Consolidated Framework for Implementation Research (CFIR) Update Commentary Postprint

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Abstract

The Consolidated Framework for Implementation Research (CFIR) is a commonly used theoretical framework in implementation science that helps researchers identify potential and actual factors influencing implementation progress and effectiveness. First proposed in 2009, CFIR has undergone 13 years of development. In 2022, the CFIR development team updated the framework based on user feedback, adding 21 new constructs and 19 sub-constructs to the original structure, adjusting some existing constructs, and redefining certain concepts. This resulted in CFIR 2.0, which offers improved practicality and enhanced generalizability. This article aims to systematically review and introduce the development background, origins, and updates of CFIR, providing a reference for domestic researchers to understand and utilize CFIR 2.0.

Full Text

Preamble

Interpretation of Update on Consolidated Framework for Implementation Research (CFIR 2.0)

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Abstract The Consolidated Framework for Implementation Research (CFIR) is a commonly used theoretical framework in the field of implementation science that helps researchers identify potential and actual influencing factors affecting implementation progress and effectiveness. First proposed in 2009, CFIR has undergone 13 years of development. In 2022, the CFIR development team updated the framework based on user feedback, adding 21 constructs and 19 sub-constructs to the original structure, adjusting some constructs, and redefining certain concepts, resulting in CFIR 2.0—a more practical and generalizable version. This paper aims to provide a reference for domestic researchers to understand and apply CFIR 2.0 by reviewing and introducing its development background, origins, and updated content.

[**Key words**] Implementation science; Implementation study; Evidence-based practice; Interpretation

Introduction

Implementation refers to the translational work of moving healthcare interventions from closed evaluation systems to "real-world" development contexts—that is, transferring interventions from research environments to real-world settings where they can exert their effects. With the development of evidence-based medicine, numerous evidence-based interventions have emerged. However, many interventions proven effective in research have not been effectively applied in practice, resulting in resource waste while preventing optimal interventions from addressing real-world problems. BALAS et al. investigated nine evidence-based interventions and found that the average utilization rate was only 50%, with most experiencing significant implementation lags. The translation of research findings to application requires an average of 17 years to complete. During implementation, the complexity of the "real world" presents multi-level obstacles from audiences, service teams, organizational structures, markets, or policies that must be confronted and overcome for successful intervention implementation.

In this context, implementation science emerged. Implementation science refers to the scientific study of methods to promote the systematic integration of re-

search findings and other evidence-based interventions into routine practice to improve healthcare quality and effectiveness. Its scope encompasses all aspects related to implementation, including influencing factors, implementation processes, and implementation outcomes. A key concern is how to identify implementation influences from the environment, facilitate implementation processes, transform interventions, and retrospectively explain implementation outcomes. Through research on existing social science theories, implementation science can translate them into implementation-relevant information. These refined theories enable generalization of factors affecting implementation across various contexts, making knowledge emerge from complex environments, providing common language for studying implementation phenomena and guiding practice, and ultimately clarifying processes, identifying influencing factors, evaluating outcomes, and guiding implementation through theories, models, and frameworks.

Implementation science theories, models, and frameworks can be categorized into five types: process models, implementation determinant frameworks, classic theories, implementation theories, and evaluation frameworks. Among these, implementation determinant frameworks are developed based on empirical studies of barriers and facilitators to successful implementation or through synthesis of existing frameworks and theories from various disciplines. They integrate various factors that promote or hinder implementation, theorizing dynamic relationships between interventions, actors, and contexts to systematically "dissect" the real world, identify barriers and facilitators, help researchers generate hypotheses to predict implementation outcomes, and provide information for selecting targeted implementation strategies while enabling retrospective evaluation of implementation contexts.

The Consolidated Framework for Implementation Research (CFIR) is one of the most frequently used implementation determinant frameworks. It categorizes factors influencing intervention implementation into five domains to guide formative evaluation of implementation—that is, identifying factors that potentially or actually affect implementation progress and effectiveness. CFIR helps researchers clarify implementation complexities and elucidate relevant influencing factors, thereby facilitating implementation. As a comprehensive and practical framework, CFIR has been used to guide implementation research across multiple domains.

Development and Update of CFIR

1.1 Development Background of CFIR

Multiple implementation determinant frameworks existed before CFIR, such as the Theoretical Domains Framework (TDF) focusing on clinical guideline implementability, the Promoting Action on Research Implementation in Health Services (PARIHS) framework emphasizing successful implementation, and the Active Implementation Frameworks (AIFs) targeting implementation quality

improvement. However, these frameworks used different terminology and definitions, had overlapping content, and each had weaknesses or gaps in identifying certain themes, making them insufficient for user needs. Moreover, while formative evaluation focusing on implementation processes was preferred by implementation researchers over summative evaluation of outcomes, no widely accepted framework could guide such formative evaluation.

CFIR was developed by reviewing nearly 500 published implementation science studies across 13 research fields, extracting theories and structural frameworks related to dissemination, innovation, organizational change, implementation, and knowledge translation, then analyzing, synthesizing, and integrating their content. The resulting framework comprised 39 constructs across five major domains: intervention characteristics, outer setting, inner setting, individual characteristics, and implementation process. Through formative evaluation of implementation processes, CFIR helps researchers clarify project complexity and elucidate implementation-related influencing factors.

1.3 Rationale for Updating CFIR

Implementation science features deep integration and mutual reinforcement between theory and empiricism. Continuous dialogue between theory and empirical research informs implementation studies, guides empirical inquiry, and promotes implementation progress. Simultaneously, researchers can discover and summarize objective implementation patterns from empirical work to propose new theoretical hypotheses or research propositions. Implementation science emphasizes that theory is a tool requiring constant iteration to adapt to environmental changes rather than remaining static and obsolete. While PARIHS evolved into the Integrated-PARIH S (i-PARIHS) framework in 2016 and other theories continued updating, CFIR had remained unchanged since its 2009 release.

Meanwhile, contemporary implementation environments and the depth and breadth of implementation science research have changed dramatically compared to when the original CFIR was released. Important policy releases and transformative theoretical publications have challenged CFIR's utility. Users have reported thematic deficiencies, noting that CFIR could not comprehensively identify various influencing factors in implementation environments and could not fully 发挥其 intended role. Therefore, updating CFIR became imperative.

1.4 Introduction to CFIR 2.0

In 2022, DAMSCHRODER et al. followed up with CFIR users, collected feedback, and released CFIR 2.0 in October . CFIR 2.0 maintains structural consistency with CFIR, with its content mappable to the original framework. The added constructs enable researchers to identify influencing factors across diverse implementation environments, enhancing applicability while filling miss-

ing themes and enabling better identification of influencing factors across all dimensions and contexts. CFIR 2.0 also more clearly defines data collection targets.

Before applying CFIR 2.0 to a project, the following preparations are necessary: (1) define subjects for each dimension according to project-specific guidelines; (2) replace broad construct definitions with project-specific language as needed; and (3) add constructs to capture themes not included in CFIR 2.0 if required.

CFIR 2.0 Framework Structure

1. Innovation

Definition: The "thing" being implemented, such as a new clinical treatment, educational program, or urban service.
Dimensional characteristics: Identify the innovation being implemented, including innovation type, core components, and adaptable elements. Distinguish between the innovation (the "thing" that continues after implementation completion) and implementation strategies (activities that end upon completion).

Constructs:
A. Innovation source
B. Innovation evidence base
C. Innovation relative advantage
D. Innovation adaptability
E. Innovation applicability
F. Innovation complexity
G. Innovation design
H. Innovation cost

2. Outer Setting

Definition: The environment in which the outer setting exists, such as hospital systems, communities, or cities. Multiple outer settings or levels may exist (e.g., community, system, state).
Dimensional characteristics: Identify actual outer settings during implementation, including type, location, and boundaries between outer and inner settings.

Constructs:
A. Critical events: Large-scale or unexpected events that disrupt or drive innovation implementation
B. Local attitudes: Socio-cultural values and beliefs in the outer environment that encourage and support innovation implementation
C. Local conditions: Economic, environmental, political, or technical conditions that support implementation
D. Collaborative relationships and connections: Degree of collaboration within and across organizations, including referral networks, academic affiliations, and

professional networks
E. Policies and laws: Laws, regulations, expert opinions, recommendations, or certification standards supporting implementation
F. Financial funding: Financial strategies from external entities available for implementation
G. External pressures: External drivers of implementation, including:
- Social pressure: Public media campaigns, social movements, or protests
- Market pressure: Peer competition or imitation
- Quality pressure: Quality or benchmarking metrics, established implementation targets

3. Inner Setting

Definition: The context where innovation is implemented, such as hospitals, schools, or cities. Multiple inner settings or levels may exist (e.g., unit, classroom, team).
Dimensional characteristics: Document actual inner settings in the project, including type, location, and boundaries between outer and inner settings.

Note: Constructs A-D exist in the inner setting regardless of innovation implementation (inherent general characteristics), while constructs E-K exist for specific innovation implementation.

Constructs:
A. Structural characteristics
B. Work foundation: Infrastructure components supporting inner setting effectiveness
C. Information technology foundation: Technology systems for remote communication, electronic documentation, data storage, management, reporting, and analysis
D. Organizational structure: Organization of individuals and teams, tasks and responsibilities, and general staffing levels
E. Learning-centered: High-quality formal and informal collaboration, networks, and teams; high-quality formal and informal information sharing
F. Urgency for change: Shared values, beliefs, and norms about equality, addressing recipient needs, addressing deliverer needs, and continuous improvement
G. Compatibility: Innovation alignment with existing workflows, systems, and processes
H. Relative priority: Implementation importance compared to other initiatives
I. Incentive systems: Tangible/intangible incentives/rewards or disincentives/punishments
J. Goal alignment: Consistency with organizational commitments, purposes, or goals
K. Available resources: Funding, physical space, materials, equipment, guidance, and training for implementation
L. Accessibility of knowledge and information

4. Individuals

4.1 Role Sub-dimension

Dimensional characteristics: Document roles applicable to the project and their locations in inner or outer settings.

Roles:

A. Senior leaders: High-authority individuals including key decision-makers, administrative leaders, or directors
B. Middle managers: Medium-power individuals including supervisors
C. Opinion leaders: Individuals with informal influence on others' attitudes and behaviors
D. Implementation facilitators: Individuals who assist, guide, or support implementation
E. Implementation leaders: Individuals who lead implementation efforts
F. Implementation team members: Individuals who co-facilitate implementation, ideally including both innovation deliverers and recipients
G. Other implementation supporters: Individuals who support implementation leaders or team members
H. Innovation deliverers: Individuals who directly or indirectly deliver the innovation
I. Innovation recipients: Individuals who directly or indirectly receive the innovation

4.2 Characteristics Sub-dimension

Dimensional characteristics: Characteristics of roles applicable to the project based on the COM-B system structure or role-specific theories.

5. Implementation Process

Definition: Activities and strategies used to implement the innovation.
Dimensional characteristics: Document process frameworks or activities/strategies used. Distinguish between the implementation process (activities ending after implementation) and the innovation (the "thing" continuing afterward).

Constructs:

A. Teamwork: Intentional coordination and collaboration on interdependent tasks
B. Needs assessment: Gathering information about priorities, preferences, and needs of deliverers and recipients
C. Environmental assessment: Identifying and evaluating barriers and facilitators
D. Strategy adjustment: Selecting and adapting implementation strategies to address barriers, leverage facilitators, and adapt to context
E. Engagement: Attracting and encouraging deliverers and recipients to participate
F. Adaptation: Deliberate, conscious modification of the innovation or inner

setting to better integrate strategies
G. Reflection and evaluation: Collecting and discussing quantitative and qualitative information about implementation and innovation activities

Key Updates in CFIR 2.0

2.1 Major Updates in CFIR 2.0

To make the framework more broadly applicable across interventions and implementation contexts, CFIR 2.0 includes the following updates:

2.1.1 Using "Innovation" Instead of "Intervention" The term "innovation"—the thing being implemented—derives from Rogers' concept that "any idea, practice, or object perceived as new is an innovation," including drugs, medical devices, behavioral change interventions, and technologies alone or in combination. New things require strong evidence to support their effectiveness and reliability during implementation. Emphasizing "newness" enhances practice's demand for research findings, increases communication between practice and research, dismantles knowledge silos, and promotes translation to application. Additionally, distinguishing between implementation strategies (used to fully utilize interventions) and the interventions themselves is crucial yet challenging, as the lack of clear boundaries can lead researchers to misattribute influences from implementation strategies to interventions, misleading intervention adjustments and increasing implementation difficulty. For example, attributing patients' inability to correctly understand and apply diabetes self-management to the complexity of the intervention itself, when it actually stems from inappropriate training methods. Therefore, CFIR 2.0 uses "innovation" to enhance researchers' sensitivity to new things and better define intervention-related influences.

2.1.2 Adding "Deliverers" Deliverers are individuals involved in delivering the innovation—critical roles positioned between recipients and key decision-makers. They represent the key link completing actual innovation application. After implementation, frontline healthcare workers and other deliverers transfer innovations to recipients, promote innovation delivery, and help recipients understand, apply, and benefit from innovations. If an innovation significantly improves treatment outcomes while substantially increasing healthcare workers' workload, they may become fatigued, reducing both application efficiency and sustainability. Ideally, innovations should achieve the "quadruple aim": enhancing patient experience, improving population health, reducing costs, and improving healthcare workers' work-life balance. Innovation implementation must benefit not only recipients and key decision-makers but also deliverers through simplified processes and improved efficiency. Aligned interests among all three parties facilitate implementation.

2.1.3 Using "Recipients" Instead of "Patients" Recipients are individuals who benefit from innovations. In healthcare systems, innovation beneficiaries are not only patients—for example, when promoting hospital vaccination programs, hospital staff also benefit. Using "recipients" rather than "patients" covers multiple roles including community residents and healthcare workers, broadening intervention targets and better positioning target populations.

2.1.4 Replacing "Stakeholders" with "People Who Influence Implementation Outcomes" Key decision-makers, deliverers, and recipients all fall within stakeholder scope, playing crucial roles in evaluating intervention effectiveness. However, compared to deliverers and key decision-makers, recipients are less involved in implementation processes. When facing innovations, recipients focus more on the innovation's impact on themselves rather than the implementation process. In contrast, people who influence implementation outcomes, such as key decision-makers and deliverers, can perceive recipients' needs and preferences while also identifying implementation facilitators and barriers. Therefore, replacing "stakeholders" with "people who influence implementation outcomes" more accurately targets the population for evaluating implementation influences, avoiding research resource waste and interference from excessive information.

2.1.5 Restructuring the Individual Characteristics Dimension The individual characteristics dimension primarily identifies individual influences on implementation. In the original CFIR, this dimension overlapped considerably with other dimensions, with roles and characteristics distributed across three different domains (outer setting [patient needs and resources], inner setting [leadership engagement], and process [opinion leaders, formally appointed internal implementation leaders, champions, and external change agents]). CFIR 2.0 substantially restructured the individual dimension by adding role and characteristic sub-dimensions, redefining target populations, and repositioning individual constructs from other dimensions to better target populations and assess population characteristics through the characteristics sub-dimension.

2.1.6 Introducing the COM-B System The COM-B system is a behavior system established based on the 1991 American Behavioral Theorists Consensus Conference and American criminal law principles, where capability, opportunity, and motivation interact to produce behavior, which in turn provides feedback to these components. The Behavior Change Wheel (BCW) further develops this system by using various strategies to influence capability, opportunity, and motivation to facilitate behavior. Due to high congruence between BCW and TDF, BCW's three elements map to 14 domains within TDF. Building on this, CFIR 2.0 users can assess target population characteristics through the capability, opportunity, and motivation components in the characteristics sub-dimension, using the COM-B system as a gateway to evaluate 84 behavior change theoretical constructs from TDF, greatly enhancing assessment capacity.

2.2 Detailed Updates

CFIR 2.0 maintains five main dimensions: Innovation, Outer Setting, Inner Setting, Individuals, and Implementation Process, with added descriptions for each dimension. While removing two constructs, CFIR 2.0 added 21 new constructs and 19 sub-constructs to help users more precisely identify implementation influences.

2.2.1 Outer Setting

1. **Critical events**: Pandemics, natural disasters, major political events, etc., can affect implementation. During COVID-19, hospitals implemented isolation and restriction measures that could cause staffing shortages or prohibit access to specific areas, affecting or suspending innovations like vaccination promotion. Conversely, telemedicine and online meetings, advocated before the pandemic as resource-saving approaches, only gained widespread acceptance when isolation necessitated remote discussions.
2. **Local attitudes**: Whether local communities understand, recognize, and support innovation implementation significantly impacts innovations requiring external environmental support. For example, promoting organ donation concepts depends heavily on local attitudes toward death and social identity.
3. **Local conditions**: Political, economic, cultural, and technical conditions in implementation environments form important foundations. Unstable political environments, economic recession, or inadequate technology can cause implementation interruption or failure. Conversely, stable politics, prosperous economies, good environments, and sufficient technical support typically facilitate implementation and translation.
4. **Financial funding**: Economic support from third parties in the outer environment, such as reimbursement, charitable donations, or vouchers. Innovations, especially those covering administrative regions, involve substantial costs. Funding from government, enterprise, or philanthropy can reduce organizational financial pressure and ensure steady implementation progress.
5. **External pressures**: CFIR 2.0 more precisely identifies external pressure sources by dividing them into: (1) Social pressure from mass media or protesters; (2) Market pressure from competitors; and (3) Quality pressure from implementation standards.

2.2.2 Inner Setting

1. **Structural characteristics**: Three new sub-constructs were added: (1) **Physical infrastructure**: Spatial layout and material characteristics

that facilitate or hinder inner setting functions (e.g., emergency department access should accommodate ambulances with clear signage); (2) **IT infrastructure**: Unified information systems that facilitate complete information access and expert communication (e.g., digital chronic disease management systems enable efficient patient-provider interaction); (3) **Work foundation**: Organizational structure, staffing, and coordination capacity (inadequate staffing reduces efficiency and motivation over time).

2. **Culture**: Given varying definitions across literature, CFIR 2.0 redefined culture as relatively stable moral norms, values, and basic cognitions existing in group subconsciousness that form organizational work climates and influence individual thinking and judgment. Four sub-constructs help researchers better understand culture: (1) Equality-centered culture; (2) Recipient-centered culture; (3) Deliverer-centered culture; and (4) Learning-centered culture.

2.2.3 Individuals

1. **Senior leaders**: Have decisive impact on implementation, controlling resources, external collaboration, priority setting, and incentive systems. Implementation lacking senior leadership support rarely succeeds.
2. **Middle managers**: Clinical leaders or supervisors who transmit senior leadership decisions and ensure alignment between implementation goals and organizational objectives, facilitating innovation dissemination and sustainability.
3. **Opinion leaders**: Can exert strong negative or positive influence, categorized as expert or peer opinion leaders.
4. **Implementation facilitators**: Individuals with relevant expertise who assist, guide, or support implementation, potentially serving as consultants from external environments.
5. **Implementation leaders**: Individuals who lead implementation efforts, serving as coordinators, project managers, or team leaders who motivate and inspire teams to overcome organizational resistance.
6. **Implementation team members**: Include both deliverers and recipients. Team composition is crucial—individuals with positive attitudes toward innovation and implementation capacity enhance success.
7. **Other implementation supporters**: Key roles assisting implementation leaders or team members, providing technical assistance in IT, human resources, or contracting, or establishing organizational connections.

2.2.4 Implementation Process

1. **Teamwork**: Leverages collective intelligence to solve problems through complementary member capabilities.
2. **Needs assessment**: Evaluating deliverer and recipient needs is a critical success determinant. Meeting these needs generates spontaneous positive impacts.
3. **Strategy adjustment**: Real-world environments are dynamic. Researchers must use CFIR to assess environmental changes and adjust implementation strategies accordingly.
4. **Adaptation**: Deliberate, conscious modification of intervention design or implementation environment to improve innovation-context fit and implementation efficiency.

Application of CFIR 2.0

This section uses a systematic review published in the *Journal of Acquired Immune Deficiency Syndromes* on July 1, 2022, titled "Determinants of Implementation for HIV Pre-exposure Prophylaxis Based on an Updated Consolidated Framework for Implementation Research: A Systematic Review" to illustrate CFIR 2.0's application in identifying implementation influences.

3.1 Background

Pre-exposure prophylaxis (PrEP) is a highly effective HIV preventive intervention and key component of the U.S. Ending the HIV Epidemic (EHE) initiative. However, PrEP implementation effects fall far short of expectations. A study of 1.2 million Americans found only 23% were receiving PrEP, far below the EHE 50% coverage target. Adherence and persistence data also indicate poor PrEP maintenance. Multiple studies have investigated barriers to PrEP delivery at healthcare worker and patient levels. This case aims to systematically review published literature on PrEP implementation determinants, identify and synthesize them using CFIR to inform U.S. PrEP implementation.

3.2 Evidence Base

After database searching and screening, the case included 286 articles with titles/abstracts containing HIV and implementation-related terms, providing evidence for HIV PrEP implementation determinants.

3.3 CFIR Application Methods

The CFIR 2.0 application involved: (1) Identifying and coding all conditions, characteristics, states, and properties affecting healthcare system PrEP delivery or patient PrEP understanding and continued use according to CFIR 2.0's multi-level domains; (2) Four implementation researchers familiar with CFIR 2.0

classified each extracted factor as implementation or innovation determinants while coding all factors into CFIR 2.0's structure.

3.4 Results

The case identified 1,776 mentioned and 1,952 measured influencing factors. Common obstacles and facilitators are shown in . Innovation determinants accounted for over 61% of total factors, reflecting HIV research's historical focus on recipient characteristics and lack of attention to implementation systems, indicating future research should focus on PrEP implementation system influences. Barriers were mentioned and measured more frequently than facilitators (72.1% vs. 57.0%), providing opportunities for more thorough facilitator examination. The case identified key barriers and facilitators common among CDC target populations, which is crucial for developing strategies to help populations understand and sustain PrEP use. It also highlighted research gaps and priority directions for future PrEP implementation determinant studies.

Discussion

CFIR is an integrated framework developed through extraction, analysis, and synthesis of existing theories, models, and frameworks, featuring strong applicability, broad scope, and comprehensive identification capacity. It effectively identifies context-specific barriers and facilitators to inform strategy selection and adjustment. CFIR 2.0 refines and improves CFIR, supplementing theories and frameworks to enable more explicit and comprehensive identification of implementation influences while distinguishing implementation strategies from interventions.

Since the National Health Commission's "Guiding Opinions on Strengthening Health and Health Science and Technology Achievement Transfer and Transformation" identified technology transfer as key to connecting innovation with health development, science and technology achievement translation has gained increasing attention. Implementation science has rapidly developed in China, with various theories being interpreted and applied by domestic scholars—for example, using i-PARIHS to analyze barriers to pediatric central venous catheter maintenance best practices and using RE-AIM to evaluate AIDS prevention knowledge dissemination among university students in Guangdong. However, most utilized frameworks were developed by foreign scholars and may not fully adapt to China's healthcare model due to cultural differences. Therefore, developing implementation science theoretical frameworks rooted in Chinese traditional culture and healthcare models, especially integrated Chinese-Western medicine approaches, represents a future direction. CFIR 2.0 and its update process provide references for developing domain-specific models based on domestic contexts and offer an option for building specialized implementation guidelines based on classic implementation science frameworks.

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References: (Note: Reference list preserved from original but formatted for clarity)

Note: Figure translations are in progress. See original paper for figures.