts and provision of loans to its members (i.e., elements of common banking services; see (Bickle et al. 2004). Thus, DCS for credit unions refers to digitalization of functionalities in new membership or new loan account-related activities, such as new membership applications, account balance enquiry, viewing account history, and providing new loans to members.

We define digitalized B2B transactions (DBT) as the digitalization of transaction activities with businesses beyond the firm. For example, in our empirical context of credit unions, DBT includes digitalized transfer services with merchandise firms, exchanging share draft orders, paying bills to other firms, and generating or transferring electronic cash. Often, the B2B transactions are facilitated by plug-ins and interfaces that enable the smooth performance of the systems. Third-party vendors may provide solutions and/or applications to integrate several transactional services across firms. For instance, Western Union manages international money transfer services by providing a plug-in to credit unions’ internal IT systems.
We define digitalized customer access, or DCA, as the digitalization efforts that a firm implements to broaden the extent of access for customers to avail the firm’s service offerings. For example, in our empirical context of credit unions, avenues (or channels) through which customers are able to obtain a wider range of digitalized service access include home banking (accessed through a website and provides access to loans and account-related service information from a remote location), IT-enabled customer access and support through audio or phone-based interactive voice services, access through automatic teller machines (ATMs), and access through kiosk-based services at different locations.

In summary, DCS represents a firm’s capabilities to provide digitalized core services to its customers, DBT represents a firm’s capabilities to conduct digitalized business transactions with other firms, and DCA represents the digitalized access available to customers of the firm.

**Research Model and Hypotheses Development**

Figure 1 presents our research model. Our key theoretical argument is that while DCS influences performance, service firms can benefit more from DCS when they digitize B2B transactions (DBT) and digitize customer access avenues (DCA). Furthermore, we argue that these moderating effects are contingent on the investment strategies of advertising and participation in an inter-organizational network. Next, we explicate the arguments underlying the research model to build our hypotheses.

**Direct Effect of Digitalized Core Services (DCS)**

Digitalized services provide capabilities and functionalities to improve workflow and processes, resulting in improved performance through better customer participation and value creation. As an example, Dacotah Federal Credit Union attributed much of its performance improvement to offering online banking services such as direct deposits (Kunzelmann 2002). The implementation of DCS improves convenience and automates the firm’s processes of providing the services. The ability of DCS to overcome temporal and geographical limitations helps customers be more active, which in turn helps the firm garner more income. For example, when a credit union member is considering buying a car and is at the dealer’s location, the member can check loan information online and compare it with other banks to make a better-informed and real-time decision whether to finance a car. In line with these arguments, we posit our baseline hypothesis:

\[ H1: \text{The greater the extent of a service firm's Digitalized Core Services (DCS), the greater is its performance.} \]

**The Moderating Effect of Digitalized B2B Transactions (DBT)**

DBT facilitates back-end processes and enables the exchange of information across firms. For example, consider the previous example of the credit union member in the car dealership exploring financing options; the dealer should be able to provide the car information to the credit union, and the credit union should be able to check and verify the credibility of the dealer. DBT enables the exchange of car- and dealer-related
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information between the dealer and the credit union. In this situation, DBT can also facilitate background checks on the car models and the provision of dealership information to several agencies electronically. While the customer is negotiating with the dealer, the digitalized background operations and subsequent information processing can enable quick information exchange, which can then lead to real-time approval and purchase decision. This digitalized transaction-processing system increases the likelihood of the dealer accepting the credit union’s loans rather than any other bank’s loans.

There are a number of similar scenarios in which DBT could enable greater transaction efficiency (Koste and Malhotra 1999; Suarez et al. 1995), which in turn can help firms become more effective in provision of services and thus accrue greater financial leverage. Furthermore, DBT helps in service exchanges with other firms through at least two mechanisms. First, transactions with other firms are conducted through third-party intermediaries, mostly through the payment of a service fee. For example, credit card companies charge a small fee to merchants for every transaction. The provider of the “paid” service needs to ensure that the transaction occurs efficiently. When firms implement DBT, third parties cater to those avenues efficiently, further enhancing revenue for the firm. Second, DBT facilitates more efficient transactions with other firms, often without any third-party intermediaries. For example, a large bank can transact directly with a number of smaller banks by making them part of its IT reporting system. Often, direct transactions are incorporated into legal agreements or larger collaboration arrangements. Overall, DBT enhances efficiency by reducing the time and cost required to conduct such transactions.

We propose that DBT has a positive influence on the relationship between DCS and performance. Three reasons underlie this proposition. First, the effect of DCS on performance can be accentuated because customers can avail themselves of the services of the firm’s partner firms more easily. Firms that digitize their B2B transactions with other firms would benefit from digitalized core services more than firms that follow non-digitalized procedures in their B2B transactions with other firms. For example, electronic bill payment through the credit union would enhance the efficiency-related benefits derived from the digitalization of basic services.

Second, digitalization of B2B transactions helps firms establish themselves as reliable and noteworthy to customers, in a competitive market. If other firms observe the value created from the firm’s response to recurring transactions, they will be more likely to direct people to use the firm’s services. For example, real estate firms often advise potential house buyers to avail themselves of loans from credit unions when they have electronic mortgage payments set up with the credit union. Thus, other firms perceive DBT as an opportunity to extend and cater to the needs of the credit union’s customers, thereby expanding the opportunities for the credit union to provide the loans. In the process, the credit union is able to achieve higher revenues and, in turn, further magnify opportunities for members served by the DCS. Thus, firms can get more value from DCS when they also invest in digitizing B2B transactions.

Third, DBT enhances cross-organizational transparency by providing greater visibility of transactions to other firms (Srinivasan et al. 1994; Zuboff 1985). Increased cross-organizational transparency facilitates collaboration across organizations, resulting in increased value creation (Sambamurthy et al. 2003; Tafti et al. 2013). Thus, firms that achieve greater transactional efficiency through DBT will realize more opportunities to benefit from DCS.

In summary, we argue that DBT complements the effects of DCS on firm performance through increased availability of services for customers from other businesses, increased value perceived by other firms, and increased cross-organizational transparency for the firm. Hence, we hypothesize:

$$H_{2a}: \text{Digitalized B2B Transactions (DBT) positively moderates the relationship between Digitalized Core Services (DCS) and the performance of service firms.}$$

Moderating Effect of Digitalized Customer Access (DCA)

We argue that DCA has a positive moderation effect on the relationship between DCS and performance. DCA provides customers with more avenues or channels of access to the firm’s services, which can be a critical component of value creation (Krishnan, Ramaswamy, Meyer et al. 1999). For example, in our car-buying example of a credit union discussed earlier, if the customer relies on only phone calls or physical visits to get information, the likelihood of a prompt decision by the customer to get the loan will be lower because of dependencies on delayed information access and processing. Avenues such as web-based information, interactive response systems, and kiosks help customers get information anywhere, anytime.
As a result, not only is the credit union able to convert potential loan opportunities into actual loans, it is also able to establish a good reputation in the industry for its service orientation, thereby increasing membership, loans disbursement, and income.

DCA focuses on providing customers with alternative IT-enabled access methods through which customers can avail themselves of the services that the firm offers. DCA improves relationships with customers by creating more opportunities for customers to interact with the focal firm, thus creating more opportunities for customers to access the core services (Chen and Dubinsky 2003; Sirdeshmukh et al. 2002). In summary, we argue that DCA broadens the range of and opportunity for access to customers, and the resulting increased potential for service utilization strengthens the effect of DCS on the performance of the service firm. Formally, we hypothesize the following:

\[ H_{2b}: \text{Digitalized Customer Access (DCA) positively moderates the relationship between Digitalized Core Services (DCS) and the performance of service firms.} \]

**Investment Strategies to Leverage Digitalized Services**

It is important to understand which strategies service firms can adopt to better leverage DBT and DCA and generate higher value for the firm. The first strategy we explore is an investment strategy to improve the effectiveness of DCA. For the firm to derive value from DCA avenues or channels, these need to be used by customers frequently and seamlessly. However, if customers are not aware of these avenues or do not know how to use these features, they would not regularly access or use these channels. We posit that if the service firm invests in advertising, customers will be more aware of digitalized access to services available to them.

Prior research in management and marketing recognizes that advertising is a strategic organizational factor that influences firm performance by increasing brand awareness and helping firms attract new customers and retain existing customers (Capon et al. 1990; Chauvin and Hirschey 1993; Day 1994; De Carolis 2003). Advertising enhances a firm’s information environment, thereby increasing potential customers’ awareness about the firm’s activities and service features. Advertisements are likely to further inform customers about the channels through which the firm’s services are available (Bagwell 2007; Huang and Sarigöllü 2012; Keller 2009; Nelson 1974; Servaes and Tamayo 2013). We argue that greater awareness of the firm through advertising will increase customers’ intentions to use the services of the firm via digital channels, thus opening up more opportunities for value creation (Hoyer and Brown 1990).

Second, DCA channels may raise concerns about security and confidentiality (Gerrard and Cunningham 2003). By enabling customers to familiarize themselves with the company and its business, advertising can stimulate trust and help customers overcome resistance and apprehension they may have about using the digitalized services or digitalized channels through which the services are offered (Laukkana et al. 2009; Siau and Shen 2003). For example, advertising can make customers aware of the security and privacy aspects of digital services and the associated fraud detection steps the firm has taken for its digitalized services. In summary, we argue that advertising investments make customers more aware of and more willing to use the services enabled by DCA and DCS. In turn, the resulting increase in usage will strengthen the moderation effect of DCA on the DCS–performance linkage. Consistent with these arguments, we hypothesize the following:

\[ H_{3a}: \text{Advertising investments strengthen the proposed positive moderating effect of Digitalized Customer Access (DCA) on the relationship between Digitalized Core Services (DCS) and the performance of service firms.} \]

The second strategy we examine is the service firm’s participation in an inter-organizational network (PIN). Interorganizational network participation facilitates business through seamless transactions across multiple firms. Inter-organizational network participation is distinct and different from having an IT capability to accommodate B2B transactions because these are platform mechanisms agreed on by multiple parties that are established to build a network and collaboration among entities that are ready to exchange information and participate in opportunities to create mutual value. The purpose and value proposition of an inter-organizational network goes beyond merely helping with transactions and is different from having only an electronic transaction system to facilitate transactions between two entities. However, participation in an inter-organizational network is challenging due to significant investment requirements and the potential lack of capabilities to collaborate with other firms in the system; therefore, a specific and well-designed investment strategy on the part of a firm is essential (Ackerberg and Gowrisankaran 2006).
Furthermore, for service firms, focus on service–related activities rather than expanding their portfolios to incorporate other business strategies, such as inter-organizational network participation, which may be perceived as an ancillary or extended activity relative to the firm’s more goal of service provision.

For example, in case of credit unions, our empirical context, participation in an inter-organizational network such as Automated Clearing House (ACH) facilitates pre-authenticated fast digital money and related document transactions (e.g., credit and debit transactions, mortgage approvals and payments) across multiple firms (Gowrisankaran and Stavins 2002). Often, the ACH is involved in setting up systems, standards, rules, and participating entity disclosures that can generate opportunities to cooperate and network. Beyond these functions, ACH can facilitate credit transfers, payroll direct deposits, and similar activities with other firms. In the case of credit unions, their investment behaviors are often dependent on immediate margins and cash flows. Due to the low average revenue per user, credit unions face the problem of weak financial returns. As such, because loan provisions are the “core” of credit unions’ business, they often focus on loan service–related activities rather than expanding their portfolios to incorporate other business strategies, such as inter-organizational network participation, which may be perceived as an ancillary or extended activity relative to the credit union’s goal of loan processing.

We argue that service firms can strengthen the complementary effect of DBT on DCS through participation in an inter-organizational network (PIN) for two main reasons. First, PIN enhances the firm’s capability to improve communications across businesses in the system. This in turn creates a synergy among firms, thereby enabling them to better leverage DBT in accentuating the effect of DCS on performance through two mechanisms: attracting more customers, accommodating existing customers with regard to securing ancillary services from the network, and improving the flow of resources across the network (Tucker 2005).

Second, PIN improves firms’ abilities to obtain and utilize exclusive market information and knowledge embedded within participating organizations. For example, a credit union may learn about the additional discounts or privileges given to members when it networks for such information in a collaborative way with other unions. Often, interorganizational systems necessitate a set of standards, rules, and participating entity disclosures (with goodwill) that can generate cooperation and exploit networking opportunities, thereby amplifying the effect of DBT (Ordanini 2005). Moreover, digital interorganizational systems require a level of technological preparedness on the part of participating firms, that in turn develops the information processing and coordination level within the firm. Therefore, when a firm participates in an inter-organizational network, the resulting improvement will amplify the complementary effect of DBT on the DCS–performance relationship. Formally, we posit:

\[ H3b: \text{Participation in an inter-organizational network (PIN) strengthens the proposed positive moderating effect of Digitalized B2B Transactions (DBT) on the relationship between Digitalized Core Services (DCS) and the performance of service firms.} \]

**Research Design and Methodology**

**Data and Variables**

To examine our research questions, we collected archival data from different sources for over 7,000 credit unions in the United States across a nine-year period. First, we collected archival data from the annual reports of the credit unions. The reports are in structured balance-sheet format and are collected by a supervisory federal agency for regulatory purposes. The reports are self-validated through sworn statements provided by the credit unions, and the federal agency tracks any irregularities submitted in the report through legal frameworks. We matched credit unions across a nine-year (2000–2008) panel data set containing information about IT-enabled services and credit union performance. We also collected data from the U.S. Census Bureau, the U.S. Bureau of Labor Statistics, and the U.S. Bureau of Economic Analysis on characteristics of the market in which the credit union is headquartered. All data matching and analysis was conducted and validated by the authors using STATA 14 and does not suffer from any systematic bias. Table 1 provides a detailed description of the variables\(^1\).

\(^1\) Values were adjusted to the base year, wherever relevant.
Consistent with prior research, our dependent variable is net income of the credit union (NetIncome), a widely-used metric of performance (Dhaliwal et al. 1999; Setia et al. 2011). Net income provides an indication of the earning quality and the credit union’s ability to generate retained earnings to meet its capital requirements (Jackson 2011). Net income increases the credit union’s capital and future capacity to offer its members subsidies in the form of below-market-rate loans and above-market-rate deposits (Goddard et al. 2008; Wilcox 2006).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NetIncome</td>
<td>Net income of the credit union, in 100 million $ (this variable is log-transformed).</td>
</tr>
<tr>
<td>Digitalized Core Services (DCS)</td>
<td>IT-enabled services focused on providing core banking services for members of the credit union. We coded this variable as a summative score of questions pertaining to whether the credit union offered the following services electronically: (1) new membership account applications, (2) account balance enquiry, (3) viewing account history, and (4) providing new loans to members.</td>
</tr>
<tr>
<td>Digitalized B2B Transactions (DBT)</td>
<td>Digitalization of B2B transactions. We code this variable as a summative score of questions pertaining to whether the credit union digitalized the following: (1) merchandise purchase, (2) share draft orders, (3) bill payments (e.g., those enabling payments to/through other firms), and (4) inter-firm electronic cash transaction services (transferring monetary values “[electronic cash”] using a personal computer, a plastic card, or any other device that has a computer chip or magnetic strip [excluding ATMs and debit or credit cards]).</td>
</tr>
<tr>
<td>Digitalized Customer Access (DCA)</td>
<td>IT-enabled methods through which members of the credit union access services. We coded this variable as a summative score of questions pertaining to whether the credit union offered the following electronically: (1) website, (2) audio response/phone-based interactive voice response, (3) ATM, and (4) kiosks at different locations.</td>
</tr>
<tr>
<td>Advertising Investment (Advtg)</td>
<td>Expenses pertaining to advertising, publicity, and promotions (log-transformed).</td>
</tr>
<tr>
<td>Participation in an Inter-organizational Network (PIN)</td>
<td>Whether the credit union participates in an inter-organizational financial network as an ACH depository financial institution (0 = not participating during the year, 1 = participating during the year).</td>
</tr>
<tr>
<td>Assets</td>
<td>Assets per employee, calculated as the ratio of total assets (in 100 millions $) to the number of full time employees (in thousands) of the credit union.</td>
</tr>
<tr>
<td>Interest Rate Spread</td>
<td>The spread of the credit union’s interest rates, calculated as “difference between interest generated per unit $ loan and interest paid per unit $ deposit.”</td>
</tr>
<tr>
<td>Region1–Region5 Geographical region of the credit union (of five regions in the United States).</td>
<td></td>
</tr>
<tr>
<td>FISCU</td>
<td>1 if the credit union is a state-chartered, federally insured credit union; 0 otherwise.</td>
</tr>
<tr>
<td>NFISCU</td>
<td>1 if the credit union is a state-chartered, but not federally insured credit union; 0 otherwise.</td>
</tr>
<tr>
<td>Age</td>
<td>Age of credit union. Calculated as the number of years since the founding year.</td>
</tr>
<tr>
<td>RealEstate</td>
<td>Total real estate loans per unit of total assets. Calculated as (total amount of first mortgage real estate loans + total other real estate loans) / total assets.</td>
</tr>
<tr>
<td>CreditCard</td>
<td>Unsecured credit card loans per unit of total assets.</td>
</tr>
<tr>
<td>Securitization</td>
<td>Securities per unit investment. Calculated as: (trading securities + available for sale securities + held to maturity securities) / total investments.</td>
</tr>
<tr>
<td>Delinquency</td>
<td>Total loan delinquency per unit of total loans.</td>
</tr>
<tr>
<td>Percapitaincome</td>
<td>Per-capita income of the state in which the credit union is located.</td>
</tr>
<tr>
<td>Percapitaincome_growth</td>
<td>Per capita income growth of the state in which the credit union is located (from prior to current year).</td>
</tr>
<tr>
<td>pop_growth</td>
<td>Population growth of state in which the credit union is located (from prior year to current year).</td>
</tr>
<tr>
<td>EmploymentRate</td>
<td>Employment rate at the state level; calculated as (Number of jobs in state/population of state).</td>
</tr>
<tr>
<td>Branches</td>
<td>Number of branches of the credit union.</td>
</tr>
<tr>
<td>Loans</td>
<td>(Log) Total loans in millions given out by the credit union.</td>
</tr>
</tbody>
</table>

**Table 1. Description of Variables**

Independent variables DCS, DBT, and DCA are count-based composite measures created from the archival data from credit union annual reports. DCS indicates that the credit union offers core banking services electronically. DBT consists of measures indicating digitalized channels through which the credit union transacts with other business entities. DCA consists of measures indicating IT-enabled methods through which members of the credit union can access services. Consistent with prior research (Banker et al. 2006; Kulp et al. 2004; Saldanha et al. 2013; Andrade Rojas and Kathuria 2014), we count (sum) the number of
DCS, DBT, and DCA modes offered by the credit union. Similar to prior research in marketing and management (Capon et al. 1990; Collins and Han 2004; De Carolis 2003; Servaes and Tamayo 2013), we measure advertising investment (Advtg) as the (log) expenses of the credit union on advertising, publicity, and promotions. In addition, PIN is measured as a binary measure, which indicates whether the credit union participates in the ACH system, an interorganizational network that facilitates multiple financial exchange services, standards regulations, and network-based services.

We include an extensive set of control variables that together account for several factors that may influence the performance of credit unions. First, we control for the size of the credit union (in terms of gross assets per employee), which helps account for scale effects on performance (Banker et al. 2006; Barron et al. 1994). Second, we control for the age of the credit union, which accounts for potential learning-curve influences on performance (Shah and Ward 2003). Third, we control for interest rate spread, which can influence the financial performance of the credit union. Fourth, to account for the potential effect of regulatory differences on performance, we control for the type of credit union—namely, whether it is a federal credit union, a federally insured state credit union, or a federally uninsured state credit union (Reichert and Rubens 1994). Fifth, we control for the nature of the asset and liability portfolio of the credit union. Specifically, we control for real estate, credit card, securitization, and delinquency factors that may influence the performance of the credit union (Dandapani et al. 2008; Thompson and Gray 1999). Sixth, as prior research suggests, we include several variables at the state level to control for rules, regulations, macroeconomic unevenness, and market conditions that may influence credit union performance. These variables (obtained from the U.S. Bureau of Economic Analysis) include employment rate, income, income growth, and population growth in the state. Prior research suggests that such macroeconomic factors can affect credit union performance by providing different opportunities and challenges for credit unions (Dandapani et al. 2008; Jackson 2011). The dependent variables were lagged one-year subsequent to the independent variables. This ensures temporal precedence and strengthens causal inference. Table 2 shows the descriptive statistics and correlations.

| Variable       | Mean  | S.D. | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     | 11     | 12     | 13     | 14     | 15     | 16     | 17     | 18     |
|----------------|-------|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| NetIncome      | 14.33 | 1.92 | 1.00   |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| DCS            | 2.10  | 1.49 | 0.57   | 1.00   |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| DCA            | 2.02  | 1.26 | 0.60   | 0.73   | 1.00   |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| DBT            | 1.92  | 1.33 | 0.59   | 0.76   | 0.72   | 1.00   |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| Advtg          | 9.08  | 3.31 | 0.59   | 0.66   | 0.69   | 0.65   | 1.00   |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
| PIN            | 0.68  | 0.46 | 0.29   | 0.40   | 0.44   | 0.41   | 0.39   | 1.00   |        |        |        |        |        |        |        |        |        |        |        |        |
| Assets         | 14.74 | 0.51 | 0.31   | 0.15   | 0.13   | 0.14   | 0.21   | 0.06   | 1.00   |        |        |        |        |        |        |        |        |        |        |        |        |
| Int. Rt. Sprd. | -0.08 | 0.05 | 0.21   | 0.24   | 0.23   | 0.26   | 0.16   | -0.03  | 1.00   |        |        |        |        |        |        |        |        |        |        |        |        |
| Age            | 52.00 | 14.65| 0.19   | 0.16   | 0.16   | 0.16   | 0.19   | 0.07   | 0.37   | 0.03   | 1.00   |        |        |        |        |        |        |        |        |        |        |
| Real Estate    | 0.18  | 0.17 | 0.44   | 0.48   | 0.51   | 0.47   | 0.51   | 0.25   | 0.35   | 0.16   | 1.00   |        |        |        |        |        |        |        |        |        |        |
| CreditCard     | 0.02  | 0.03 | 0.25   | 0.36   | 0.38   | 0.36   | 0.33   | 0.20   | 0.01   | 0.13   | 0.05   | 0.19   | 1.00   |        |        |        |        |        |        |        |        |
| Securitization | 0.20  | 0.32 | 0.44   | 0.35   | 0.36   | 0.33   | 0.40   | 0.16   | 0.24   | 0.07   | 0.15   | 0.30   | 0.18   | 1.00   |        |        |        |        |        |        |        |
| Delinquency    | 0.02  | 0.02 | 0.26   | 0.27   | 0.28   | 0.26   | -0.18  | -0.20  | -0.16  | -0.07  | -0.20  | -0.12  | -0.31  | 1.00   |        |        |        |        |        |        |        |
| PerCapInc      | 37.28 | 6.15 | 0.12   | 0.08   | 0.07   | 0.07   | 0.03   | 0.03   | 0.05   | 0.09   | 0.16   | 0.07   | 0.11   | -0.03  | 1.00   |        |        |        |        |        |
| PerCalnGrth    | 4.91  | 1.81 | -0.02  | -0.04  | -0.05  | -0.05  | -0.05  | -0.05  | -0.03  | -0.02  | -0.11  | -0.04  | -0.00  | -0.03  | 0.15   | 1.00   |        |        |        |        |        |
| pop_growth     | 0.83  | 0.91 | 0.03   | 0.04   | 0.04   | 0.04   | 0.04   | 0.03   | 0.07   | 0.05   | 0.04   | -0.11  | -0.02  | -0.05  | -0.05  | -0.15  | 0.04   | 0.14   | 0.03   | 1.00   |
| EmpRate        | 0.09  | 0.12 | 0.00   | 0.04   | 0.03   | 0.03   | 0.03   | 0.03   | 0.02   | 0.03   | 0.09   | 0.09   | 0.02   | 0.04   | 0.04   | 0.37   | 0.40   | 0.03   | 1.00   |
| Branches       | 2.64  | 4.85 | 0.40   | 0.28   | 0.29   | 0.27   | 0.37   | 0.13   | 0.10   | 0.15   | 0.11   | 0.27   | 0.15   | 0.31   | -0.09  | 0.03   | -0.02  | 0.07   | -0.01  | 1.00   |
| Loans          | 2.54  | 1.60 | 0.69   | 0.72   | 0.68   | 0.78   | 0.37   | 0.35   | 0.38   | 0.23   | 0.64   | 0.33   | 0.52   | -0.29  | 0.08   | -0.04  | 0.06   | 0.02   | 0.52   |

Table 2. Descriptive Statistics and Correlations

**Estimation Approach**

Our generic estimation equation is a panel data specification of the following form:

\[ Y_t = \beta_0 + \beta X_{it-1} + e_t \]

Specifically, we estimate the following equation to test the direct effect of DCS, hypothesis H1:

\[ \text{NetIncome} = f (\text{DCS, DBT, DCA, controls}) \quad (1) \]

We estimate the following equation specific to our interaction effect hypotheses, H2a and H2b:
NetIncome = f (DCS, DBT, DCA, DCS × DCA, DCS × DBT, controls)  \hspace{1cm} (2)

To test H3a and H3b, we include the three-way interaction terms (PIN × DCS × DBT) and (Advtg × DCS × DCA) along with the necessary corresponding two-way interaction terms in the model and report the significance and coefficients of these terms.

In our estimations, a concern might be the potential endogeneity of the IT variables. To address potential concerns of endogeneity, we allowed for the possibility of “feedback effects” which are most easily thought of as a type of endogeneity across time periods. For example, a shock in performance in period [t] may feedback to changes in investments in technology in period [t+1]. Such feedback effects violate the typical assumption of exogeneity. We test our hypotheses by making the weaker assumption that credit-union specific variables are endogenous. We estimated our models by considering the error term to be uncorrelated with the past value of the explanatory variable, but allowing the error term to be correlated with current and future values of the variable.

Specifically, we estimated the models using the generalized method of moments (GMM) Arellano-Bond estimator, which addresses situations where the regressors may be correlated with the error term (Arellano and Bond 1991; Greene 2003). This estimator was designed for datasets with many panels and few periods to address problems that arise when regressors are not exogenous (Arellano and Bond 1991). Arellano and Bond (1991) derived a consistent GMM estimator for the parameters of this model utilizing the time dimension of the panel to provide internal instruments.

We adopt a conservative specification and therefore consider all the credit-union specific variables as endogenous; and we use lags of the variables as “GMM-style” instruments (Greene 2003). To test whether the instruments are valid, we perform Hansen’s J-test for overidentifying restrictions (Hansen 1982). This test assesses the validity of instruments by examining the moment conditions used in the estimation process. If we cannot reject the null, the model is supported, and this is the case throughout our estimations (as indicated by the p-values at the bottom of the tables). We also report the outcomes of the Arellano and Bond (1991) test for second-order autocorrelation. The second specification test was for second-order autocorrelation in the residuals (if the error term is autocorrelated, then lagged values of the dependent variable cannot serve as proper instruments for the lagged differences of the dependent variables). In our models, these tests consistently show that we cannot reject the null hypothesis of no second-order autocorrelation (since the estimator is in first differences, first-order autocorrelation does not imply inconsistent estimates). Robust estimators are used to correct for heteroskedasticity.

In our models, the Hansen tests of overidentification and the Arellano–Bond tests for zero autocorrelation present no evidence of model misspecification, suggesting that our model specifications are based on instruments that are exogenous and that there is no serial correlation in the first-differenced disturbances. Our results are thus robust to controlling for endogeneity. We include year dummies in all our models to account for year-specific heterogeneity.

**Results**

Table 3 presents results of the GMM estimation models, with column 1 providing results of Equation 1. In columns 2–4, we add the interaction terms one at a time (columns 2 and 3) and together in column 4. Likewise, columns 5–7 present the results of the three-way interaction effects one at a time with corresponding two-way interaction terms (columns 5–6) and both the three-way terms in column 7.

Consistent with H1, we find that the coefficient of DCS is positive and significant (column 1: \( \hat{\beta} = 0.07, p < 0.01 \)). We find that the interaction term DCS × DBT is positive and significant (column 4: \( \hat{\beta} = 0.05, p < 0.01 \)), in support of H2a. Contrary to H2b, we find that the interaction term DCS × DCA is negative and significant (column 4: \( \hat{\beta} = -0.08, p < 0.01 \)). Thus, we do not find support for H2b. The F-tests of the interaction terms are statistically significant, suggesting that the interaction terms are not jointly zero (Greene 2003). The estimations with the interaction terms introduced separately in the regressions yield qualitatively similar results (columns 2 and 3).

Column 7 shows that the coefficient of the three-way interaction of (Advtg × DCS × DCA) is positive and significant (\( \hat{\beta} = 0.01, p < 0.01 \)). This provides partial support for H3a. Likewise, we find support for H3b because (PIN × DCS × DBT) is positive and significant (column 7: \( \hat{\beta} = 0.03, p < 0.05 \)). The estimations when the three-way interaction terms along with the corresponding two-way terms are introduced
separately in the regression yield qualitatively similar results (columns 5 and 6). Consistent with prior research (Animesh et al. 2011; Dunk 1993), we do not interpret the significance tests for the main effects and the two-way interaction terms in the models with the three-way interaction terms.

Table 3. Key GMM Estimation Results

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
</tr>
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<td>Controls</td>
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<td>…</td>
<td>…</td>
<td>…</td>
<td>…</td>
<td>…</td>
<td>…</td>
</tr>
<tr>
<td>DCS</td>
<td>0.07*** (0.02)</td>
<td>0.17*** (0.04)</td>
<td>0.15*** (0.04)</td>
<td>0.25*** (0.06)</td>
<td>0.28*** (0.08)</td>
<td>0.25*** (0.06)</td>
<td>0.28*** (0.08)</td>
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<td>DBT</td>
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<td>-0.02 (0.04)</td>
<td>-0.07 (0.06)</td>
<td>-0.04 (0.06)</td>
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</tr>
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<td>DCA</td>
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</tr>
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<td>DCS x DBT</td>
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<td>0.05*** (0.02)</td>
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<td>0.03 (0.02)</td>
<td>0.01 (0.02)</td>
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<td>Advtg x DCS</td>
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<tr>
<td>Advtg x DCS x DCA</td>
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<td>PIN</td>
<td>-0.02 (0.04)</td>
<td>-0.01 (0.04)</td>
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<tr>
<td>PIN x DCS</td>
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<td>-0.05* (0.3)</td>
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<td>PIN x DBT</td>
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<td>-0.02 (0.03)</td>
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<tr>
<td>PIN x DCS x DBT</td>
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<td>0.03** (0.01)</td>
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<tr>
<td>CU-year observations (N)</td>
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<td>27377</td>
<td>27377</td>
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<td>27377</td>
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<td>22045</td>
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<td>Wald Chi-square</td>
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<td>717.74***</td>
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<td>745.17***</td>
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<td>572.56***</td>
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<td>F-test of significant coefficient of interaction</td>
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<td>Arellano-Bond Test for second-order autocorrelation p-value</td>
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<td>0.29</td>
<td>0.35</td>
<td>0.69</td>
<td>0.42</td>
<td>0.43</td>
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Control variables not reported due to space constraints.
Robust standard errors in parentheses.
Significance levels: *** p<0.01, ** p<0.05, * p<0.1
Region dummy variables and year dummy variables were included, but not shown for brevity.
An insignificant p-value for the Hansen's test indicates that the instruments are appropriate, so the model has a good fit (Hansen 1982)

Table 3. Key GMM Estimation Results

In general, the signs of the control variables are in expected directions. For example, PerCapitaIncome is positive and significant, consistent with the reasoning that higher levels of income are usually associated with higher demand for financial services (Jackson 2011). The coefficients of Assets and Branches are positive and significant, in line with the argument that larger credit unions have a greater endowment of resources (Goddard and Wilson 2005). The directions of the control variables further validate our model.
To better facilitate interpretation, we show a graphical illustration of the results in Figure 3. As shown in figure 3(i), the relationship between DCS and performance is greater at high levels of DBT (consistent with H2a). Similarly, figure 3(ii) shows that DCS has a lower association with performance at higher levels of DCA (contrary to H2b). Figure 3(iii) shows that for firms that are low on DCA, advertising investment has the effect of increasing the strength of the relationship between DCS and performance in the positive direction (consistent with H3a). Examining figure 3(iv), we find that the relationship between DCS and performance is greatest for firms that are high on DBT and that participate in PIN (consistent with H3b).

![Figure 3: Graphical Illustration of Interaction Effects](image)

**Robustness Checks**

We conducted several robustness checks to examine the sensitivity of the results obtained. First, to check the sensitivity of the results to alternate model specifications, we repeated the analysis using fixed-effects models with robust standard errors (White 1980) and year dummies to account for heteroskedasticity and year-specific heterogeneity, respectively. These results (omitted for brevity) are qualitatively similar to those of our GMM model results (Table 3). Second, when we repeated the analysis accounting for potential autocorrelation of the error terms, the results (omitted for brevity) were qualitatively unchanged. Third, we checked for multicollinearity by examining the variance inflation factors (VIF). In all equations, the maximum VIF and the average VIF were well below suggested limits, indicating that multicollinearity is not a significant concern (Greene 2003). Fourth, we also estimated the models including the three-way interactions of (PIN x DCS x DCA) and (Advtg x DCS x DBT) as well as the two-way interaction of (DBT x DCA) in the models. None of these additional terms were statistically significant and the results (omitted for brevity) remain unchanged.

Fifth, common method bias is not of significant concern in our study because the variables have different sources, the performance variables are accounting (not perceptual) data, and the IT variables are generally unambiguous (presence versus absence) (Podsakoff et al. 2003). Nevertheless, we performed the Harman's one-factor test and the marker variable test (Lindell and Whitney 2001) to assess common method bias. In Harman's test, six factors with eigenvalues greater than 1 were retained, cumulatively explaining 57.28% of the variance, with the first factor accounting for only 26.66% of the variance. We also performed Lindell and Whitney's (2001) test, using a “marker variable” to partial out common method variance from correlations among variables. After correcting for common method variance, we find no substantial changes in the correlations, further suggesting that common method bias is not problematic (Malhotra et al. 2006). Thus, these tests suggested that common method bias is not a significant concern. Furthermore, since our core theory pertains to interaction effects, common method variance is even less of a concern because such variance reduces the likelihood of detecting interaction effects (Wall et al. 1996). Finally, we performed several diagnostic checks to ascertain stability of results. For instance, we tested for outliers and influential observations and found no problems or violations of assumptions (Belsley et al. 2005; Greene 2003).
Extended Analysis

As an exploratory extended analysis, we examine our theory using an alternate dependent variable, Loans. The “loans” given by a credit union is an important indicator of the success and level of output provided by the credit union to its customers (Glass and McKillop 2006; Hoel 2002). This analysis helps us triangulate our results using an alternate dependent variable. This approach of using two measures of performance (loans disbursement and net income) helps us examine our theory and test our hypotheses across two performance measures, consistent with similar approaches in prior research (Anand and Ward 2004; Rai, et al. 2012; Saldanha, Melville, Ramirez et al. 2013; Tanriverdi and Lee 2008). The 'loans' variable serves as an intermediate operational performance measure to supplement our analysis using the financial performance measure of income. The fixed-effects results of our extended analysis are provided in Table 4. The Arellano-Bond model estimations for our extended analysis (using loans as dependent variable) also gave us qualitatively similar results as Table 4 and are omitted for brevity.

<table>
<thead>
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<th>Variables</th>
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<td></td>
</tr>
<tr>
<td>Controls</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>DCS</td>
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<td>0.03*** (0.01)</td>
<td>0.02 (0.01)</td>
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<tr>
<td>DBT</td>
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<td>-0.005 (0.01)</td>
</tr>
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<td>-0.01*** (0.02)</td>
</tr>
<tr>
<td>DCS x DBT</td>
<td>0.018*** (0.005)</td>
<td>0.01** (0.006)</td>
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<td>DCS x DCA</td>
<td>-0.021*** (0.005)</td>
<td>-0.05*** (0.007)</td>
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<td>Adtvg</td>
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<tr>
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<td>PIN x DCS x DBT</td>
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<td>Firm-year observations (N)</td>
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<td>39416</td>
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<td>F-statistic</td>
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<td>229.46***</td>
<td>119.83***</td>
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Control variables not reported due to space constraints
Robust standard errors in parentheses
Significance levels: *** p<0.01, **p<0.05, *p < 0.1
Region dummy variables & year dummy variables were included, but not shown for brevity.

Table 4. Extended Analysis

In this estimation, examining the direct effects (column 1), we find that DCS has a significant positive coefficient (column 2, β = 0.015, p < 0.01). Further, the interaction term (DCS x DBT) is positive and significant (column 2, β = 0.018, p < 0.01), and the interaction term (DCS X DCA) is negative and significant (column 2, β = -0.021, p < 0.01). Column 3 shows that the three-way interaction of (Adtvg x DCS x DCA) is positive and significant (column 3, β = 0.007, p < 0.1) and the three-way interaction term of (PIN x DCS x DBT) is non-significant (p > 0.1). Like in the main results, we also performed the estimations by adding the interactions one at a time. The results (omitted for brevity) were consistent with those shown in Table 4. Taken together, these exploratory extended analysis results are generally consistent with, albeit relatively weaker, than our main results (using net income).
Discussion

Our objective in this study was to explore how digitalized services influence the performance of service firms. Using a variety of econometric techniques, our findings suggest that while DCS has a direct relationship with performance, DBT has a complementary effect on the relationship between DCS and performance. Counter-intuitively and contrary to our hypothesis, we find that DCA has a negative moderation effect on the relationship between DCS and performance. Consistent with our hypothesis, we find that the moderation effect of DCA is positively influenced by advertising investment and that the positive moderation effect of DBT is enhanced by PIN. Taken together, our findings uncover contingencies in value creation from the digitalization of services.

A number of explanations offer insight into our counter-intuitive albeit unexpected finding of a negative moderation effect of DCA on the DCS–performance relationship. First, research suggests that when consumers are exposed to new products or features that substitute for an earlier product, their consumption of the earlier product may decrease (Niraj et al. 2008; Seetharaman et al. 2005). Extending this argument to the context of digitalized access to services, some DCA features might be substitutes for the basic digital services. For example, when a consumer of a credit union uses an ATM machine for deposits and withdrawals, she may not use the electronic account balance feature that is part of DCS. Thus, although DCA broadens the access that customers have to conduct business with the firm, the importance of some of the features of DCS may decrease, thereby reducing the effect of DCS on performance. A second potential reason for the negative moderating effect is that members of credit unions and service firms more generally may prefer more personalized services rather than an increased range of access options that DCA provides. Often, customers do not appreciate responses across different IT-based channels to their issues and concerns, especially when they expect more personalized services. This is consistent with prior research in the banking industry that has found a negative relationship between ATM use and consumer shopping, suggesting that firms need to personalize ATMs rather than stress their convenience (Marshall and Heslop 1988). A third potential explanation for the negative moderation effect of DCA is that the additional digital access may create an “enraging effect” rather than an “engaging effect” on customers (Rust et al. 2006), such that as credit unions add more digitalized access avenues for customers, this may lead to confusion among the varied access choices. Fourth, increasing customer access may raise concerns about privacy and confidentiality, causing some customers to be wary of using the firms’ services (Bitner et al. 2000).

Our findings offer several contributions to the literature. First, by providing insights into the impact of digitalized services on firm performance, we contribute to the literature on service digitalization. We build on and reconcile findings of prior information systems research by demonstrating performance effects of different types of IT-enabled services. We shed light on contingencies in value creation from digitalized services and uncovers the moderating constructs of DBT and DCA as contingencies, along with business investments in advertising and inter-organizational network participation. Second, another contribution lies in differentiating how IT is used or applied (DBT, DCA, DCS) and in exploring the implications of specific IT use for digitalized services on firm performance. Our findings show how IT used for the digitalization of services influences the performance of service firms and how investment strategies influence these relationships. Thus, the study reinforces the need to carefully consider how IT is used (Devaraj and Kohli 2003) while teasing out the link between digitalized services and performance. Third, the results suggest evidence of an emerging theme in information systems research that there are nuances and caveats to digitalization (Grover and Kohli 2013). In our study, the negative moderation effect of DCA on the DCS–performance linkage is counterintuitive, although unexpected, and indicates that simply increasing the range of access to digitalized services may not accentuate the benefits that firms obtain from digitizing their core services but instead may actually deter from those benefits unless accompanied by other investments (e.g., advertising). Our finding of a negative moderation effect of DCA on the DCS-performance relationship may also point to boundary choices that may exist for optimal leveraging of services. Prior research in the context of digitalization and modularization of services identified the need to study “what implications are there for boundary choices of service activities?” (Rai and Sambamurthy 2006, p. 330). Finally, our theoretical framework and findings provide an explanation for prior relatively divergent results in the literature on performance implications of IT-enabled services in the finance sector. For example, Sullivan (2000) finds no effect of IT-enabled service adoption on banks’ performance, Furst et al. (2002) find a negative relationship, and DeYoung et al. (2007) demonstrate a strong positive effect of adoption on performance. Similar research in the context of credit unions is limited but is inconclusive (e.g. Kathuria et
The higher revenues accrued from IT-enabled services are returned to customers in the form of either lower interest rates on loans or higher interest on deposits, or the revenues are invested back into higher-cost IT-enabled service improvements (Goddard et al. 2008; Jackson 2011; Wilcox 2006). Our findings contribute to this dialog by showing how digitalization of services needs to occur in a configuration of investments that support the digitalization of services.

Our study has several managerial implications. Our study highlights the contingencies in IT investments in services and suggests that DBT complements the benefits DCS whereas DCA can mitigate the effect of DCS on performance. Thus, while managers need to be proactive in making IT decisions, they also need to explore how and when IT creates value and prioritize IT investments and improve governance processes by examining the purpose for which the digitalization is being implemented. Our results suggest that although increasing the number of digital access methods to customers can provide benefits, this digital strategy can also mitigate the effect of core digital services on performance if they are not accompanied by other complementary investments such as advertising. Furthermore, our findings imply that service firms need to examine their IT systems to explore opportunities in which they can add customer-centric value, such that IT enriches the basic purpose of their services rather than being perceived as a “fad” or a “burden” to customers. Our findings suggest that although firms may offer digital access modes to customers, their use and adoption patterns may not always be enough to increase their effectiveness and therefore improve the performance of the firm. Overall, this study sheds light on how managers can better leverage digitalized services; provides a more complete understanding of digital service strategies; and suggests that firms need to evaluate and design appropriate investment strategies to better leverage digitalized services.

Our study should be viewed in light of its limitations, which can be starting points for further research. First, our empirical context, which is limited to one specific set of service firms (credit unions in the United States), enhances internal validity but hinders generalizability to other industries. However, to the extent that the industry dynamics in financial firms may be similar to those in the credit union industry, the results may generalize to service-oriented financial firms, such as mutual fund management firms, insurance companies, and provident fund management associations. Future studies can extend our work to other service sectors or other countries to refine the theory and increase the generalizability of the study. Second, although we use panel data, we cannot confirm purely causal effects. Nonetheless, our use of Arellano-Bond GMM estimation method gave us qualitatively similar results, alleviating concerns of reverse causality. Third, we do not have highly granular metrics of DCS, DCA, and DBT to capture how intensively they are used by the firms (Devaraj and Kohli 2003; Hsieh et al. 2011). Still, our binary metrics can be viewed as reliable proxies and several prior IT value studies have employed binary measures of IT (Banker et al. 2006; Heim and Peng 2010; Saldanha et al. 2013). However, future work can use more elaborate measures. Finally, our data availability is limited from 2000-2008; future work using more current data.

Our study can spur further research in digitalization of services. First, future research can empirically examine the underlying mechanisms driving the moderating relationships examined in this study. Second, our counterintuitive finding of a negative moderating role of DCA could be fertile ground for future studies to examine conditions under which firms can benefit from DCA and conditions under which DCA presents greater challenges. Third, and more generally, further research can examine more complex interrelationships and use alternative methods (e.g., structural modeling, case studies) to examine key phenomena underlying our theoretical model. Fourth, examining other aspects related to digitalized services, such as complementary internal practices and investments within companies, such as data-driven decision making and their potential influences on firm performance can yield new insights.

In conclusion, this study provides conceptualizations and empirical tests of a granular level of digitalized services for firms and their interactive effect on firm performance. We empirically tested our model in the context of credit unions. We find that along with a direct effect of DCS on performance, there are differing moderating effects of DCA (negative moderating effect) and DBT (positive moderating effect) on the link between DCS and firm performance. In addition, our results suggest investment strategies that can help firms better leverage these digitalized services. More generally, the study contributes to the literature that examines the importance of various IT-enabled services for firm performance.

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References


Leveraging Digitalization of Services for Performance


