How do Aspiration Shortfalls Interact with Regulatory Incentives and Controls to Drive Innovation in U.S. Hospitals?

Research-in-Progress

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Abstract

Strategic choices about innovation are becoming increasingly relevant in the healthcare industry to meet the changing needs of the marketplace. We draw on the Behavioral Theory of the Firm and Institutional Theory to (1) identify the influence of aspiration shortfalls of Patient Quality and Cost of Care on IT-enabled Clinical Process Innovation and Services Innovation, and (2) identify how the nature of these relationships change based on regulation at the federal (American Recovery and Reinvestment Act of 2009) and state (Certificate of Need programs) level. Our empirical study is situated in the U.S. healthcare industry. We draw on multiple sources of data, such as the American Hospital Association Annual Survey and IT Supplement as well as the Centers of Medicare and Medicaid, to construct a panel dataset of 3,500 hospitals from 2008—2013. We identify measures for our constructs and propose analysis methods to test our model and hypotheses.

Keywords: Strategic Choice, Innovation, Aspiration Shortfall, Regulation, Healthcare

Introduction

Hospitals are challenged to make strategic choices about innovation to meet the changing needs of the healthcare marketplace. Although the U.S. government has spent close to $30 billion in the past several years to promote electronic health records and other clinical process improvements (CMS 2015), U.S. hospitals still face significant tensions on where to allocate limited innovation resources. In particular, they have to contend with a variety of continuing financial and quality demands levied on them by diverse stakeholders (e.g., patients, internal board, system affiliates, and regulatory bodies). To address these demands effectively, hospitals need to make decisions on where to focus their innovation—services or processes, as both of these types of innovations have the potential to influence organizational performance (Kimberly and Evanisko 1981).

In general, the search for innovation is driven by an organization's desire to improve its performance. Hospitals, like other organizations, compare their performance with referents who are similar in key characteristics (such as teaching status, non-profit/for-profit, and system affiliate) and determine their aspiration level through this comparison. Drawing on the Behavioral Theory of the Firm, if an organization experiences an *aspiration shortfall* (where performance falls below that of its referents), it will initiate a search for solutions to address this shortfall (Cyert and March 1963; Gavetti et al. 2012; Greve 1998; Greve 2003). In the healthcare context, aspiration shortfalls have been shown to influence hospitals' IT investment (Salge et al. 2015). We are motivated to go beyond the aspiration shortfall logic by considering the role of regulation, as the U.S. healthcare industry is a regulated marketplace (Field 2006). As the healthcare industry is undergoing increasing regulatory interventions at the state and federal levels, it follows that an institutional framework should be used to study the impact of these various regulations on organizational innovations. Thus, we integrate views from the Behavioral Theory of the Firm (Cyert and March 1963) and Institutional Theory (DiMaggio and Powell 1983) to better understand how a hospital's aspiration shortfalls and the regulatory environment in which it operates together influence its decision on where to focus innovation.

Specifically, we are motivated to elaborate our understanding by uncovering the influence of a hospital's aspirational shortfalls on two different types of clinical innovations: (1) IT-enabled Clinical Process Innovation, which are technologies that enable the coordination of clinical activities and (2) Services Innovation, which are technologies or services that are used in the diagnosing and treating of patients in a hospital.

In terms of the regulatory environment at the federal level, the government has developed key programs designed at accelerating targeted IT-enabled clinical process innovation. The main program was enacted with the Health Information Technology for Economic and Clinical Health (HITECH) Act, part of the American Recovery and Reinvestment Act of 2009 (the "Stimulus"). This Act authorized incentive payments through the Centers of Medicare and Medicaid (CMS) to healthcare professionals and hospitals for implementing specific IT-enabled clinical process innovation, which took effect in 2011 (e.g. a carrot). As of October 1, 2014, this carrot (incentive) became a stick (penalty), meaning that healthcare professionals and hospitals that have not adequately implemented these innovations are now penalized for their non-compliance.

At the state level, governments have mechanisms to evaluate compliance with Certificate of Need (CON) programs. These programs were originally enacted in 1975 under the National Health Planning and Resources Development Act as an attempt to slow the increase in the cost of healthcare. The original argument for CON programs was to insure adequate healthcare services were available to meet the needs of each state's citizens, as well as to protect against unnecessary duplication of healthcare services and facilities (Cauchi 2013). Although enacted at the federal level, states were in charge of their own programs to analyze their market needs for a proposed service/facility. While the federal mandate was repealed in 1987, many states still maintain their CON programs (36 states) and even those states which repealed still retain some mechanisms intended to regulate costs and duplication of services (Cauchi 2013).

It is in this multi-level regulatory setting that we seek to identify how a hospital's aspiration shortfalls affects its decision-making about innovations. Specifically, we examine:

1) a) How is the influence of a hospital's performance aspiration shortfall on IT-enabled clinical process innovation moderated by federal incentives or penalties?

b) How do these moderation effects change co-present CON regulation at the state level?

2) a) How is the influence of a hospital's performance aspiration shortfall on services innovation moderated by state regulation for CON?

b) How does this moderation effect change co-present federal incentives or penalties for IT-enabled clinical process innovation?

Our empirical study is situated in the U.S. healthcare industry. We integrate multiple sources of data to construct a panel dataset of 3,500 general and surgical hospitals spanning 2008–2013. Our research design enables us to examine how hospitals' decisions on IT-enabled clinical process innovation and services innovation are collectively influenced by: (1) two key aspiration shortfalls—Patient Quality of Care and Patient Cost of Care, and (2) phases of a major federal government intervention (which represents a unique quasi-natural experiment as we are able to differentiate between the various phases for the adoption of IT-enabled clinical process innovation), and (3) the role of state-level controls on costs and duplication of services. Overall, our research seeks to expand our understanding of how a hospital's aspirational shortfalls can drive its strategic choices in innovation and how these choices change given the incentives and controls in a multi-level regulatory environment.

Theoretical Development

Conceptualizing a Hospital's Aspiration Shortfall with a Behavioral Theory of the Firm Lens

The Behavioral Theory of the Firm proposes that a firm will aim at satisficing (i.e., does not aim to maximize, but rather seek "good enough" results) (Cyert and March 1963). Managers of an organization will define goals and set aspiration levels. These aspiration levels are the thresholds that the organization sets for itself to evaluate its performance and can be based on the organization's own prior performance (i.e., historical aspirations) or the performance of the organization's reference group (i.e., social aspirations) (Greve 2003). Reference groups can be rather arbitrary. However, once aspiration levels and reference groups have been determined, the organization monitors actual performance against its aspirations. When managers find the organization's performance to be below the aspiration, the aspirational shortfall triggers a search (Cyert and March 1963) to raise performance (Bromiley 1991). Such search is called problemistic search and seeks to find solutions to address the aspiration shortfall. In a recent study of all public, non-specialist hospitals in England, it was shown that when a hospital's patient survival rate was suppressed (i.e., aspiration shortfall), the hospital would increase IT investment (Salge et al. 2015). This study showed that managers invested in IT as a solution for their performance shortfall. Therefore, an organization strives for tangible performance improvements. Another possible solution that problemistic search might generate to resolve the aspiration shortfall is to strategically focus on organizational innovation.

Differentiating between IT-enabled Clinical Process Innovation and Services Innovation

A hospital can choose to innovate in a variety of ways. Specifically, it can make a strategic choice on how much to focus on organizational efficiency (IT-enabled clinical process innovation) versus a range of organizational services (services innovation). We conceptualize IT-enabled clinical process innovation as technologies that enable the coordination of healthcare activities by clinicians in the clinical care process. Furthermore, informed by Mitchell & Zmud (1999), it is about new ways in which IT can enable the configuration of assets and activities to facilitate the steps employed in diagnosing and treating patients in a hospital. These technologies encompasses a wide-range of activities (such as Computerized Physician Order Entry (CPOE), Clinical Decision Support (CDS), and e-prescribing), which in turn can have a broad effect on various outcomes, from lessening paper work (EHRA 2009) to alerting clinicians to actions that could potentially harm a patient. While the evidence of the potential benefits of focusing on IT-enabled clinical process innovation is far from unequivocal (Buntin et al. 2011), recent studies point to reducing readmissions, clinical errors, and eliminating unnecessary testing, which can all be interpreted as a deterministic relationships – but some of them are arguably measures of quality (such as medical errors) (Agarwal et al. 2010).

We elaborate services innovations into three categories: technology-enabled services innovation, core services innovation, and support services innovation. Technology-enabled services innovation are technologies that enable new and existing services to facilitate the necessary actions taken in diagnosing and treating of patients in a hospital, such as Magnetic Resonance Imaging (MRI), Computed Tomography (CT), catheterization, and robotic surgery. Core services innovation are services that are directly used to diagnose and treat patients in a hospital. They are core to the how a hospital creates value for a patient. Support services innovation are services that are indirectly used to diagnose and treat patients in a hospital. They include services such as meals on wheels, patient education center, and adult day care.

Conceptualizing Regulation by the Federal Government and States with an Institutional Theory Lens

Institutional Theory proposes that an organization's survival requires it to conform to its institutional environment. An organization's structure, policies, procedures, and even services can demonstrate conformity with the rules and expectations imposed by institutions (DiMaggio and Powell 1983; Meyer and Rowan 1977). Furthermore, organizational change can be in direct response to a changing institutional environment. For example, manufacturers adopt new pollution control technologies to conform to environmental regulations; nonprofits hire accountants to maintain account in order to meet tax law requirements; and organizations employ affirmative-action officers to fend off allegations of discrimination (DiMaggio and Powell 1983). In all cases, the government has the power to change the institutional environment by means of incentives (carrots) and punishments (sticks). We focus on two major government programs enacted to bring about change: one at the federal level which uses the carrot and stick method to achieve change in practices by hospitals and one at the state level which uses compliance to ostensibly fulfil the needs of the community. While all organizations may feel the same pressures, it does not necessarily imply that they will react in similar ways.

The U.S. healthcare industry has a long history of regulation (Field 2006). In fact, healthcare is regulated at different government levels (federal, state, and local) in a variety of ways. For example, the Joint Commission grants accreditation to hospitals and this is sometimes a condition of receiving Medicaid reimbursement and the Emergency Medical Treatment & Labor Act (EMTALA) ensures public access to emergency services regardless of a patient's ability to pay.

We focus on the HITECH Act at the federal level, which enabled healthcare professionals and hospitals to receive incentive payments through the CMS to implement specific IT-enabled clinical process innovation. These are not insignificant incentives. Eligible hospitals can receive up to $6,370,000 (CMS 2015). However, these carrots would not last indefinitely. As of October 1, 2014, the carrot became a stick. Hospitals and healthcare professionals are now penalized for not adequately implementing (or not complying) with the rules set forth by the CMS.

At the state level, we focus on the government enacted Certificate of Need programs to evaluate compliance. CON programs, by design, force hospitals to conform to the directive of a legitimate authority, in this case, the state in which it operates, to fulfill the needs of a community. Therefore, we can view CON programs as a location-based standard for compliance. Given that states have free reign to regulate the facilities and services of hospitals, the enforcement and penalties vary by state.

Given the heavily regulated nature of this industry, innovation in processes and services may be stimulated by government incentives and/or penalties, as well as monitored by regulators.

Model and Hypotheses

Figure 1 represents our model of a hospital's aspiration shortfall impacting its decisions on how much to innovate in IT-enabled clinical process innovation and services innovation, as well as the moderating influence of the federal and state regulatory environments.

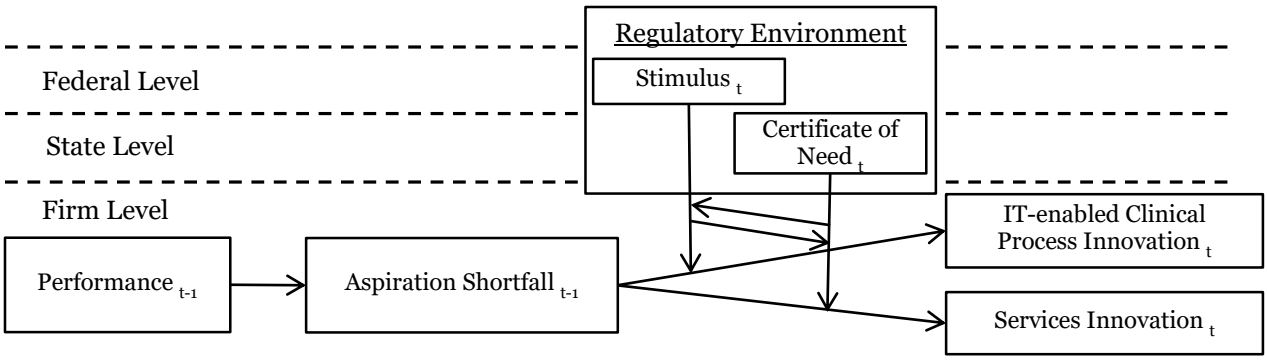

Figure 1: Research Model

Influence of Aspiration Shortfall on IT-enabled Clinical Process Innovation and Services Innovation

Behavioral Theory of the Firm asserts aspiration shortfall will trigger a search for ways to address the shortfall. Salge et al (2015) found that when a hospital experienced decreased patient survival rates with respect to its reference group, it increased investments in IT, ostensibly to address this shortfall. In our context of general surgical and medical hospitals in the U.S., we define a hospital's aspiration shortfall as a decrease in its performance (increased patient cost of care and decreased patient quality of care) relative to its reference group.

To address this aspiration shortfall, a hospital needs to be innovative in two distinct areas. First, it can innovate in IT-enabled clinical process innovations. Innovations in clinical processes have goals in reducing readmissions, reducing clinical errors, and eliminating unnecessary testing, all of which can positively influence patient quality and cost of care. For example, innovations to clinical processes can facilitate shorter hospital stays, which can ultimately reduce costs (Newby et al. 2000). Secondly, innovations in services go directly to the core of how a hospital creates value for a patient. By expanding and developing new services, it is either creating new markets or filling a gap in the market and thus bolstering their innovation in services. Either of these innovations is likely to address the aspiration shortfall experienced by the hospital. Therefore, we present the following:

H1: When a hospital experiences a performance aspiration shortfall, it will lead to increases in (a) IT-enabled Clinical Process Innovation and (b) Services Innovation.

Moderating Effect of the Federal Incentive Program

In February 2009, the American Recovery and Reinvestment Act was signed into law and with it the HITECH Act, which promoted the expansion of health information technology. The HITECH Act specified incentive payments to eligible professionals and hospitals starting in 2011. Prior to the Act being signed into law, there was uncertainty in the industry as to the final contents of the act as well as if the act was even going to pass Congress. We view this period (pre-2009) as an uncertainty phase. After the Act was signed into law in 2009, it would not be until 2011 that the incentive payments would start. We view this period as a weak incentive phase. Hospitals know the contents of the Act and what will be required of them, but they will not directly benefit from it in the form of incentives until 2011. From 2011 onward, we view this period as a strong incentive phase, i.e., the incentive payment can now be realized by hospitals. See Figure 2 for the timeline of the phases.

As stated above, Behavioral Theory of the Firm asserts that when an organization faces an aspiration shortfall, it triggers a search for various ways to address the shortfall. In the context of the healthcare industry, the federal government allocated billions of dollars to promote and expand clinical process innovations. Therefore, a hospital should be more willing to increase their IT-enabled clinical process innovations when experiencing an aspiration shortfall while under the federal incentive program as the cost to them would be subsidized. We further argue, that given the same aspiration shortfall, the level of IT-enabled clinical process innovation may depend on what regulatory phase the hospital is currently in, see Figure 3. Therefore, we propose the following hypothesis:

H2: When a hospital experiences a performance aspiration shortfall, it will increase IT-enabled clinical process innovation, more so when moving from the uncertainty phase through the weak incentive phase to the strong incentive phase in the regulatory environment.

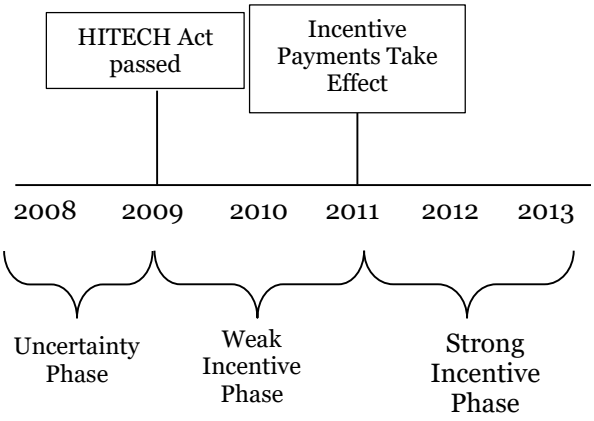

Figure 2: Federal Incentive Program Phases

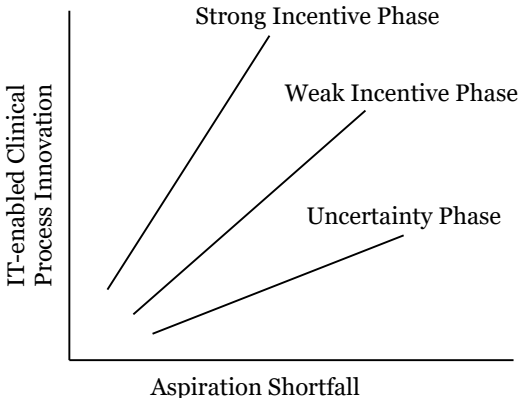

Figure 3: Moderation of Federal Incentive Program

Moderating Effect of State Compliance Programs

As detailed in the prior sections, CON programs are state-specific and as such, states are given the right to regulate a variety of services and facilities. These are generally common services, such as Cardiac Catheterization, Computed Tomography (CT) Scanners, Gamma Knives, Magnetic Resonance Imaging (MRI) Scanners, Neo-Natal Intensive Care, Obstetrics Services, Open Heart Surgery, Organ Transplants, and Positron Emission Tomography (PET) Scanners, to name a few. Thus the severity of a state's CON programs can be seen as the degree of state oversight for common services. As a hospital searches for ways to address its aspiration shortfall, CON programs add an additional layer of bureaucratic costs by regulating common services, and thus the hospital has a greater incentive to pursue uncommon or innovative services. Therefore, we hypothesize:

H3: When a hospital experiences a performance aspiration shortfall and operates in a state with a high severity of CON programs, the hospital will increase services innovation more than if it operated in a state with a low severity of CON programs.

Moderating Effect of the Federal Incentive Program Co-present State Compliance Programs

Above, we argued for the positive relationship between a hospital experiencing an aspiration shortfall and IT-enabled clinical process innovation when under a federal incentive program and for the positive relationship between a hospital experiencing an aspiration shortfall and services innovation under CON programs. In each of these circumstances we cannot ignore the state in which a hospital operates or the federal regulatory environment. Hospitals located in a state with a CON have more of an incentive to innovate away from IT-enabled clinical process innovation and more towards services innovation, as services innovation represent an underserved variety of amenities. Whereas, the federal incentive program incentivizes hospitals with payments to increase their innovations in IT-enabled clinical processes. Therefore, there are two different regulatory initiatives that are trying to divert hospital resources towards either IT-enabled clinical process or services innovation. Thus, we hypothesize:

H4a: The positive relationship between a hospital's performance aspiration shortfall and its IT-enabled clinical process innovation under the federal stimulus program will be dampened when the hospital is in a state with CON programs.

H4b: The positive relationship between a hospital's performance aspiration shortfall and its services innovation under the federal stimulus program will be dampened when the hospital is in a state with CON programs.

Empirical Study

Data Sources

We have created a comprehensive longitudinal dataset from multiple sources. From the American Hospital Association (AHA) Annual Survey, we obtained a list of the current services offered by the hospital, as well as financial and demographic information. Taken together, our data spans from 2008 to 2013, before and after a major federal government intervention (i.e., the 2009 Stimulus Package).

The dependent variables consist of IT-enabled clinical process innovation, technology-enabled services innovation, core services innovation, and support services innovation. These variables were measured using a Saidin index. Per Spetz and Baker (1999), we used the weighted sums of the number of technologies or services available in the hospital (from a list of possible technologies or services provided by the AHA Annual Survey), with the weights being the percentage of hospitals in the country that do not possess the technology or service. Thus, the Saidin index will increase with the addition of new technologies or services and increase more with the addition of technologies/services that are relatively rare. Rarer technologies or services are usually more expensive, new, or difficult to implement, and thus should have more weight in the Saidin Index (Spetz and Baker 1999). Therefore, technologies/services that are more common, such as operating rooms, receive lower weights. This index should increase over time with increases in the degree of technology or services advancement.

We draw on Greve (2003) and Cyert & March (1963) to operationalize performance aspiration level. We measure a hospital's aspiration as the average performance of those hospitals in the hospital's reference group. The reference groups are defined based on whether the hospital is teaching/non-teaching, non-profit/for-profit, and geography. The Performance (P) variables considered are (1) patient cost of care operationalized as hospital operating expense or Total Facility Expenses (excluding bad debt) (Rivers and Bae 1999) and (2) patient quality of care is measured as patient satisfaction (recommendation, as well as overall rating) and by pneumonia readmission rate (Bhardhan et al. 2015; Menon and Kohli 2013).

The moderator variables represent the regulatory environment at the federal and state levels. The 2009 stimulus package is measured as phases using binary variables. The uncertainty phase is from 2008-2009. The weak incentive phase is from 2009-2010. The strong incentive phase is from 2011-2013. Certificate of Need programs are regulated at the state level. We created an index to measure the severity of the CON programs in each state. This was calculated by the total number of facilities or services regulated by CON in a particular state over the total number of facilities or services that are regulated by CON across all states. An index measure of 0 (zero) would mean that there are no facilities or services in the state regulated by CON programs, whereas a 1 (one) would mean substantial regulation, in that the state regulates all possible facilities and services.

This data was combined with data on hospital characteristics from the AHA Annual Survey Database as well as data from the AHA IT Supplement, CMS, the U.S. Department of Health and Human Resources (HHS), and the National Conference of State Legislatures (NCSL). The full dataset contains information on approximately 6,500 U.S. hospitals and provides us with numerous variables ranging from hospital demographics, organizational structure, utilization data, physician arrangements, managed care relationships, hospital expenses, and hospital staffing. The final, merged dataset contains approximately 3,500 hospitals from 2008-2013 (sample size pared down to general surgical and medical hospitals).

Construct Operationalization

Table 1 presents the measures used for the constructs and the data sources.

Variable		Description	Source
Name	**Type**		
IT-enabled Clinical Process Innovation	DV	Saidin Index of 36 IT-enabled Clinical Process Innovations	AHA
Technology-enabled Services Innovation	DV	Saidin Index of 21 Technology-enabled Services Innovations	
Core Services Innovation	DV	Saidin Index of 26 Core Services Innovations	
Support Services Innovation	DV	Saidin Index of 66 Support Services Innovations	
Aspiration Shortfall	IV	Difference between a hospital's performance in year t and the average performance of its reference group that year. The following aspects of performance as considered: • Pneumonia Readmission Rate • Hospital Patient Satisfaction • Operating Expenses (Total Facility Expense)	CMS
Stimulus	Moderator	Binary, 0/1 = not in phase/in phase: Uncertainty Phase, Weak Incentive Phase, Strong Incentive Phase	HHS
Certificate of Need	Moderator	Number of services regulated by CON in the given state/Total number of services regulated by all CON programs	NCSL
Teaching Status	Control	Binary, 0/1 = teaching/non-teaching	AHA
Ownership	Control	Binary, 0/1 = for profit/non profit	
Affiliate	Control	Binary, 0/1 = in a system/ not in a system	
Slack Resources	Control	Ratio of Assets/Liabilities	
Size	Control	Number of Beds (Log)	
Location	Control	State in which hospital is located	
Case Load	Control	Number of annual inpatient admissions per full-time equivalent employee	
Region Variables	Control	Dummy variable indicating region hospital is located	

Table 1: Measures for Constructs and Data Sources

Analysis

Our empirical estimations will use panel data analyses. We plan on lagging aspiration shortfall by at least one year to decrease the potential for endogeneity (Greene 2007). Other lags will also be examined as robustness. We will use the Hausman test to determine if fixed or random effects estimation is favored. Multicollinearity will be quantified by using the variance inflation factor (VIF) and condition indices. Interaction plots will be generated for significant interactions. We will also use propensity score matching and other robustness checks including varying hospital reference groups in the assessment of aspiration shortfalls.

Expected Contribution

By integrating the Behavioral Theory of the Firm and Institutional Theory, we will be able to (1) identify the influence of aspiration shortfalls in patient quality of care and patient cost of care on IT-enabled Clinical Process Innovation and Services Innovation, and (2) identify how these relationships change based on regulations at the federal and state levels. More broadly, we expect our study to expand our understanding of how a firm's strategic choices with respect to innovation can be influenced through incentives and controls at different levels in the regulatory environment.

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