

Author's response to reviews

Title: Fostering implementation of health services research findings into practice:
A consolidated framework for advancing implementation science

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Author's response to reviews: see over

Greetings –

We thank you for the opportunity to resubmit this paper. We have seriously considered all the comments from the editors and two reviewers and we believe this second draft is significantly stronger. The paper is also considerably longer. The following table provides a point-by-point response to each comment.

Thank you for the thoughtful responses and we look forward to hearing your response to this revision.

Point-by-Point Response to Reviewers

Editor's Comments	RESPONSE
<p>This manuscript takes on a difficult task, that of outlining a comprehensive model that can be used to guide implementation theory and research. Given my read and the reviewer comments, I am inviting a revision and resubmission of the article. In addition to my comments and those of reviewer 1, please pay particular attention to the detailed comments of Reviewer 2.</p>	<p>Thank you for the opportunity to do the significant revisions that we believe, have considerably strengthened the paper.</p>
<p>My assessment and that of Reviewer 2 is that in the interest of parsimony, some important work was not included and should be considered for inclusion.</p> <p>If the goal was a framework - as defined by Kitsen - then more detail is needed and the authors need to be absolutely sure that "saturation" has been reached.</p>	<p>The most significant revision to the manuscript was turning it "inside out" – we moved the descriptions for each construct from the Appendix up into the main body of the paper.</p> <p>In the first version of the paper, we explicitly included 12 models in our analysis. Since then, based on reviewer suggestions and several additional recently published models, we added another 7 models. These last 7 models did not yield new constructs but did, however, contribute to a more rich description and/or adjustment to definitions in a few cases. We expect the CFIR to continue to evolve as more people use the CFIR and contribute to the implementation research knowledge base.</p>
<p>Figure 1 may not be very useful in its present form and either should provide more real detail (as suggested by Reviewer 2) or be deleted.</p>	<p>We believe that having a visual is a powerful way to communicate key features of the CFIR so we would like to keep it in if the reviewers and editor are amenable. We have retooled the figure, however. We want to emphasize that CFIR is not a prescriptive model for implementation but rather a framework that synthesizes the array of factors that are thought to influence implementation. We hope the introduction and discussion make this much clearer.</p>
<p>Frameworks that were considered but not included should also be noted. Those that come readily to mind include meta-analyses by Damanpour, and a review by Frambach and Schillewaert. In regard to organizational social context and the impact of culture and climate - work by C. Glisson should be considered.</p>	<p>Much of the "classic" works (including Damanpour's meta-analyses) have already been synthesized into the Greenhalgh et al model and thus, we did not list them separately. We clarified inclusion/exclusion criteria in the "Foundations of the CFIR" section. We added the suggested models and included several others that were published in the last year.</p>
<p>In health care settings, innovation effectiveness - as defined by Klein, Conn, & Sorra - is perhaps the critical determinant of successful implementation. Their model does not stop with implementation effectiveness.</p>	<p>We agree with this statement. We cut the discussion of "implementation effectiveness" because it detracted from the aim of the paper. This is a topic better addressed in a separate paper. We believe the content of the CFIR is not dependent on how one defines implementation effectiveness.</p>
<p>For some innovations, implementation effectiveness can be linear and easily measured. While fidelity may be different for different interventions, that doesn't mean that it is always non linear.</p>	<p>We agree with this statement and clarify this point in the introduction, discussion and description of process.</p>
<p>Organizational citizenship behavior is also akin to organizational commitment [and] organizational justice</p>	<p>We have developed this construct more – also, broadening it more explicitly to include OCB, organizational justice, emotional</p>

climate. The authors raise the issue of OCB as a tangential thought - with no real support for why it should be included in models of implementation. This should be elucidated or dropped.	exhaustion, and organizational commitment. Glisson et al's work made a nice addition to this section.
On page 16 the authors take the stance the implementation studies are not invoking "implementation science" when there are many funded implementation studies grounded in theory and testing implementation theories (or elements thereof).	We did not intend to imply this and have taken this statement out.
REVIEWER #1 (Eloise Carr)	
<i>Major Compulsory Revisions</i>	
This paper brings together a strong array of work and analysis of key work in the field. The scholarly scrutiny of an area which has received less attention than others is welcome. The model proposed reflects the complexity of health and practice and will broaden the context rather than reducing it.	Thank you for your very helpful comments!
Would be helpful to give examples perhaps across a couple of countries to highlight the international interest and initiatives (p3).	We added an example from the UK.
It would be helpful if the databases accessed for the search and timelines were made explicit in the main body of the paper.	We have provided more detail about how we identified models in the "Foundations for the CFIR" section of the paper.
<i>Minor Essential Revisions</i>	
US and VA need full explanation then abbreviation (p3)	Done.
6 additional files were included with the manuscript but only two referred to on p27	The files should be consistent in this submission.
REVIEWER #2 (Peter Mendel)	
This paper consolidates a wide and complex set of literatures for which the field of implementation research desperately requires synthesis. However, the paper in its current state is severely lacking in presentation, organization, and in development of certain dimensions of the framework it introduces.	In response to your comments, we have turned the paper "inside out" which we believe made it much stronger and coherent. Thank you for your very helpful and in-depth comments.
In particular, the body of the paper focuses too much on how the authors picked and chose through various concepts in the literature for the CFIR framework, as opposed to defining and explaining the importance and application of the constructs (leaving this to a long and fairly unwieldy appendix). In this sense, the organization of the paper appears backwards.	We have included descriptions of each construct in the main body of the paper and left rationale for the appendix – which, we hope, will give the sense of being in forward order; rather than backwards.
In addition, the many previous published frameworks cited in the paper have raised the bar of what the field needs—not merely another synthesis of implementation concepts but one which demonstrates how this particular arrangement of constructs has been usefully applied to empirical research and, ideally, improves on what is already available.	We have included more details of one study in which we used the CFIR to guide evaluation. In addition, we provide illustrative quotes highlighting how each construct appeared to have influenced implementation at the study sites. However, by eliminating the detailed explanations of why we picked and chose through various constructs in the literature, we have removed some of the rationale behind why the CFGIR improves upon what is already available. We agree that some of these details can be tedious. We hope the explanation that remains provides a compelling argument for the CFIR.
<i>Major Compulsory Revisions</i>	
1. (main paragraph on p.4): Justification at the end of this paragraph for the CFIR framework seems weak. Contrary to the claim in this last sentence, a number of	We state the contribution of the CFIR more clearly: 1. At a macro-level, the CFIR provides a pragmatic and consistent framework to promote reporting and learning

<p>papers attempt this synthesis—many that the article specifically reviews, as well as others that have been published, such as Fixsen et al. 2005, Glisson and Schoenwald 2005, and Mendel et al. 2008. As mentioned above, you need to justify the CFIR on what it adds or how it improves upon these other frameworks. In addition, the whole discussion in this paragraph on the nature of frameworks is a bit long-winded—I’d suggest simplifying and distilling the ideas.</p>	<p>from implementation findings across studies and to promote theory building and verification.</p> <ol style="list-style-type: none"> At a micro-level, the CFIR provides a comprehensive list of potential antecedents for effective implementation from which to select to guide formative evaluations pre-, during, and post-implementation. <p>In addition, it should be noted that we did more than simply synthesize—we combined and separated constructs and attempted to provide clearer definitions that can be operationalized in implementation efforts.</p> <p>In summary, the CFIR:</p> <ol style="list-style-type: none"> Proposes coherent and standard language and terminology – e.g., culture is defined in myriad ways across other frameworks; a specific definition is proposed here. Is comprehensive – e.g., 12 of the 19 models we reviewed do not explicitly include strength and quality of evidence supporting the intervention. Consolidates - some constructs in other models/frameworks are too difficult to operationalize; e.g., some models have “observability” and “relative advantage” as separate factors. However, these constructs are difficult to disentangle in the real world and were therefore, combined into a single construct while acknowledging the important role of both. Parses conflated constructs: for example concepts of “absorptive capacity for new knowledge” and “receptive context” are terms that are commonly used in the literature but are defined inconsistently and include multiple overlapping constructs; from leadership engagement to learning climate. <p>The CFIR is not intended to be a prescriptive model. It complements many existing models by providing a comprehensive list of constructs from which to select those related specifically to implementation in a specific study and setting.</p>
<p>2. Also as mentioned above, the body of the paper focuses too much on how the authors constructed the CFIR from various other published frameworks and literature. The first problem this poses is that the paper assumes a great deal of familiarity on the part of readers with the models being discussed. For example, most readers will not know enough about the PARHiS and Greenhalgh et al. papers to understand (or even care) why certain portions of these articles were adapted or not (e.g., last paragraph on p.7, not enough detail given about these frameworks to understand the differences being talked about; also end of second paragraph p.11, many readers will not be familiar enough with the Greenhalgh et al. paper to understand this point).</p>	<p>You raise an excellent point. We debated many times about which way to go and now have restructured the paper, as mentioned above, moving the appendix up to the main body of the paper and most of the original content back to the appendix.</p>
<p>The second problem is that most of the definitions and explanations of concepts, their importance and implications for implementation, and how they relate to each other, are relegated to the appendices. Appendix 1 in particular, although containing much useful</p>	<p>Appendix 1 has been moved up into the body of the paper. It’s long but we’ve added illustrative quotes from one of the studies to help root the paper in the real world. We hope this will provide smoother reading.</p>

information (I'd say the "meat" of what's in the paper), is long and unwieldy.	
Not only is it intimidating in length, the "coding notes" do not seem very helpful without additional context, and I'm also concerned about the mixing of "theoretical" and "empirical" support ("theoretical" support seems more appropriate to include with the definitions and descriptions of the concepts, while "empirical" support should focus on evidence from studies).	We have deleted the "coding notes" and combined general support in the literature as "rationale" for each construct in the Appendix. We believe descriptions are short and yet sufficiently rich (especially with the illustrative quotes) to communicate meaning for each construct.
Similarly, the definitions in Appendix 2 (see references on p.11 and footnote ii) should be incorporated into the body of the paper in order to remind the general reader and help bring consensus on common terms in implementation research.	Done.
The third problem with the current organization of the paper is that what little definition of concepts are given in the body of the text are still rather detached from application. Thus, it would greatly help to expand and/or integrate the example applications given in the short section on pp.19-20 to more concretely demonstrate how the CFIR can be applied for different purposes.	We have incorporated examples from one study (the qualitative study of MOVE! Program implementation) to help illustrate how the CFIR can be applied in a formative evaluation.
In general, I suggest reorganizing the paper to present the "meat" of the CFIR framework up front (moving up and succinctly presenting the Appendix 1 & 2 definitions and descriptions), spend minimal time explaining the sourcing of concepts (relegating that discussion and material such as Table 1 to appendices or footnotes),	Agreed.
...then expanding the discussion of the MOVE! illustration to include more detail on how the CFIR guided that study and what it yielded (particularly compared to what the other off-the-shelf frameworks would have),	We have done so in a comprehensive but brief manner.
...and paying some additional attention to the application of the CFIR to the other three studies and phases of evaluation in Table 4.	We did not include the other studies because we were concerned the paper would be too long and unwieldy. We hope you agree – if not, perhaps we could provide a paragraph for each, simply highlighting main findings.
3. (p.7, last third of page): The mention of "positivist" and "realist" labels are too cryptic; either needs additional explanation, or should be removed if the distinction is not central to understanding of the CFIR framework (or at least put in a footnote).	These references have been removed.
4. (p.8) Figure 1 is problematic for several reasons. First, while it is useful to attempt to depict the non-linear nature of implementation processes, this is not the same as randomness or "fuzziness". In particular, the process arrows that do not connect any specific constructs, and the oddly shaped contours, make the figure difficult to follow and interpret.	We have retooled the figure and hope that it conveys more clearly (with much help from much improved content in "Overview of the CFIR" what we intend to communicate. The figure is intended to show overarching relationships between the five major domains of the CFIR – not to depict any particular prescriptive process or set of activities.
I also note that the dependent variables discussed on pp.9-10 are nowhere included in the figure.	We took out discussion of the dependent variable (implementation effectiveness"). The discussion detracts from the main aim of the paper – to present the CFIR. We plan to address the "problem" of the dependent variable more thoroughly in a separate paper.
It would be useful to give more specificity to the steps of the implementation process in the text and the figure, describing how some steps in implementation	We have clarified that the CFIR is not prescribing steps or activities for implementation. As stated in the introduction, "In essence, the CFIR is "meta-theoretical"—it includes elements from

<p>process (e.g., tailoring of an intervention, initial adoption) serve as dependent variables for various process outcomes (such as avoidance, compliant use, committed use) that affect patient care and health outcomes, which I think are more important outcomes of the implementation process than the effects on the intervention (or innovation) itself, as currently depicted in Figure 1. Although the latter are also important, this could be depicted simply with a loop back to the innovation (see, e.g., Mendel et al.'s Figure 2).</p>	<p>a synthesis of existing theories, without depicting interrelationships or specific hypotheses. We offer the CFIR as a typology—a list of constructs to promote theory development and verification, from which researchers can select those most relevant for their particular study and setting.” The CFIR complements many existing models that prescribe assessment of “context;” the CFIR provides a comprehensive set of constructs to consider in accomplishing assessments of context. Figure 1, therefore, is not intended to illustrate a series of steps or activities but rather depict the complex inter-relationships between the 5 major domains; with and without the intervention adapted.</p>
<p>A last minor comment on Figure 1: just looks odd to me to have External Context on the bottom of the figure, rather than on top.</p>	<p>We have shifted outer setting to the top.</p>
<p>5. (p.8, top): What does “full assimilation” of an intervention mean?</p>	<p>We have taken this language out.</p>
<p>6. (p.8, Table 1): Besides considering moving Table 1 to the appendix as suggested above, I would suggest eliminating the “I/D” designations in the “Strength & Direction of Evidence” column, since the paper does not discuss the implications of whether a construct is used as an independent or dependent variable. Also, what does the “N/A” for Execute (under IV. Process) mean (not applicable, or not available)?</p>	<p>We have moved Table 1 to a separate Appendix (2) and replaced it with a list of citations for the models analyzed for the CFIR.</p> <p>We deleted the I/D designation in the table.</p>
<p>7. (p.9, Table 2): In line with comments above, I suggest making this the main table, since it provides descriptions of each of the main categories and sub-categories in the CFIR.</p>	<p>Table 2 is retained in the main paper.</p>
<p>You might even expand it a bit to address some of the dimensions that you’ve stuffed into sub-categories—mainly to illustrate the range of constructs included in these buckets and why its logical to group them together.</p>	<p>We have included all the sub-constructs in Table 2.</p>
<p>I also suggest dropping the column on “Applicable Change Theory(s)” from the table, since a) the column is too sparsely populated, b) would require more explanation of these theories and how they relate to the constructs in their respective rows, c) raises additional complications, since some theories will serve to show relationships between constructs (rows in the table) as opposed to solely being tied to one or another.</p>	<p>We have dropped this column as suggested.</p>
<p>Here again, one or two concrete examples of how a theory would be applied within the CFIR to explain the direction of effects or relationships among constructs would be more helpful than cryptic references of several theories in the table.</p>	<p>Because we dropped this column, we did not provide concrete examples of applying theory. This is a potential topic for a future paper.</p>
<p>8. (p.9, second paragraph starting with “Our goal...”): this paragraph is not very convincing and feels tagged on. It’s probably not needed here anyway, since it’s just a restatement of earlier justifications without any additional insight (such as giving more detail on how the CFIR meets these overall goals).</p>	<p>Agreed. We have rewritten the introduction.</p>
<p>9. (p.10) “success or failure” too black-and-white, too dichotomous for the outcomes interested in, wouldn’t you agree? (see also mention of “success” on p.15, last paragraph) Seems more appropriate to talk in terms of degree of implementation (e.g., see concept</p>	<p>Agreed. We have taken out discussion of implementation effectiveness, as mentioned above. We incorporate a short discussion of fidelity (including Pearson’s conceptualization of intensity) under Executing within Process in the Appendix.</p>

of implementation intensity, both depth and breadth, in Pearson et al. 2005).	
10. (p.10): the sentence starting “The definition of “committed use” will depend...” is too cryptic. A short example would be helpful here.	Agreed. This discussion is no longer in the paper.
11. (p.10): the sentence beginning “Conceptually,, use of the intervention or practice should conform to pre-specified goals or protocols...”: here I would say “ideally”, since often such pre-specified goals or protocols are vague at best, and it’s often up to the evaluators to divine what these are; indeed the level of specificity of such goals or protocols is a highly variable attribute that differs across interventions.	Agreed. This discussion is no longer in the paper.
In the next few sentences on “fidelity”, I suggest more forcefully stating how one person’s “fidelity” is often another’s “innovation” or “tailoring” of the intervention, which raises interesting questions of who’s doing the tailoring (developers of the intervention vs those implementing it), and whether such modifications to the original intervention design are “successful”, “adaptive”, or even necessary to implement an intervention within a particular context, as well as whether they affect the essence of the scientifically validated components of an intervention (if it has any). I believe Fixsen et al. have a discussion of these issues that could be cited.	Agreed. This discussion is longer in the paper.
12. (pp.11-12): “design quality and packaging”: I’d be more interested in what these terms refer to, than in where you got the concepts (which again can be given in footnotes, appendices, etc).	Agreed. We now provide a description of what this means in the body of the paper.
13. (p.12): “We combined political directives into intentional spread strategies...”: I don’t agree with conflating these two concepts. If anything, “political directives” is the more inclusive construct.	We have renamed this construct (External Policies and Incentives) and extended the content to include pay-for-performance mechanisms. From an organizational perspective, it is often difficult to separate the influences of e.g., a directive to use a set of guidelines and the effect of the guidelines themselves.
Similarly, later on p.12, I strongly disagree with conflating formal structure and informal networks, especially since the overall label of this category (“network and communications”) emphasizes the latter. It is important to create categories that logically group constructs, but at the same time allows for explaining key distinctions without conflating concepts. See also the discussion of “readiness for change” (p.14, second paragraph), which appears to conflate a number of important constructs.	We have added Structural Characteristics to acknowledge the body of research available on the influence of formal structure (e.g., administrative intensity, functional differentiation) and organizational characteristics such as size and age. Networks and Communications retains it attention to less formal aspects of networks and communications. We did not do justice in describing the “readiness for implementation” construct and rationale for its sub-constructs. We hope this is clarified. The Appendix provides a “sidebar” discussion of readiness for change, receptive context, etc that are used in the literature.
14. (p.15): The paper needs much better justification and explanation of why “organizational citizenship” is included, especially since it’s sourcing was different than the rest of the concepts in the CFIR (i.e., it didn’t come from other models in the lit review or personal experiences). First of all, what is “organizational citizenship” (only a few readers will be familiar with the term), and how does it effect implementation to a degree that it warrants placement in the framework ex machina? A better approach might be to subsume “organizational citizenship” within another dimension already included in the CFIR (say, Culture) and invite	Agreed. We hope to have accomplished that in this version of the paper.

researchers to explore it within that domain. Please also provide a citation for organizational citizenship (even a general one, such as Smith et al. 1983 or Manville & Ober 2003).	
15. (p.15): I was very encouraged by the inclusion of “Process” into the framework. Implementation process is an area that needs much more attention in implementation research, especially within healthcare. But the topic could use much more development in the body of the paper itself. Again, I suggest pulling much more of the underlying concepts out from the appendices into the body of the paper.	Agreed. We have pulled the descriptions into the main body of the paper.
A thoughtful discussion of implementation process and the methodological issues involved in attempting to better study it (such as the necessity of longitudinal qualitative and quantitative techniques) would be much more useful than statements like “by its very nature, defies definition—it is like water running through your hands”. I also fundamentally disagree with that statement: social processes can be rigorously studied, both quantitatively and qualitatively; it’s just that health services research in particular hasn’t done it very well.	Agreed. We reduced discussion of this topic to reduce distraction from the main purpose of this paper.
16. (p.16, top paragraph): Add a citation for “the importance of engaging key stakeholders strategically in the process”.	Done.
You can also cite Van de Ven et al. 1999 (which is already included in the paper as citation #22) here for the incremental, spiral nature of implementation (similar to their observation of the “non-linear” nature of the innovation process).	Done.
17. (p.16, middle paragraph): Again, define “formative evaluation” in the text, rather than merely referring to a definition in a table.	Done. We use the Mendel et al, 2008 paper (which provides helpful definitions and layout in the Figure) as a guide to walk through the phases.
18. (pp.18-19): This discussion is not very helpful for what are truly difficult methodological issues in implementation research. Examples from actual research might help to make these issues and possible solutions more concrete and explicit.	Agreed. We took out discussion of specific study approaches.
19. (p.20): The paper needs a stronger, more compelling conclusion. Perhaps this will be more clear after addressing some of the comments above, especially those related to better describing the unique contributions of the CFIR framework.	Agreed. We hope we have accomplished this. Certainly, reworking the paper helped to crystallize purpose and conclusion.
<i>Minor Essential Revisions</i>	
20. (p.4): comma or semi-colon needed before “but too little detail”	Rewritten.
21. (p.6): in second quotation, “seek” should be “seeks”	Rewritten.
22. (p7): need a paragraph break somewhere on this page.	Rewritten.
23. (p.10): “we want to see” seems like awkward phrasing	Rewritten.
24. (p.12, middle of page): “affect” should be “effect”	Done.
25. (p.18, middle of page): “herculean undertaking”, “elegant exterior” seem awkward	Rewritten.
26. In general, the tables need a great deal of formatting help. The Excel spreadsheet formats are	We have improved formatting.

<p>very difficult to read, especially when printed out (i.e., small fonts, hard to follow information across rows and columns without gridlines, etc.)</p>	
<p><i>Discretionary Revisions</i></p>	
<p>27. (p.7, first paragraph): This paragraph has a good initial overview of different implementation frameworks and models. Other recent implementation frameworks mentioned above that might be helpful in addressing these reviewer comments include: Fixsen et al. 2005—although their main manuscript is not peer-reviewed, it has been applied by others in peer-reviewed articles, and I wouldn't be surprised if they have referenced it in one of their published papers. Glisson and Schoenwald 2005—an implementation framework developed out of child mental health interventions. Mendel et al. 2008—a dissemination and implementation framework based mostly on studies of mental health quality improvement, with discussion of community-participatory approaches.</p>	<p>We have added these plus 4 more.</p>
<p>28. (p.8): I believe you can use Fixsen et al. as a citation for core vs periphery of interventions, if you need it.</p>	<p>Done.</p>
<p>29. (p.10, second part): "skill and enthusiasm of stakeholders using the intervention" seems more like part of the internal context and should be discussed in relation to that.</p>	<p>We have added an Individual Stage of Change construct under Characteristics of Individuals.</p>
<p>30. Table 3: This table is a candidate to be dropped, since a) it's mainly a restatement of Stetler et al., and b) doesn't really demonstrate how the CFIR can or has been used for each of these evaluation stages, and c) the main point of it (that the CFIR can help with different forms of evaluation, formative or otherwise) can be stated much more succinctly in the text. probably best to just incorporate this table into Table 4.</p>	<p>This table is dropped, as suggested.</p>
<p>References: Fixsen D.L., Naoom, S.F., Blase, K.A., Friedman, R.M., & Wallace, F. 2005. Implementation Research: A Synthesis of the Literature. Tampa, Florida: Louis de la Parte Florida Mental Health Institute, University of South Florida. Glisson, C., & Schoenwald, S.K. 2005. The ARC organizational and community intervention strategy for implementing evidence-based children's mental health treatments. <i>Mental Health Services Research</i>, 7(4), 243-259. Manville, B. and J. Ober. 2003. <i>A Company of Citizens</i>. Boston: Harvard Business School Press. Mendel, P., Meredith L.S., Schoenbaum M., Sherbourne C.D., & Wells K.B. 2008. Interventions in organizational and community context: A framework for building evidence on dissemination and implementation in health services research," <i>Administration and Policy in Mental Health and Mental Health Services Research (APMH & MHSR)</i>, 35(1-2): 21-37. Pearson, M.L., Wu S.Y., Schaefer J., Bonomi A.E.,</p>	<p>Thank you for the references and all your thoughtful suggestions that have served to improve this paper.</p>

Shortell S.M., Mendel P.J., Marsteller J.A., Louis T.A., Keeler E.B.. 2005. A method for assessing the implementation of the chronic care model in quality improvement collaboratives, *Health Services Research*, 40(4): 978-96.

Smith, C., D. Organ, and J. Near. 1983. "Organizational citizenship behavior: its nature and antecedents," *Journal of Applied Psychology*, 68(4): 653-663

Van de Ven, A., Polly, D., Garud, R., & Venkataraman, S. 1999. *The Innovation Journey*. New York: Oxford University Press.