

RESEARCH REPORT

The role of organizational culture in health information technology implementations: A scoping review

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Abstract

Introduction: The exponential growth in health information technology (HIT) presents an immense opportunity for facilitating the data-to-knowledge-to-performance loop which supports learning health systems. This scoping review addresses the gap in knowledge around HIT implementation contextual factors such as organizational culture and provides a current state assessment.

Methods: A search of 13 databases guided by Arskey and O'Malley's framework identified content on HIT implementations and organizational culture. The Consolidated Framework for Implementation Research (CFIR) was used to assess culture and to develop review criteria. Culture stress, culture effort, implementation climate, learning climate, readiness for implementation, leadership engagement, and available resources were the constructs examined. Rayyan and Qualtrics were used for screening and data extraction.

Results: Fifty two studies included were mainly conducted in Academic Health Centers (n = 18, 35%) and at urban locations (n = 50, 96%). Interviews frequently used for data collection (n = 26, 50%) and guided by multiple frameworks (n = 34). Studies mostly focused on EHR implementations (n = 23, 44%) followed by clinical decision support (n = 9, 17%). About two-thirds (n = 34, 65%) reflected culture stress theme and 62% (21 of 34) acknowledged it as a barrier. Culture effort identified in 27 studies and was a facilitator in most (78%, 21 of 27). Leadership engagement theme in majority studies (71%, n = 37), with 35% (n = 13) noting it as a facilitator. Eighty percent (42 studies) noted available resources, 12 of which identified this as barrier to successful implementation.

Conclusions: It is vital to determine the culture and other CFIR inner setting constructs that are significant to HIT implementation as facilitators or barriers. This scoping review presents a limited number of empirical studies in this topic highlighting the need for additional research to quantify the effects of culture. This will help build evidence and best practices that facilitate HIT implementations and hence serve as a platform to support robust learning health systems.

KEYWORDS

health information technology, implementation framework, implementation science, learning health systems, organizational culture, review

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1 | BACKGROUND

1.1 | Increasing investments and implementations in Health Information Technology

Since the 2010 multi-billion dollar investment in health information technology (HIT) through the HITECH Act,¹ the HIT industry has been on a growth trajectory. Subsequent major federal health initiatives (CURES Act in 2016,² CARES in 2020³) have included significant provisions leveraging HIT to improve the quality and outcomes in healthcare. While HIT interventions hold a lot of promise for improving healthcare, many HIT solutions are not able to deliver on this promise due to a multitude of factors including adoption and implementation issues. Apart from substantial organizational investment, HIT implementations also suffer from high failure rates,⁴ as these systems are complex impacting numerous stakeholders across an organization and requiring buy-in for success. Given the magnitude of financial capital and human resources being invested, it is vital to understand factors that influence HIT implementations.

1.2 | Implementation science framework to understand HIT implementations

Informatics is a socio-technical field, and there is an increasing need to understand the role of contextual factors such as organizational culture in impacting HIT implementations. Implementation science offers a systematic way to understand the barriers and facilitators to implementing innovations. The Consolidated Framework for Implementation Research (CFIR)^{5,6} is a state of the science implementation framework which provides a robust method to examine constructs that are associated with effective implementations. The CFIR consists of five main constructs (outer setting, inner setting, intervention characteristics, individual characteristics, and process).⁵ Organizational culture, an inner setting

construct in CFIR, has been recognized as an important factor in HIT implementations.⁷ Culture is defined as the norms, values, and basic assumptions of a given organization.⁸ Fernandez et al, assessed various measures related to the inner setting of CFIR and highlighted culture stress and culture effort as sub-constructs of culture.⁹ In addition to culture, CFIR includes implementation climate and readiness to implementation (leadership engagement, available resources) as constructs in inner setting.⁵ Table 1 presents the definitions of key concepts related to culture utilized in this study.

1.3 | HIT and implementation science as pillars to support Learning Health Systems

Learning Health Systems (LHS) are organizations that continuously self-study and adapt using data and analytics to generate knowledge, engage stakeholders and implement changes to transform healthcare delivery.¹⁰ The rapid pace of growth in HIT enables the acceleration of learning cycles that convert data to knowledge (D2K), knowledge to performance (K2P), and performance to data (P2D).¹¹ A well-functioning LHS is one wherein science, informatics, incentives, and culture are aligned for continuous improvement and innovation.¹² The intellectual advancement and broad impact of LHS innovations underscore the importance and research to support LHS.

Because of their significant impact on several organizational and team structures across IT and clinical care, HIT implementations can be classified as complex healthcare interventions.¹³ Robust evaluation methods are typically needed to understand how complex interventions work in different contexts. Supporting culture is considered a critical infrastructure component for effective LHS.¹⁴ Informatics and implementation science are recognized competencies for LHS researchers.¹⁵ This study brings these domains together and aims to understand the influencing role of organizational culture in the context of informatics and HIT implementations.

TABLE 1 Definitions of Culture Related Concepts

Concept	Definition
Culture	"Norms, values, and basic assumptions of a given organization" ⁵
Culture stress	"Perceived strain, stress, and role overload" ⁹
Culture effort	"How hard people in organizations work toward achieving goals" ⁹
Implementation climate	"The absorptive capacity for change, shared receptivity of involved individuals to an intervention, and the extent to which use of that intervention will be rewarded, supported, and expected within their organization" ⁵
Learning climate	"A climate in which: (a) leaders express their own fallibility and need for team members' assistance and input; (b) team members feel that they are essential, valued, and knowledgeable partners in the change process; (c) individuals feel psychologically safe to try new methods; and (d) there is sufficient time and space for reflective thinking and evaluation" ⁵
Readiness for implementation	"Tangible and immediate indicators of organizational commitment to its decision to implement an intervention" ⁵
Leadership engagement	"Commitment, involvement, and accountability of leaders and managers with the implementation" ⁵
Available resources	"The level of resources dedicated for implementation and on-going operations, including money, training, education, physical space, and time" ⁵

1.4 | Prior research

Prior scoping reviews of HIT implementations have focused on the concept of “champions” to synthesize their characteristics, behaviors, and impacts on HIT implementations.¹⁶ A subsequent study aimed to understand the breadth of impact of these champions by increasing scope to include implementation leader, opinion leader, facilitator, and change agent.¹⁷ Both reviews found that champions were important positive influences for effective implementations. A recent study by Gui et al, specifically focused on the role of physician champions through qualitative explorations of their challenges and strategies during a large-scale HIT implementation.¹⁸

1.5 | Study objectives

The objective of this scoping review was to summarize current evidence regarding organizational culture in HIT implementations. The aim was to understand the scope and impact of organizational culture by assessing both quantitative and qualitative studies, which addresses a critical gap in knowledge on this important construct. By examining the supporting constructs of the CFIR Inner Setting domain, the review provides added clarity to the impact of organizational culture in HIT implementations.

2 | METHODS

The study approach was based on the five-step framework developed by Arskey and O'Malley¹⁹: (a) identifying the research question, (b) identifying relevant studies, (c) selecting studies, (d) charting relevant data, and (e) summarizing and reporting the results. The study was registered in the Open Science Framework²⁰ prior to start of the research.

2.1 | Sources and searches

Relevant studies were identified by conducting a comprehensive search incorporating both natural language and controlled vocabulary that reflected the concepts of organizational culture (including change management, organizational culture, and values) and health information technology implementation, including electronic health record implementation. Searches were limited to items published since 2010 and through March 2020. No limits were placed on the language of publication or study design. The search strategy was executed across 13 databases: MEDLINE, PsycINFO and Embase via Ovid; PubMed; Cochrane Library via Wiley; Scopus Web of Science Core Collection; Business Source, CINAHL, Library & Information Science Source and Library, Information Science & Technology Abstracts via EBSCO; CRD Database; and IEEE Xplore. The full search strategy is available in Data S1.

2.2 | Selection of studies

Two independent researchers screened each title and abstract using previously defined inclusion and exclusion criteria. Screening was facilitated by Rayyan,²¹ a web-based tool intended for systematic review screening. The HITECH Act definition of HIT was utilized for this study: “hardware, software, integrated technologies, or related licenses, intellectual property, upgrades, or packaged solutions sold as services that are designed for or support the use by health care entities or patients for the electronic creation, maintenance, access, or exchange of health information”.¹ Examples include electronic health records (EHRs), clinical decision support (CDS) tools, and technologies involving clinical notes, medication lists, laboratory results, and telemedicine. We utilized the CFIR definition of culture as “norms, values, and basic assumptions of a given organization.” Culture related definitions and constructs mentioned in CFIR were used to develop inclusion and exclusion criteria.

Articles were excluded if they did not include some component of organizational culture, did not involve a HIT implementation, were based outside of the United States, or described projects primarily completed prior to 2010. Articles also were excluded if they were focused on health information exchange (HIE) implementation or described a technology such as mobile apps aimed at patient self-management. The initial screening process was followed with full-text screening using previously established criteria. Three authors (SR, GH, CB) were involved in all aspects of screening process (title/abstract and full text reviews). Any discrepancies in screening decisions were resolved through discussion or by a senior faculty researcher (GM) where necessary. Reasons for exclusion were recorded to be reported in accordance with PRISMA-ScR standards.²²

2.3 | Data extraction and synthesis

Relevant data for charting was first identified collaboratively by the researchers. A data charting form using survey software (Qualtrics, Provo, UT) was developed by one researcher (GH) and tested by other researchers (CB, SR) for any potential further refinement or clarification. Every study was reviewed by two researchers and discrepancies in the data extracted were resolved through consensus. As this is a scoping review rather than a systematic review or meta-analysis, formalized risk of bias assessment was not undertaken.

The type of HIT implemented was recorded along with any HIT vendor to capture the predominance of studies around any particular HIT. Next, the factors related to culture (culture stress, culture effort) were identified, along with implementation climate, learning climate, readiness for implementation, leadership engagement, and available resources. These seven constructs were chosen for this study due to the availability of tools/measures as validated by Fernandez et al.⁹ The definitions presented in this paper were used as guidelines to code culture and related constructs. Relevant text from studies were highlighted and captured in the form so that additional analysis could be performed. Two researchers reviewed all qualitative data to code

each construct identified in a paper as being a barrier to implementation, facilitator to implementation, both a barrier and a facilitator, or to have an unclear role or impact. Following extraction of needed information, the results were synthesized, and findings summarized through iterative discussions in the research team (SR, GH, CB, and GM).

3 | RESULTS

3.1 | Study selection

The literature search results are presented in Figure 1 using the PRISMA flow chart. The searches across various databases yielded 3787 articles and no additional papers were brought in through other sources. After the removal of duplicate articles, 2178 articles remained which met the criteria for initial screening. After title and abstract review, 1845 of these were excluded and 333 articles met the criteria for full text review. The full text screening led to exclusion of 278 articles (reasons listed in Figure 1) with 55 papers for inclusion in the detailed analysis. Three of those used the same data as selected ones and so a final count of 52 studies are included. A listing of these studies with relevant information is provided in Data S2.

3.2 | Study characteristics

3.2.1 | Publication timeframe

The years 2015 ($n = 8$) and 2018 ($n = 8$) had the most publications of the 52 selected studies. It should be noted that data for the year 2020 included only the months of January through March but had 6 studies published by then. The inclusion of culture and related concepts over the years is represented in Figure 2. Culture stress was

predominant in 2015 ($n = 6$) and culture effort was also a strongly identified theme that year ($n = 8$). Implementation Climate ($n = 19$), Leadership Engagement ($n = 19$) and Available Resources ($n = 29$) have been consistent factors identified in most articles since 2017.

3.2.2 | Study location and health system

Studies were most frequently conducted in Academic Health Centers ($n = 18$, 35%), followed by studies conducted in multiple settings/systems ($n = 16$, 31%) as presented in Table 1. Three studies were conducted in the setting of the Veteran's Administration and only 2 studies were conducted in Federally Qualified Health Centers (FQHC). Smaller settings had fewer studies (independent clinics = 2, outpatient clinics = 2) and only 1 study had a focus on critical access hospitals. Almost all studies predominantly were conducted in urban locations ($n = 50$, 96%) and only 2 studies (4%) were done exclusively in rural locations. In terms of the geographic representation, 19 studies (37%) included settings nationwide across the US, with Massachusetts being the most represented ($n = 6$, 12%).

3.2.3 | Study data collection and implementation phase

Given the need to gather detailed information on implementations, half of the studies ($n = 26$, 50%) collected data using interviews. This was followed by data collection using surveys ($n = 16$, 30%) and field studies/observations ($n = 12$, 23%). A large number of studies included more than one data collection method. A majority ($n = 38$, 73%) of papers were on the implementation phase of the HIT cycle along with elements of evaluation ($n = 34$, 65%). Fourteen papers (27%) had some aspects of planning along with emphasis on implementation.

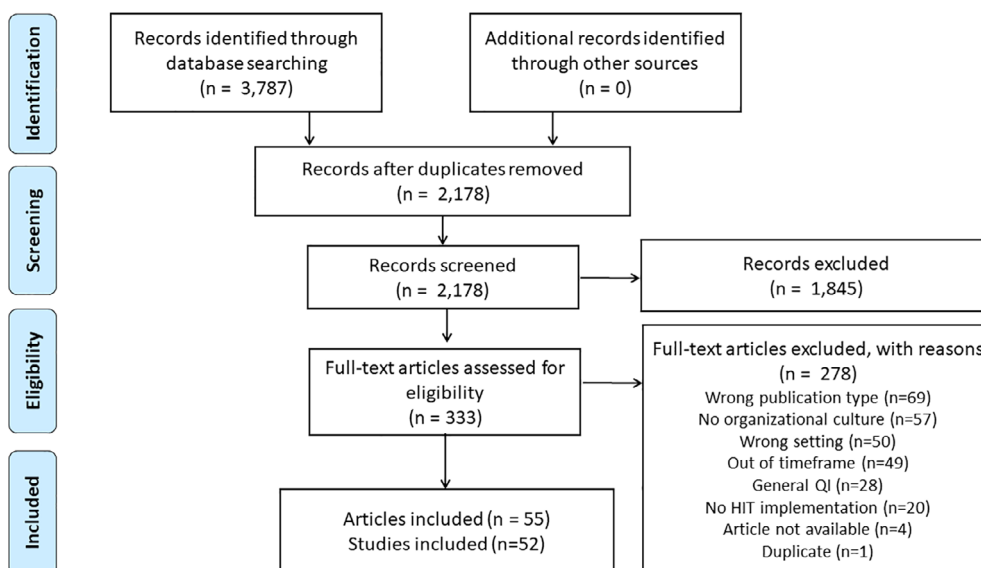


FIGURE 1 PRISMA diagram for literature search on culture in HIT implementations

3.3 | Frameworks used

A total of 34 frameworks were used across these studies (Figure 3). Some studies (n = 8) utilized more than one

framework to guide their research and its interpretation. Frameworks were primarily drawn from the field of implementation science, including the CFIR and Reach, Effectiveness, Adoption, Implementation and Maintenance (RE-AIM). The sample of studies

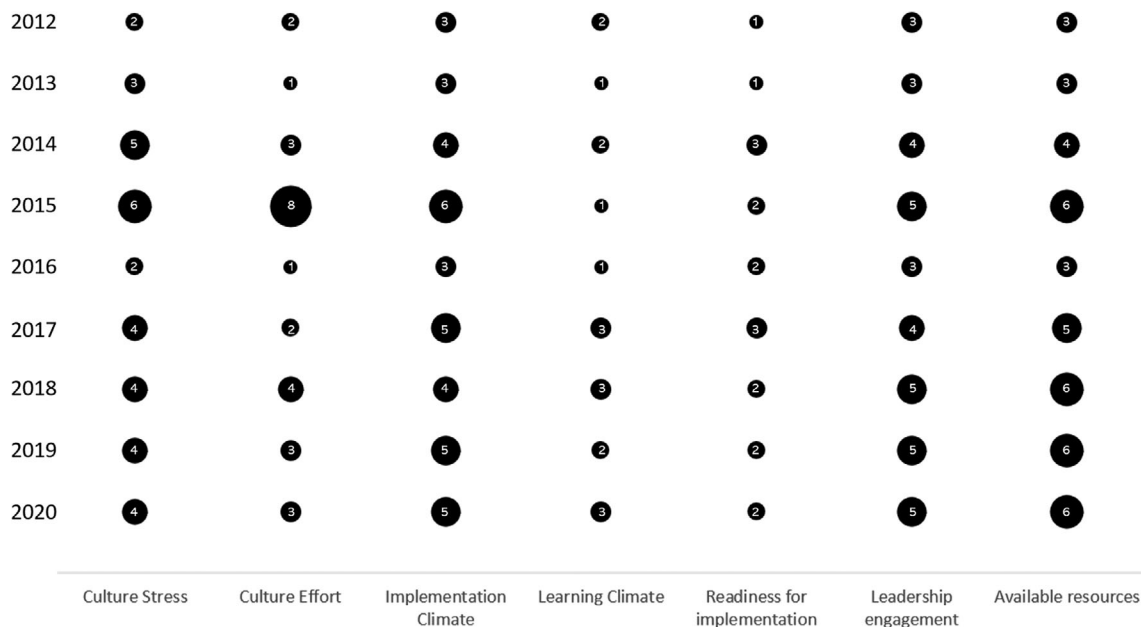


FIGURE 2 Representation of culture concepts in citations over the study period

Reach, Effectiveness, Adoption, Implementation and Maintenance (RE-AIM) Framework		Consolidated Framework for Implementation Research (CFIR)	
Expert Recommendations for Implementing Change (ERIC)	Multiple Perspectives Framework	Technology Acceptance Model	
Professional Complex Systems Theory	Social Network Theory	Social Influence Theory	
Interprofessional Collaborative Practice Theoretical Framework	Job Characteristics Model (JCM)	Adaptive Structuration Theory (AST)	
Integrated Behavioral Model	Plan-Do-Study-Act performance improvement model	Ecological Transactional Model	
Organizational Readiness for Change	Complex Adaptive Systems Theory	Planned Organization Change Theory	
Participative Decision Making	Coping Model of User Adaptation (CMUA)	Competing Values Framework	
Transtheoretical Model of Change	TeamSTEPPS	Rogers' Diffusion of Innovations (DOI) Theory	
Organizational Information Processing Theory	Transtheoretical Model for Organizational Change	Social Cognitive Theory	
Kubler-Ross Five Stages of Grief	Kotter's Eight Step Change Management Framework	Situated Cognition Theory	
Situated Change Perspective	Coordination Theory	Eight-Dimensional Socio-Technical Model	
Fit between Individuals, Task and Technology (FITT) Framework		Social Processes of Sensemaking	

FIGURE 3 Frameworks used to study and represent culture

TABLE 2 Details on Health Information Technology Implementations in Selected Studies

ID	Year	Study citation	Study emphasis/ type of HIT	Study location		Study data collection	Study health system type and name	Study focus/Phase of HIT cycle	Study HIT vendor info
				Urban/Rural	Region/State				
1	2020	Bachmann et al ²³	Patient reported outcomes system	Urban	Southeast (TN)	Stakeholder feedback	Academic Health Center	Planning; Implementation	Epic
2		Businger et al ²⁴	Patient portal, Patient interactive platform, EHR dashboard	Urban	Northeast (MA)	Stakeholder feedback, Systems/ chart review	Academic Health Center (Brigham and Women's Hospital)	Implementation	Epic
3		Cartier et al ²⁵	Platform for referral to social services	Urban	Nationwide	Review existing literature, Market/ vendor analysis	Multiple	Planning; Implementation	Multiple referral tools ^a
4		Chipps et al ²⁶	General EHR optimization	Urban	Nationwide	Focus group	Multiple	Evaluation	Multiple
5		Heinze and Heinze ²⁷	EHR	Urban	Nationwide	Survey, Interview	Multiple	Implementation; Evaluation	Multiple
6		Sieck et al ²⁸	EHR	Urban	Midwest	Interview	Academic Health Center	Implementation; Evaluation	Epic
7	2019	Angoff et al ²⁹	EHR	Urban	Northeast (MA)	Systems/chart review	Federally Qualified Health Center (Boston Health Care for the Homeless Program [BHCHP])	Implementation	Epic
8		Chaturvedi et al ³⁰	Intravenous clinical integration (IVCI) to allow bidirectional communication between EHRs and infusion pumps	Urban	Westcoast (CA)	Interview, Field studies/ observation	Academic Health Center (Cedars- Sinai Medical Center)	Planning; Implementation	EHR: Epic, Dispensing cabinet: Pyxis, Smart pump vendor: CareFusion
9		Orenstein et al ³¹	CDS for refugee health	Urban	Nationwide	Stakeholder feedback	Multiple	Planning; Implementation	Epic
10		Pittman et al ³²	eScreening patient self-assessment tool	Urban	Westcoast (CA)	Survey, Interview, Focus Group	VA/Military (VA San Diego Healthcare System [VASDHS])	Implementation	Not specified
11		Rangachari et al ³³	Social Networking System	Urban	Southeast (GA)	Interview, Systems/ chart review	Academic Health Center (AU Health [Augusta University's Health System])	Planning; Implementation; Evaluation	EHR: Cerner, Message system: Yammer

TABLE 2 (Continued)

ID	Year	Study citation	Study emphasis/ type of HIT	Study data collection		Study location		Study health system type and name	Study focus/Phase of HIT cycle	Study HIT vendor info
				Interview	Survey, systems/ chart review	Urban	Rural			
12		Zhang et al ³⁴	Patient Reported Outcomes System	Interview		Urban	Midwest (IL)	Academic Health Center (Northwestern Medicine)	Evaluation	Epic
13	2018	Anderson et al ³⁵	EHR based communication tool	Survey, systems/ chart review		Urban	Midwest	Academic Health Center	Planning; Implementation	Not specified
14		Barrett ³⁶	EHR	Survey		Urban	Southwest	Federally Qualified Health Center	Evaluation	Epic
15		Campione et al ³⁷	EHR, E-reporting	Survey		Urban	Nationwide	Multiple	Planning; Implementation	Multiple
16		Chung et al ³⁸	CPOE for chemotherapy	Survey, stakeholder feedback, systems/ chart review		Urban	Southwest (TX)	Academic Health Center (Harris Health System)	Implementation; Evaluation	Epic
17		Creber et al ³⁹	CDS tool for pediatric head trauma	Interview, Existing literature, Market/ vendor analysis		Urban	Westcoast (CA)	Integrated Health System (Kaiser)	Evaluation	Epic
18		Giuliano et al ⁴⁰	Clinical decision support for antimicrobial stewardship	Interview		Urban	Nationwide	Integrated Health System (Ascension Health)	Evaluation	CDS: SENTRI7
19		Hao and Padman ⁴¹	Wireless personal digital assistant based tool for online access to clinical data for phsticians	Systems/chart review		Urban	Northeast (PA)	Integrated Health System	Implementation; Evaluation	Not specified
20		Rao-Gupta et al ⁴²	Patient Interactive Platform	Survey, systems/ chart review, Field studies/ observation		Urban	Midwest (IL)	Academic Health Center (Ann & Robert H. Lurie Children's Hospital of Chicago)	Implementation	Patient Interactive Platform: GetWellNetwork
21	2017	Kim et al ⁴³	General HIT	Survey		Urban	Nationwide	Multiple	Evaluation	Multiple
22		Kooienga and Singh ⁴⁴	e-prescribing	Interview, field studies/ observation		Rural	West	Independent Clinic	Evaluation	e-prescribing tool: Surescripts
23		Leslie et al ⁴⁵	General HIT	Field studies/ observation		Urban	Nationwide	Academic Health Center	Evaluation	Not specified

(Continues)

TABLE 2 (Continued)

ID	Year	Study citation	Study emphasis/ type of HIT	Study data collection		Study location		Study health system type and name	Study focus/Phase of HIT cycle	Study HIT vendor info
				Interview	Case study	Urban/Rural	Region/State			
24		Mason et al ⁴⁶	EHR	Interview		Rural	Midwest (MO)	Outpatient Clinic	Implementation; Evaluation	Not specified
25		Reidy et al ⁴⁷	Internet based tool for advanced care planning, integrated into the EHR	Case study		Urban	Northeast (MA)	Academic Health Center (UMass Memorial Medical Center)	Planning; Implementation; Evaluation	Advanced Care planning tool: Luminat
26		Saleem et al ⁴⁸	EHR	Case study		Urban	Southwest (TX)	Inpatient Hospital	Implementation; Evaluation	Not specified
27		Tobler et al ⁴⁹	EHR	Interview, Field studies/ observation		Urban	West (UT)	Outpatient Clinic	Planning; Implementation	Not specified
28	2016	Ballaro and Washington ⁵⁰	EHR	Survey		Urban	Nationwide	VA/Military (Military Healthcare System [MHS])	Implementation	Not specified
29		Bentley et al ⁵¹	EHR	Case study		Urban	Midwest (OH)	Academic Health Center (Ohio State Wexner Medical Center)	Planning; Implementation; Evaluation	Not specified
30		Gross et al ⁵²	EHR	Case study		Urban	Northeast (MA)	Academic Health Center (Dana- Farber Cancer Institute)	Implementation; Evaluation	Not specified
31		Lin et al ⁵³	Electronic drug- disease alert for patients with CKD	Interview		Urban	West (WA, AK, MT, ID)	Multiple	Planning	Multiple
32		Queenan and Devaraj ⁵⁴	CPOE	Survey		Urban	Nationwide	Inpatient Hospital (Multiple)	Evaluation	Multiple
33		Ramsey et al ⁵⁵	General HIT	Survey		Urban	Nationwide	Multiple	Implementation	Multiple
34	2015	Callahan et al ⁵⁶	Sexual orientation and gender identity fields in EHR	Interview, Field studies/ systems/chart review		Urban	Westcoast (CA)	Academic Health Center (University of California Davis Health System)	Implementation; Evaluation	Not specified
35		Collins et al ⁵⁷	EHR	Interview		Urban	Nationwide	Multiple	Implementation; Evaluation	Multiple
36		Elias et al ⁵⁸	EHR	Field studies/ observation		Urban	Southeast	Independent Clinic	Planning; Implementation	Not specified

TABLE 2 (Continued)

ID	Year	Study citation	Study emphasis/ type of HIT	Study data collection		Study location		Study health system type and name	Study focus/Phase of HIT cycle	Study HIT vendor info
				Study data collection	Study data collection	Urban/Rural	Region/State			
37		McAlearney et al ⁵⁹	EHR	Interview, Focus group	Urban	Nationwide	Multiple	Evaluation	Multiple	
38		Sherer et al ⁶⁰	EHR	Interview, Systems/chart review	Urban	Northeast (PA)	Academic Health Center (Lehigh Valley Health Network)	Implementation; Evaluation	GE Centricity	
39		Wright et al ⁶¹	CDS	Interview	Urban	Nationwide (MA, IN, OR, NJ)	Multiple	Implementation; Evaluation	Multiple	
40		Wright et al ⁶²	Problem lists in EHRs	Survey, Interview, Systems/chart review	Urban	Nationwide (OR, TX, NY, UT)	Multiple	Evaluation	Multiple	
41		Yuan et al ⁶³	EHR	Survey, Interview, field studies/observation	Urban	Not Stated	Academic Health Center	Implementation	Not specified	
42	2014	Chase et al ⁶⁴	EHR	Interview, field studies/observation	Urban	Nationwide	Multiple	Implementation; Evaluation	Multiple	
43		Fairbrother et al ⁶⁵	General HIT	Interview	Urban	Midwest (OH)	Multiple	Implementation; Evaluation	Multiple	
44		Muslin et al ⁶⁶	CPOE	Survey	Rural	Southeast	Inpatient Hospital	Implementation; Evaluation	Not specified	
45		Shea et al ⁶⁷	General HIT	Survey	Urban	Southeast	Academic Health Center (University of North Carolina Health Care System)	Implementation; Evaluation	Not specified	
46		Wells et al ⁶⁸	Personal health record	Survey, Interview	Urban	Nationwide	Multiple	Evaluation	Multiple	
47	2013	Boswell ⁶⁹	EHR	Interview	Urban	Northeast (PA)	Multispecialty ambulatory care organization	Planning; Implementation	Not specified	
48		Craven et al ⁷⁰	EHR	Interview	Rural	Nationwide	Critical Access Hospitals (Multiple)	Planning; Implementation	Multiple	
49		Kitzmilller et al ⁷¹	Electronic nursing documentation system	Field studies/observation	Urban	Southeast	Academic Health Center	Implementation; Evaluation	Not specified	

(Continues)

TABLE 2 (Continued)

ID	Year	Study citation	Study emphasis/ type of HIT	Study location		Study data collection	Study health system type and name	Study focus/Phase of HIT cycle	Study HIT vendor info
				Urban/Rural	Region/State				
50	2012	Ash et al ⁷²	CDS, specifically focused on CDS for providers with ordering authority	Urban	Nationwide (OR, CA, MA, IN, NJ)	Survey, Interview, Field studies/ observation	Multiple sites ^b	Evaluation	Multiple
51		Lanham et al ⁷³	EHR	Urban	Southwest (TX)	Interview, Field studies/ observation	Multispecialty ambulatory care organization	Implementation; Evaluation	Not specified
52		McAlearney et al ⁷⁴	EHR	Urban	Nationwide	Interview, Focus group	Multiple	Implementation; Evaluation	Multiple

^aMultiple Referral Tools: Aunt Bertha, CharityTracker, CrossTx, Healthify, Peces Iris, NowPow, One Degree, TAVConnect (now Signify Community), and Unite Us.

^bMultiple (Providence Portland Medical Center, El Camino Hospital, Partners HealthCare, Wishard Memorial Hospital Clinics, Roudebush Veterans Health Administration, Mid-Valley IPA, RWJ) Medical Group.

also included frameworks from the fields of organizational science, strategic management, change management, social science, information systems, psychology, communications, work redesign and quality improvement.

3.3.1 | Type of HIT and vendor

Table 2 presents the details of the type of HIT implemented in the selected studies. Approximately half of studies (n = 23, 44%) were focused on EHR implementations (both new and switching from legacy EHRs). This was followed by the implementation of CDS tools (CDS/CPOE/alert), which comprised 9 studies (17%). The next set of implementations focus on patient facing tools (PROM, PHR, patient portal) and included 6 studies (11%). The most frequently mentioned EHR vendor in these studies was Epic (n = 10), and in 18 studies no vendor was described as associated with the HIT.

3.4 | Culture and inner setting constructs

Table 3 presents the representation of culture and related inner setting constructs across the selected studies. Apart from identifying the presence of these constructs (culture stress, culture effort, implementation climate, learning climate, readiness for implementation, leadership engagement, and available resources), the table also identifies the role of construct as a barrier, facilitator, both or not stated. These are also depicted graphically in Figure 4.

3.4.1 | Culture stress

Culture stress as defined by Fernandez et al, refers to “Perceived strain, stress, and role overload”.⁹ Out of the 52 chosen studies, about two thirds (n = 34, 65%) included the construct culture stress. Approximately two-thirds of these studies (21 of 34) were identified as barriers and no study listed stress as a facilitator. In the recent publications, about 50% had stress-related concepts in both 2020 (4 out of 6) and in 2019 (4 out of 6). This construct was not connected with a specific vendor or the type of health system.

3.4.2 | Culture effort

Approximately 50% of studies addressed culture effort, defined as “How hard people in organizations work toward achieving goals”.⁹ Culture effort was coded as a facilitator in three fourth of these studies (21 of 27). In most of these studies (23 out of 27), culture effort co-occurred with the construct of implementation climate. Half of studies in recent years (3 out of 6 in 2020 and 3 out of 6 in 2019) were coded for this construct.

3.4.3 | Implementation climate

Implementation climate was defined as “the absorptive capacity for change, shared receptivity of involved individuals to an intervention and the extent to which use of that intervention will be rewarded, supported, and expected within their organization”.⁵ Approximately three-fourths of the studies (n = 38, 73%) mentioned this construct, of which 17 (45%) were identified as a facilitators and 8 (21%) identified as barriers and in 10 studies (26%) this was not stated or was unclear.

3.4.4 | Learning climate

A learning climate is “a climate in which (a) leaders express their own fallibility and need for team members' assistance and input; (b) team members feel that they are essential, valued, and knowledgeable partners in the change process; (c) individuals feel psychologically safe to try new methods; and (d) there is sufficient time and space for reflective thinking and evaluation (in general, not just in a single implementation)”.⁵ Eighteen studies (35%) were coded as representative of this construct, of which 10 (56%) were facilitators and 2 (11%) were barriers.

3.4.5 | Readiness for implementation

“Tangible and immediate indicators of organizational commitment to its decision to implement an intervention” is referred as the readiness for implementation”.⁵ Eighteen studies (35%) were coded to be representative of this construct of which 6 were coded as facilitators, 1 was a barrier, 1 had both listed and 10 studies did not state if it was a barrier or a facilitator or was unclear.

3.4.6 | Leadership engagement

Engagement of the leadership of an organization in the HIT implementation process is an indicator of readiness for implementation and is defined as “Commitment, involvement, and accountability of leaders and managers”.⁵ Close to three-fourths of studies (n = 37, 71%) had identified this construct, of which 13 studies were noted to be a facilitator, 5 as a barrier, 3 were stated to be both and 16 studies did not state if it was a barrier or a facilitator or was unclear.

3.4.7 | Available resources

Eighty percent (42 out of 52 studies) had mentioned available resources as part of the HIT life cycle process (planning, implementation, evaluation), as shown in Table 2. This indicates the “level of resources dedicated for implementation and on-going operations including money, training, education, physical space, and time”.⁵ Of

these, 4 studies had identified available resources as facilitator to implementation efforts, 12 studies as a barrier, 5 indicated both and 12 studies did not state if it was a barrier or a facilitator or was unclear.

3.5 | Impact of organizational culture in HIT implementations

Of all the inner setting constructs, culture stress was most frequently noted as a barrier (21/34 studies), followed by lack of available resources (12/42). Representative quotes (as shown in Table 3) describe the high volume of work and understaffing as issues in implementations. Culture effort (21 studies), implementation climate (17 studies), and leadership engagement (13 studies) were more frequently noted as facilitators. Quotes presented in Table 4 point to shared responsibility, management support, and financial commitment as facilitators related to these constructs. As shown in Table 3, insufficient training programs, perception of roles as passive implementers, and lack of enthusiasm/communication from the top were some of the barriers related to learning climate, readiness for implementation and leadership engagement respectively.

4 | DISCUSSION

The studies provide insight into the range of different types of HIT implementations and the work done to understand the impact of organizational culture on its success across different health systems and geographic locations over the last decade. Despite the breadth of implementations and settings represented, the total number of empirical studies examining organizational culture in this context is limited. Nevertheless, this scoping review yields important insights.

The predominance of EHR implementations in these studies may be due to the timeframe of the study and the influence of the HITECH Act when large numbers of organizations were adopting EHRs or switching from legacy systems. Based on the publication date, it appears that other HIT tools such as patient facing technology (patient portals for capturing PROM) are increasingly being studied once basic functionalities were established. Likewise, Epic being the predominant vendor in these studies is reflective of the fact that this HIT vendor being used by many health systems across the US.^{75,76}

With respect to the study design and data collection methods utilized in these studies, a majority of studies used multiple data collection methods with half of them using interviews with a qualitative approach to gather more contextual data. Most of the published studies are from academic health centers as these entities may be more involved in research and tend to publish due to their academic context.

Overall, 34 frameworks were used across 10 different fields to represent the concepts of culture and other inner setting constructs. Culture stress, culture effort, implementation climate, learning climate, readiness for implementation, leadership engagement, and available

TABLE 3 Representation of organizational culture and inner setting constructs in selected studies

Year	Citation	Culture Stress	Culture Effort	Implementation Climate	Learning Climate	Readiness for implementation	Leadership engagement	Available resources
2020	Bachmann et al ²³			◇			◇	◇
	Businger et al ²⁴	○	□	□			□	◇
	Cartier et al ²⁵	○	◇	□	□	◇		○
	Chipps et al ²⁶	△					□	△
	Heinze and Heinze ²⁷			□	○	□	◇	□
	Sieck et al ²⁸	○	□	□	□		△	○
2019	Angoff et al ²⁹		□	□			□	◇
	Chaturvedi et al ³⁰	△		□	□		△	□
	Orenstein et al ³¹					◇	◇	◇
	Pittman et al ³²	○		□			△	○
	Rangachari et al ³³	△	△	◇	□	◇	◇	◇
	Zhang et al ³⁴	△	□	○				○
2018	Anderson et al ³⁵		□	◇	◇			◇
	Barrett ³⁶	○				□		◇
	Campione et al ³⁷	◇					◇	◇
	Chung et al ³⁸	○	□	□	□			◇
	Creber et al ³⁹		□	□	□	□	□	□
	Giuliano et al ⁴⁰	○					□	△
	Hao and Padman ⁴¹		□				□	
	Rao-Gupta et al ⁴²			◇			◇	
2017	Kim et al ⁴³					◇	◇	◇
	Kooienga and Singh ⁴⁴	△		□		○		△
	Leslie et al ⁴⁵	△		△			◇	
	Mason et al ⁴⁶						△	△
	Reidy et al ⁴⁷			◇	□	□	◇	△
	Saleem et al ⁴⁸	△	□	△	◇			
Tobler et al ⁴⁹	△	□	△	○			○	
2016	Ballaro and Washington ⁵⁰			○			◇	
	Bentley et al ⁵¹			◇	□	□	□	◇
	Gross et al ⁵²	○	□					◇
	Lin et al ⁵³	△						◇
	Queenan and Devaraj ⁵⁴							
	Ramsey et al ⁵⁵			△		◇	○	
2015	Callahan et al ⁵⁶	△	○		◇	◇	○	◇
	Collins et al ⁵⁷		□	△			◇	△
	Elias et al ⁵⁸	△	◇	△			△	
	McAlearney et al ⁵⁹	△	◇	◇		□	◇	◇
	Sherer et al ⁶⁰	△	◇					◇
	Wright et al ⁶¹	△	□					△
	Wright et al ⁶²		□	□				
	Yuan et al ⁶³	△	□	○			□	△
2014	Chase et al ⁶⁴	△	□				◇	◇
	Fairbrother et al ⁶⁵	○	□	□				△
	Muslin et al ⁶⁶	△		△	△	△	○	△
	Shea et al ⁶⁷	○	□	◇		◇	□	
	Wells et al ⁶⁸	△		□	△	◇	□	◇

TABLE 3 (Continued)

Year	Citation	Culture Stress	Culture Effort	Implementation Climate	Learning Climate	Readiness for implementation	Leadership engagement	Available resources
2013	Boswell ⁶⁹	◦	□	□	□	◇	□	□
	Craven et al ⁷⁰	△		◇			◇	◇
	Kitzmiller et al ⁷¹	△		□			□	△
2012	Ash et al ⁷²	△	□	◇	□		◇	△
	Lanham et al ⁷³	◇		□			◇	◇
	McAlearney et al ⁷⁴		□	□	◦	◇	□	◇

Note: □, Facilitator; △, Barrier; ◦, Both; ◇, Not stated.

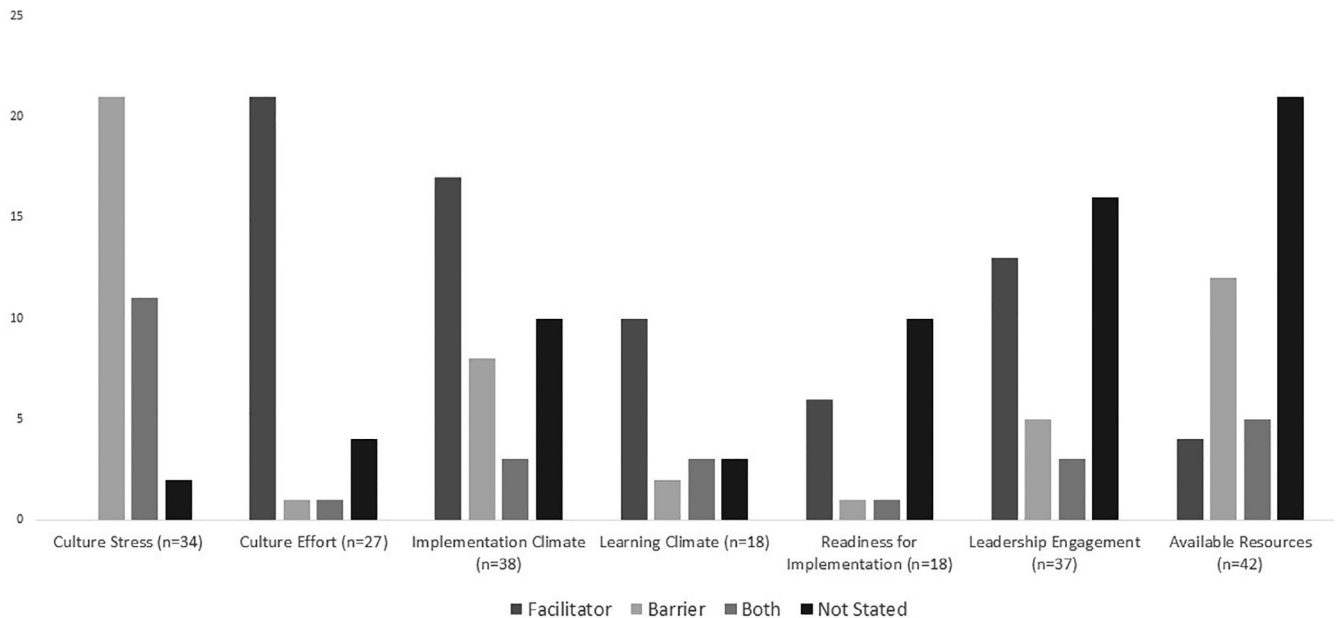


FIGURE 4 Culture and inner setting context themes by code

resources were all represented in this body of literature. However, the influence of these constructs in implementations appears to be varied. All these constructs can be either a barrier or a facilitator in for a particular HIT implementation. This demonstrates how constructs do not exist in isolation, with these constructs often co-occurring and, presumably, influencing each other. Individuals and organizations involved in HIT implementations should consider not only the role of single constructs in serving as barriers or facilitators, but instead may wish to consider the role and interplay of these constructs.

This review points to current gaps in the literature and additional studies are needed to build evidence and develop best practices for effective implementations. Studies which presents contextual information around HIT implementation (objectives, funding, market dynamics, project influencers, decision-makers) will provide valuable insights. More in-depth research is needed to present a set of recommendations that point to optimal criteria that should be in place to ensure successful HIT implementations. Although the intention of a

scoping review is to provide an overview of the landscape, this project identifies that this field is well-positioned to move toward research of efficacy. This could include the use of validated measures, such as those identified by Fernandez et al,⁹ to assess the role of organizational culture in HIT implementations. Only a few academic health centers are the main contributors for publications, and efforts should be made to widen the scope of this research to other institutions and settings, so that findings are generalizable. Robust studies will need to be based on theories and as such guidance on frameworks to be used for studying these HIT implementations is needed.

Findings from this review on organizational culture and HIT implementation can be applicable to the evolving concept of LHS, as informatics is an integral element of LHS. The journey to being effective LHS is iterative characterized by strong leadership, along with a culture and workforce committed to continuous learning and improvement.¹⁵ McGinnis et al,⁷⁷ noted in a recent perspective that the digital revolution with HIT and advanced analytics has the

TABLE 4 Representative quotes on culture related concepts in health information technology implementations

Theme	Sub-theme	Sample quote
Culture stress (n = 34)	Facilitator (n = 0)	NA
	Barrier (n = 21)	“[The participants] articulated that the volume of work shifted to [the staff] was very high and that they were understaffed ... Overall, participants felt that there was not a sufficient numbers of [staff] in their organization and that these [staff] were under-resourced.” (Chipps et al ²⁶)
	Both (n = 11)	“The informant reported that initially there was ‘anticipatory panic’ expressed by medical assistants about fitting the additional work into the clinical workflow. However, once staff started using the platform and were able to see positive effects on patients’ lives, they became more enthusiastic about the technology.” (Cartier et al ²⁵)
	Not Stated or Unclear (n = 2)	“In practices where communication patterns are more fragmented, EHR support staff may need to work with each individual to achieve EHR use goals set by the larger organization.” (Lanham et al ⁷³)
Culture effort (n = 27)	Facilitator (n = 21)	“both primary care providers and specialists considered themselves to have shared responsibility for problem list maintenance” (Wright et al ⁶²)
	Barrier (n = 1)	“I have seen prescribers simply ‘not act’ to reconcile a medication because there was insufficient information or they were not sure” (Rangachari et al ³³)
	Both (n = 1)	“[The authors] viewed this resistance as an invitation to educate leaders, providers, and staff about LGBT health disparities and to expose providers to techniques” (Callahan et al ⁵⁶)
	Not Stated or Unclear (n = 4)	“Managing the culture, it is what it is. The most you can do is find, like a good physician champion, find a strong practice leader.” (McAlearney et al ⁵⁹)
Implementation climate (n = 38)	Facilitator (n = 17)	“...the decision to pursue [an HIT implementation] stemmed from a culture of innovation, particularly regarding initiatives to improve patient safety and organizational efficiency” (Chaturvedi et al ³⁰)
	Barrier (n = 8)	“...physicians did not view their role as active translators of the technology to their local setting. In other words, because physicians felt that the [HIT implementation] was not customized to local needs, resistance was engendered, rather than acceptance” (Muslin et al ⁶⁶)
	Both (n = 3)	“In our case, oncologists were not incentivized to review PROs, whereas surgeons could receive additional payment for including PRO assessment” (Zhang et al ³⁴)

TABLE 4 (Continued)

Theme	Sub-theme	Sample quote
	Not Stated or Unclear (n = 10)	“Cultural shifts within a clinical area are required to promote sustained practice change. The cultural shift toward early mobility started in 2010 ... yet integration of early mobility as a cultural norm continued to be a work in progress” (Anderson et al ³⁵)
Learning climate (n = 18)	Facilitator (n = 10)	“The importance of institution wide educational efforts in resolving user workflow problems cannot be emphasized enough.” (Chung et al ³⁸)
	Barrier (n = 2)	“a lesson here is simply having a training program is not sufficient; providing physicians with a set of instructions for using the ordering software will not necessarily create buy-in” (Muslin et al ⁶⁶)
	Both (n = 3)	“One clinician commented, ‘occasionally things pop up and I have to learn how to do it but after a few times, you learn how to make it faster.’ Another felt she navigated the [new] screen quite well and adapted the screen to meet her needs.” (Tobler et al ⁴⁹)
	Not Stated or Unclear (n = 3)	“The first phase of implementation consisted of staff participation in an online educational module ... Although completion of the eMobility module was not tracked by individual staff participants, the postimplementation survey asked whether the module was viewed and helpful.” (Anderson et al ³⁵)
Readiness for implementation (n = 18)	Facilitator (n = 6)	“organizational innovativeness is likely associated with more forums associated with the technology, including workshops, seminars, and email groups. These outlets create opportunities for employees to ask each other for advice and help” (Barrett ³⁶)
	Barrier (n = 1)	“Physicians here viewed their role simply as passive implementers of a standardized technology package. A physician stated: “The training and implementation left much to be desired.” (Queenan and Devaraj ⁵⁴)
	Both (n = 1)	“One practice was very engaged about change and implementation of technology, while the other was somewhat resistant to change and wary of e-prescribing feeling it was not make prescribing safer with less prescribing errors.” (Kooienga and Singh ⁴⁴)
	Not Stated or Unclear (n = 10)	“Informants at all our sites recognized that some potential EHR users, mainly clinicians, did not have basic computer literacy and skills. Several of the sites recognized this need and developed pre-implementation skills assessments.” (McAlearney et al ⁷⁴)

(Continues)

TABLE 4 (Continued)

Theme	Sub-theme	Sample quote
Leadership engagement (n = 37)	Facilitator (n = 13)	“Support from high level management was instrumental to success and played a critical role in communicating the organizational vision, the expectation for clinician engagement, and that the PHR implementation was the organization's policy” (Wells et al ⁶⁸)
	Barrier (n = 5)	“Though most leadership expressed strong support for eScreening in individual interviews, many staff focus group participants sensed a lack of enthusiasm for the project either because of little to no communication from the top.” (Pittman et al ³²)
	Both (n = 3)	“Several of the primary barriers (eg, openness/buy-in) were centered on collective attitudes and perspectives of those within the organization, such as leaders in the position of making clinical care (and therefore adoption) decisions, about technology-based approaches.... Successful implementation is more likely in climates with motivation to change, that are flexible for embracing innovation, and that have leadership support and infrastructure resources to support the innovation.” (Ramsey et al ⁵⁵)
	Not Stated or Unclear (n = 16)	“Specifically, top-down communication must clearly delineate strategies and tactics for achieving system standardization, processes for change management decisions, the capability of the EHR, and expectations for professional competencies.” (Collins et al ⁵⁷)
Available resources (n = 42)	Facilitator (n = 4)	“However, leadership reported making an early decision to commit the necessary financial requirements for implementation—even when it became clear that the staff time investment was significantly larger than initially expected.” (Creber et al ³⁹)
	Barrier (n = 12)	“A challenge at all four demonstration sites was securing the technical, clinical and informatics resources needed to complete the implementation.” (Wright et al ⁶¹)
	Both (n = 5)	“Physicians noted that training tailored to their role helped them to adapt to using the EHR. For example, as one physician told us, “I think if it's very specific, and it's sort of triggered by the provider... then they think, they'd probably accept it pretty well. But, if it's sort of imposed, probably not.” (Sieck et al ²⁸)
	Not Stated or Unclear (n = 21)	“The organization mobilized over 600 super users who received extra training and were pulled out of staffing to offer at-the-elbow support 24/7 for the first 2 weeks.” (Bentley et al ⁵¹)

potential to increase the scale, speed, and sophistication of LHS. These advances along with a supportive organizational culture will facilitate the adoption of best practices in care processes and generate new knowledge as part of healthcare delivery and support the continuous learning loop of an effective LHS.

4.1 | Limitations

This scoping review has some limitations. The study sample is restricted to only US-based implementations and so results may not be generalizable to other contexts or settings. The review content was limited to studies where the data were mostly gathered post-2010 and so the portrayal of the role of organizational culture in HIT implementations is restricted to a single decade. All the identified publications focused on the process of HIT implementations and included culture and inner settings concepts as part of that research. The culture and related constructs were inferred by the researchers and were not measured explicitly in the studies. Data abstraction from these publications required significant effort on the part of the researchers with ongoing discussion and reaching consensus. Finally, this review did not specifically examine other factors related to implementation failures or successes; so, additional research is needed to identify cultural constructs related to implementation outcomes.

5 | CONCLUSION

Supported by a detailed analysis of 52 studies, this scoping review provides insights into the current state of the science around HIT implementation and the inner settings of an organization including culture. This study also underscores the need to recognize organizational culture as an important element during implementations of HIT. Our findings point to the need for additional research to facilitate the understanding of the role of organizational culture, specifically the characteristics that facilitate HIT implementation and hence serve as a platform to support LHS.

CONFLICT OF INTEREST

The authors declare that they do not have any competing interests.

AUTHOR CONTRIBUTIONS

Genevieve B. Melton provided guidance throughout the review and writing process. Sripriya Rajamani, Gretchen Hultman, and Caitlin Bakker participated in all stages of the review process from conceptualization, screening, data extraction and analysis. Sripriya Rajamani led the drafting of the manuscript and all authors read and approved the final version.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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