SUPPLEMENTAL FILE: Development and usability testing of an online support tool to identify models and frameworks to inform implementation

Appendix 1. Mapping criteria

The purpose of this exercise is to map a list of TMFs to (1) Nilsen's taxonomy and (2) the Knowledge-to-Action (KTA) Framework and categorize them by (3) level of behaviour change (individual, organizational, system). The results will be used to inform the content of a support tool to help individuals who are doing or supporting implementation practice activities to identify an appropriate TMF to inform their work.

(1) Nilsen's Taxonomy (Nilsen, 2015):

Category^	**Description[1]**	**Similarities and differences[1]**
Process models	- Specify steps/stages/phases in process of translating research into practice, including implementation and use of research - Aim to describe and/or guide process of translating research into practice - An action model is type of process model that provides practical guidance in planning and execution of implementation endeavors and/or implementation strategies to facilitate implementation - Note that terminology is inconsistent, as some models are referred to as frameworks and vice versa.	<u>Process models vs. frameworks:</u> - While many process models mention relevance of addressing B/Fs to translating research into practice (e.g., KTA), these models do not identify or systematically structure specific determinants associated with implementation success like frameworks do - Process models recognize temporal sequence of implementation endeavors (although actual process is not necessarily sequential), whereas determinant frameworks do not explicitly take a process perspective of implementation since determinants typically relate to implementation as whole
Determinant and evaluation frameworks	- Many frameworks developed by synthesizing results from empirical studies of B/Fs to implementation success or constructed based on synthesis of constructs related to behaviour change found in behaviour change theories - ***Determinant frameworks*** describe/specify types/classes/ domains of determinants and individual determinants, which act as B/Fs and enablers (IV)	<u>Frameworks vs. process models:</u> - Determinant frameworks may be *used* to help guide implementation practice (i.e., function as action models), because they identify potential B/Fs that might be important to address when undertaking implementation endeavor. However, most determinant frameworks provide limited "how-to" support for carrying out implementation endeavors since determinants usually are too generic to provide

[1] Source: Nilsen. Making sense of implementation theories, models and frameworks. Implement Sci 2015;10:53.

	that influence implementation outcomes (DV) - Aim to understand and/or explain influences on implementation outcomes, e.g., predicting outcomes or interpreting outcomes retrospectively - May specify relationships between some types of determinants - ***Evaluation frameworks*** specify aspects of implementation that could be evaluated to determine implementation success	sufficient detail for guiding implementation process - Evaluation framework could also be process model if it contains process pieces <u>Frameworks vs. theories:</u> - A lot of theory has been used to identify determinants of behaviour, but the resulting framework does not address how change takes place or any causal mechanisms (e.g., Theoretical Domains Framework, a framework, versus Health Action Process Approach, a theory).
Classic and implementation theories	- Aim to understand and/or explain aspects of implementation by addressing how change takes place (i.e., the causal mechanisms) without ambitions to actually bring about change. - <u>Expanded definition</u>: "'A set of concepts and/or statements with specification of how phenomena relate to each other. Theory provides an organizing description of a system that accounts for what is known, and explains and predicts phenomena'.[2] …[must] include a set of concepts that describe, explain and predict phenomena including the relationships between the concepts".[3] - ***Classical theories*** originate from fields external to implementation science (e.g., psychology, sociology and organizational theory).	<u>Theories vs. process models:</u> - Theories may be *used* to guide implementation practice (i.e., function as action models), because they identify potential B/F that might be important to address when undertaking implementation endeavor. However, theories typically describe change mechanisms and explain how change occurs without ambitions to bring about change (i.e., the process). <u>Theories vs. frameworks:</u> - See <u>Frameworks vs. theories</u> above - Theories may be *used* for evaluation because they describe aspects that might be important to evaluate.

[2] Hobbs et al. Behaviour change theories across psychology, sociology, anthropology and economics. A systematic review. Psychol Health 2011;26(Supp 2):6-72.

[3] Colquhoun et al. A systematic review of the use of theory in randomized controlled trials of audit and feedback. Implement Sci. 2013;8:66.

	- ***Implementation theories*** have been developed by implementation researchers, from scratch or by adapting existing theories and concepts.	
None of the above	- Approaches that do not meet any of Nilsen's definitions of TMF should go here (a critique of his taxonomy).	E.g., taxonomy, checklist, principles, tools

B/Fs = barriers and facilitators
Note: ^Code TMF according to intended aim as described in its original publication.

(2) KTA Framework (Graham et al., 2006):

KTA Stage	**Notes[4]:** **Does the TMF aim to describe or understand/explain aspect of, or specify how to…**
Define the evidence to practice gap - Identify problem - Determine the know/do gap - Identify, review, select knowledge	- Identify the problem? - Assess the current level of an activity? - Assess what "best practices" are or what the 'know' part of this stage entails? - Measure the "gap" between evidence and practice or policy making? - Conduct a needs assessment (e.g., using admin dataset or chart audit) to determine size and nature of the gap? - Identify and appraise relevant research that could help solve the gap? - Actively involve relevant stakeholders in identifying and prioritizing the knowledge gap?
Adapt knowledge to local context	- Adapt the knowledge to the local practice environment/context? (e.g., guideline adaptation)
Assess barriers/ facilitators (B/Fs) to knowledge use	- Assess B/Fs to knowledge use? (e.g., Delphi procedure, focus groups, interviews, questionnaires, statistical analyses on types of data) - Map identified B/Fs to behaviour change techniques and/or intervention components? (approach may include qualitative participatory methods, PDSA cycles, or theory-based approaches such as Michie's intervention mapping)
Select, tailor, implement interventions to promote knowledge use	- Select/incorporate intervention components to develop a KT intervention? (approach may include intervention mapping, marketing, precede/proceed, quality cycle, change management, organizational development, community development, and health technology assessment)

[4] Sources: table adapted from intersectionality & KT project work at Unity Health Toronto (personal communication with Kasperavicius); Straus et al. Knowledge Translation in Health Care, 2nd Ed. 2013; CIHR, http://www.cihr-irsc.gc.ca/e/40618.html; Straus et al. Monitoring use of knowledge and evaluating outcomes. CMHJ, 2010;182(2):E94-8.

	- Tailor the selected KT intervention components to the specific B/Fs to which they map? (e.g., using exploratory or theory-based approach) - Implement a KT intervention that has been designed?
Monitor knowledge use	- Assess uptake of the knowledge to determine how and to what extent the knowledge is used by decision-makers? o Conceptual knowledge use: changes in levels of knowledge or understanding or in attitudes (e.g., intentions to change) o Instrumental knowledge use: changes in behavior or practice (e.g., adherence to recommendations) o Strategic (persuasive) knowledge use: use of knowledge for political change and to influence policy (e.g., use in policy-related documents) - Note: TMF requires feedback and evaluation (e.g., process evaluation) to meet this step
Evaluate outcomes	- Determine the impact of use of knowledge on outcomes specific to health, provider and/or system? o Patient: impact on patients of using or applying the knowledge (e.g., health status, HR-QOL, satisfaction with care) o Provider: impact on providers of using or applying the knowledge (e.g., satisfaction with practice, time taken to do new practice) o System: impact on health system of using or applying the knowledge (e.g., length of stay, cost, waiting times)
Sustain knowledge use	- Plan for sustainability (continued implementation of KT interventions over time), spread (e.g. expanded to new setting or context) and/or scaling up (e.g. expanded to reach greater proportion of eligible population) of knowledge use? - Maintain change, adapt and sustain ongoing knowledge use?

(3) Level of change:[5]

Level	Definition	Example
Individual	Changing behaviour of a single person, or a group of individuals that are bound by common characteristics but don't necessarily work collectively	This level deals with the individual/person level (e.g., psychological TMF)
Organizational	Change within the confines of a single organization. Individual change is part of organizational change, but what makes	This level deals with groups of individuals – it could be a small team or a full organization such as a hospital or social institution

[5] Sources: Moore et al. Public Health Action Model for Cancer Survivorship. Am J Prev Med. 2015;49(6 Suppl 5):S470-6; Intersectionality & KT project work at Unity Health Toronto (personal communication with Kasperavicius).

	organizational change differ from individual change is the concept of collective behaviour/action (e.g., collective commitment to change, collective values and interests, etc.)	(e.g., sociologically-based TMF and those based in organizational behaviour)
System/policy	"Large-system transformations in health care are interventions aimed at coordinated, systemwide change affecting multiple organizations and care providers, with the goal of significant improvements in the efficiency of health care delivery, the quality of patient care, and population-level patient outcomes."[6]	This level deals with groups larger than the organization – how do different hospitals (including multiple hospitals in a large network) or different provinces or countries interact within themselves and beyond themselves *Add a note in the comments column when the TMF applies to policy-level

[6] Best et al. Large-System Transformation in Health Care: A Realist Review. Milbank Q. 2012; 90(3):421-56.

Appendix 2. Consolidated criteria for reporting qualitative studies (COREQ) checklist

Item	Description
Domain 1: Research team and reflexivity	
1. Interviewer/facilitator	Lisa Strifler
2. Credentials	BSc, MSc, PhD candidate
3. Occupation	PhD student
4. Gender	Female
5. Experience and training	Strifler is a PhD candidate who conducted this research as part of her PhD thesis project. She has training in health services research and methods and received formal training in qualitative research methodology during her graduate studies.
6. Relationship established	Email communication was exchanged between Strifler and the participant to determine eligibility and schedule an interview.
7. Participant knowledge of the interviewer	Participants were aware of the purpose and rationale of the study, that it was being conducted as part of Strifler's PhD thesis project, and the project funding source.
8. Interviewer characteristics	Strifler disclosed her role as a PhD candidate at the University of Toronto, a graduate trainee with the Knowledge Translation Program at St. Michael's Hospital in Toronto, Canada, and primary researcher on this project.
Domain 2: study design	
9. Methodological orientation and theory	Content analysis
10. Sampling	Convenience and snowball sampling were used
11. Method of approach	Participants were recruited via an ad in the Knowledge Translation Canada e-newsletter (which ran for 4 weeks in March and April 2023) or by snowball sampling with our usability study participants. Participants in our previous study, who provided consent to be contacted for participation in future research, were also invited to participate in the usability study via personalized email.
12. Sample size	10 participants. A target sample size of 5-8 participants was expected to provide sufficient information to answer the research question through semi-structured interviews and was considered a feasible range given the available resources.
13. Non-participation	13 individuals either responded to the ad in the e-newsletter (n=11, of which 5 did not book an interview) or were referred by a usability study participant (n=2). 7 eligible participants in our previous study were sent an email invitation, of which 4 did not respond and 1 was not reached due to an undeliverable email address. Participants were recruited until no new usability issues were identified; therefore, not all of the 24 participants in our previous study were contacted/invited to participate.
14. Setting of data collection	Interviews were conducted online using a video conferencing platform. Participants participated from their preferred location.

15. Presence of non-participants	No non-participants were present during the interviews.
16. Description of sample	See Table 2. All participants were from Canada (Ontario, Alberta or British Columbia) except for 1 participant who was from Australia. Participants worked in a variety of healthcare environments and had a range of experience supporting implementation activities in healthcare environments.
17. Interview guide	See Supplemental File Appendix 3. A semi-structured interview guide was prepared and revised as needed throughout data collection. The interview guide was reviewed by a clinician/knowledge translation expert who had experience with qualitative research and implementation science and practice.
18. Repeat interviews	Repeat interviews were not conducted.
19. Audio/visual recording	Interviews were audio and video-recorded using an online video conferencing platform and transcribed verbatim.
20. Field notes	Strifler took notes during and immediately following each interview and referred to these notes during data analysis and interpretation.
21. Duration	Interviews lasted 30 to 60 minutes.
22. Data saturation	Participants were recruited until no new usability issues were identified.
23. Transcripts returned	Individual transcripts were not returned to participants for comment.
Domain 3: analysis and findings	
24. Number of data coders	Data were inductively coded by a single investigator. The first 2 coded transcripts (a subset of 20%) were reviewed by a second investigator.
25. Description of the coding tree	A description of the coding tree has not been provided but will be made available upon request.
26. Derivation of themes	Themes were derived from the data.
27. Software	NVivo 12 Plus qualitative data analysis software (QSR International, Cambridge, MA) was used to organize and code the transcripts.
28. Participant checking	Participant checking was not performed, as changes were made to the tool iteratively, throughout usability testing.
29. Quotations presented	See Tables 3 and 5. Direct quotes from participants were presented in tables to support the study findings. Each quotation was identified using participant ID numbers.
30. Data and findings consistent	The data and findings are consistent.
31. Clarity of major themes	See Table 4. Major issues/suggestions for improvement included additional instruction and guidance on what to expect from the tool and

	how to use the information in the output table. Tool improvements included: (1) incorporating an overview figure outlining the tool steps and output, (2) displaying the tool questions on a single page, and (3) clarifying the available functions of the results page, including adding direct links to the glossary and to complementary tools.
32. Clarity of minor themes	See text in Results section. Issues/suggestions for improvement and corresponding changes made to the tool were further described within the text in the Results under sections for (1) tool purpose and content and (2) tool format and function.

Appendix 3. Usability study scenarios with instructions, and interview guide

Scenario A:

Please take a moment to read the scenario aloud. Once you are familiar with the scenario, please take a few minutes to reflect on what you might want to consider, and complete the task described below using the support tool. As you are doing so, please "think aloud" and provide any feedback including saying what you are thinking, what you are looking at and what you are trying to do.

You will have up to 10 minutes to complete the task. Do you have any questions?

SCENARIO

Background: Adults aged 65 and older account for a high percentage of acute hospital stays. Evidence suggests that early and consistent mobilisation of older adults admitted to hospital can decrease acute care length of stay, increase functional status and increase rates of discharge to home. Yet, rates of mobilisation in patients admitted to hospitals remain low. To address this gap, the Mobilisation of Vulnerable Elders (MOVE) initiative aims to promote early and consistent mobilisation practices for older adults admitted to hospitals. The three key components of this evidence-based program are to: mobilise patients at least three times a day; use progressive, scaled mobilisation; and, assess mobility within 24 hours of the decision to admit.

Task: As an implementation practitioner, **you are planning to implement the MOVE program within an acute care hospital to support a change in practice related to mobilisation of older adults**. To inform your work, you are looking to identify an appropriate knowledge translation theory, model or framework.

Scenario B:

Please take a moment to read the scenario aloud. Once you are familiar with the scenario, please take a few minutes to reflect on what you might want to consider, and complete the task described below using the support tool. As you are doing so, please "think aloud" and provide any feedback including saying what you are thinking, what you are looking at and what you are trying to do.

You will have up to 10 minutes to complete the task. Do you have any questions?

SCENARIO

Background: Adults aged 65 and older account for a high percentage of acute hospital stays. Evidence suggests that early and consistent mobilisation of older adults admitted to hospital can decrease acute care length of stay, increase functional status and increase rates of discharge to home. Yet, rates of mobilisation in patients admitted to hospitals remain low. To address this gap, the Mobilisation of Vulnerable Elders (MOVE) initiative aims to promote early and consistent mobilisation practices for older adults admitted to hospitals. The three key components of this evidence-based program are to: mobilise patients at least three times a day; use progressive, scaled mobilisation; and, assess mobility within 24 hours of the decision to admit.

Task: As an implementation practitioner, **you are planning to evaluate the implementation of the MOVE program across a network of acute care hospitals**. To inform your work, you are looking to identify an appropriate knowledge translation theory, model or framework.

Usability Study Interview Guide:

Read Informed Verbal Consent Script to participant, covering:

- *Welcome and introductions*
- *Purpose of research study and interview process*
- *Terms of consent*

** Start recording*
** Obtain consent and record time*

SCENARIO A (0) or B (1)

Great, let's begin! First, I am going to share the link to the tool in the chat.
**Share link to tool and ensure participant can successfully access it*

I have two scenarios for you, that will be presented in random order. You will have 10 minutes to complete each task and provide feedback on the tool while doing so. Here is your first scenario.
** Share screen (first scenario)*
** Provide up to 10 minutes for participant to complete the task and provide their feedback on the tool while doing so.*
** Start timer for 10 minutes*
** Ask participant to share their screen as they complete the task*

Notes on issues/feedback/suggestions during first task:

Great, thank you! Here is your second scenario. Again, you will have 10 minutes to complete the task and provide feedback on the tool while doing so.
** Share screen (second scenario)*
** Provide up to 10 minutes for participant to complete the task and provide their feedback on the tool while doing so.*
** Start timer for 10 minutes*
** Ask participant to share their screen as they complete the task*

Notes on issues/feedback/suggestions during second task:

SYSTEM USABILITY SCALE

I'm going to read out a series of 10 statements. On a scale of 1 to 5, 1 being strongly disagree and 5 being strongly agree, how would you rate each of the following statements?
** All items should be answered. If a participant feels that they cannot respond to a particular item, they should select the centre point of the scale (i.e., 3); Source: Brooke, 1995.*

- I think that I would like to use this tool frequently
- I found the tool unnecessarily complex
- I thought the tool was easy to use
- I think that I would need the support of a technical person to be able to use this tool
- I found the various functions in this tool were well integrated
- I thought there was too much inconsistency in this tool
- I would imagine that most people would learn to use this tool very quickly
- I found the tool very cumbersome to use
- I felt very confident using the tool
- I needed to learn a lot of things before I could get going with this tool

Questions on Tool Content

1. Are the questions in the tool clear and easy to understand? Why or why not?
    - Is there anything in this tool that you found difficult to understand?
    - Is the language appropriate?

2. Is there anything in this tool that you would change or remove? If so, what? Why?

3. Is there any information missing from this tool that you think would be helpful to include?

Questions on Tool Navigation & Format

4. Did you find the tool easy to use? Why or why not?

- Does the order of the questions make sense?
- Which aspects of the way the tool is organized do you like/not like?
- How would you like the information to be organized and displayed?

5. Do you find the tool visually appealing (e.g., layout, font, colours)? Why or why not?

Questions on Tool Purpose

6. Would you consider using a tool like this to inform your next implementation project? Why or why not?
    - Would this tool help you choose a knowledge translation theory, model or framework to inform your work? Why/why not?
    - Can you describe some advantages/disadvantages of using a tool like this?

Thank you for your feedback on the tool. We are coming to the end of the interview.

Other Questions

7. Before we wrap up, do you have any additional comments, concerns, or suggestions for improvements to share, regarding the tool?

8. Do you currently use any online tools to facilitate selecting a(n) implementation/knowledge translation theory, model or framework to inform your work?
    - If yes, which ones?
    - If no, why not?

Demographic Information

I have a few demographic questions to ask and then we will wrap up the interview.

9. For approximately how long (in years) have you been facilitating knowledge translation/implementation practice activities in a healthcare environment?

10. Could you please briefly describe, in a couple of words, the type of healthcare organization or environment in which you work? (e.g., rural or urban healthcare organization, teaching hospital, funding or regulatory organization, etc.)

Thank you so much for your time!

Appendix 4. Results of mapping exercise for 210 TMFs

Name of TMF	Taxonomy					KTA stage				Change level			Reference
	Process model	Evaluation framework	Determinant framework	Classic theory	Implementation theory	Select and adapt knowledge	Barriers/ facilitators and/ or implement strategies	Monitor knowledge use and/or evaluate outcomes	Sustain knowledge use	Individual	Organizational	System	
4E Framework for Knowledge Dissemination and Utilization			x				x			x	x	x	[1,2]
A Framework for Improvement			x				x			x			[3]
A Framework for Spread	x		x						x		x	x	[4]
A Model of Interpersonal Behavior				x			x			x			[5]
A Staged Model of Innovation Development and Diffusion of Health Promotion Programs	x					x	x	x	x	x	x	x	[6]
Academic Center for Evidence-Based Practice (ACE) Star Model of Knowledge Transformation	x					x	x	x		x	x		[7]
Action Research	x					x	x	x		x	x	x	[8-11]
Active Implementation Frameworks (AIF)	x		x			x	x	x	x	x	x		[12]
Adherence Model			x				x	x	x	x		x	[13]
Advancing Research and Clinical Practice through Close Collaboration (ARCC) Model of Evidence-Based Practice in Nursing and Healthcare	x		x				x	x		x	x	x	[14-15]
Affective Events Theory				x			x			x			[16]
An Action Theory Model of Consumption			x	x			x			x			[17]
An Organizational Theory of Innovation Implementation Effectiveness					x	x		x			x		[18]
Attitude, Social Influence and Self-efficacy (ASE) Model		x	x	x			x	x		x			[19-21]
Availability, Responsiveness Continuity (ARC): An	x					x		x		x	x	x	[22-24]

Name of TMF	Taxonomy					KTA stage				Change level			Reference
	Process model	Evaluation framework	Determinant framework	Classic theory	Implementation theory	Select and adapt knowledge	Barriers/ facilitators and/ or implement strategies	Monitor knowledge use and/or evaluate outcomes	Sustain knowledge use	Individual	Organizational	System	
Organizational & Community Intervention Model													
Behavioral-Ecological Model of AIDS Prevention			x				x			x			[25]
CAN-IMPLEMENT Framework	x					x	x	x	x	x	x	x	[26]
Capability Opportunity Motivation and Behaviour (COM-B)				x			x			x			[27]
CDC DHAP's Research-to-Practice Framework	x					x	x	x			x	x	[28-29]
CIHR Model of Knowledge Translation	x					x	x	x		x	x	x	[30-32]
Classical Conditioning				x			x			x			[33]
Clinical Work Assessment Model	x				x		x				x		[34-35]
Cognitive Behavioural Theory				x			x			x			[36]
Cognitive-Behavioral Model of Relapse Prevention			x	x			x			x			[37]
Cognitive-Social Health Information-Processing (C-SHIP) Model				x			x			x			[38]
Co-KT Framework	x					x			x	x	x	x	[39]
CollaboraKTion Framework	x		x			x	x	x	x	x	x	x	[40]
Collaboration for Leadership in Applied Health Research and Care (CLAHRC) Approach to Implementation	x						x	x	x	x	x	x	[41]
Collaborative Model for Achieving Breakthrough Improvement	x					x	x	x			x		[42]
Collaborative Model for Knowledge Translation Between Research and Practice Settings	x					x	x			x	x	x	[43]

Name of TMF	Taxonomy					KTA stage				Change level			Reference
	Process model	Evaluation framework	Determinant framework	Classic theory	Implementation theory	Select and adapt knowledge	Barriers/ facilitators and/ or implement strategies	Monitor knowledge use and/or evaluate outcomes	Sustain knowledge use	Individual	Organizational	System	
Communication-Behavior Change Model	x					x	x	x		x			[44]
Community Coalition Action Theory (CCAT)			x				x		x		x	x	[45]
Community-Based Knowledge Translation Framework (or Applying Knowledge To Generate Action Framework)	x					x	x			x	x	x	[46]
Complex Innovations Implementation Framework			x			x	x		x	x	x		[47]
Conceptual Framework for Addressing Social Context of Health Behaviors			x				x	x		x	x		[48]
Conceptual Framework for Program Sustainability in Public Health			x						x		x	x	[49]
Conceptual Framework for Research Knowledge Transfer and Utilization	x		x			x	x	x			x		[50]
Conceptual Model by Lara et al.	x		x				x	x				x	[51]
Conceptual Model for the Diffusion of Innovations in Service Organizations			x				x			x	x	x	[52]
Conceptual Model of Implementation Research		x						x		x	x	x	[53]
Conceptual Model of Knowledge Utilization			x				x				x	x	[54]
Conduct and Utilization of Research in Nursing (CURN) Project Model	x					x	x	x	x	x	x	x	[55-58]
Consolidated Framework for Implementation Research (CFIR)			x				x				x	x	[59]
Continuous Quality Improvement (CQI) model	x							x		x	x	x	[60]

Name of TMF	Taxonomy					KTA stage				Change level			Reference
	Process model	Evaluation framework	Determinant framework	Classic theory	Implementation theory	Select and adapt knowledge	Barriers/ facilitators and/ or implement strategies	Monitor knowledge use and/or evaluate outcomes	Sustain knowledge use	Individual	Organizational	System	
Coordinated Implementation Model	x		x			x	x			x	x	x	[61]
Core Steps for Effective Implementation	x					x	x	x		x	x	x	[62]
Critical Realism & the Arts Research Utilization Model (CRARUM)	x		x				x	x		x	x		[63]
Davis' Pathman-PRECEDE Model	x						x		x	x	x	x	[64-66]
Design Focused Implementation Model	x						x	x		x	x	x	[67]
Development Strategy			x				x			x			[68]
Diffusion of Innovations				x			x		x	x	x	x	[69]
Dissemination of Evidence-Based Interventions to Prevent Obesity	x		x				x			x	x	x	[70]
Dynamic Sustainability Framework			x					x	x	x	x	x	[71]
E2D2 Model	x	x	x				x	x		x	x	x	[72]
Ecological Framework by Durlack & DuPre		x						x		x	x	x	[73]
Ecological Framework by Sallis & Owen			x				x			x	x	x	[74-75]
Ecological Model of Diabetes Prevention					x		x			x			[76]
Ecological Model of Health Behaviour			x				x			x	x	x	[77]
Evidence-Driven Community Health Improvement Process (EDCHIP)	x					x	x	x		x	x	x	[78]
Expectancy-Value Model				x			x			x			[79]
Exploration, Preparation, Implementation, Sustainment (EPIS) Framework	x		x			x	x		x		x	x	[80]

Name of TMF	Taxonomy					KTA stage				Change level			Reference
	Process model	Evaluation framework	Determinant framework	Classic theory	Implementation theory	Select and adapt knowledge	Barriers/ facilitators and/ or implement strategies	Monitor knowledge use and/or evaluate outcomes	Sustain knowledge use	Individual	Organizational	System	
Explore Values, Operationalize and Learn, and eValuate Efficacy (EVOLVE)	x						x	x		x	x	x	[81]
Extended Information Processing Model (or Information Processing Model of Attitude Change and its extension or McGuire's persuasion matrix)	x		x				x			x			[82]
Extended Parallel Process Model (EPPM)				x			x			x			[83]
Factors Determining Rate of Adoption of Research Innovations into Practice			x			x	x				x		[84]
Framework by Cochrane et al.		x	x				x			x	x	x	[85]
Framework by Ferlie and Shortell			x				x			x	x	x	[86]
Framework by Grol & Wensing	x		x				x			x	x	x	[87]
Framework by Gurses et al.		x	x				x	x		x			[88]
Framework For Analyzing Adoption of Complex Health Innovations		x					x			x	x		[89-90]
Framework for Conceptualizing Program Sustainability			x						x		x	x	[91]
Framework for Knowledge Translation (or Understanding-User-Context Framework)			x			x	x			x	x		[92]
Framework for the Dissemination & Utilization of Research for Health-Care Policy & Practice	x		x				x	x	x	x	x	x	[93]
Framework for the Transfer of Patient Safety Research into Practice	x					x	x	x			x	x	[94]

Name of TMF	Taxonomy					KTA stage				Change level			Reference
	Process model	Evaluation framework	Determinant framework	Classic theory	Implementation theory	Select and adapt knowledge	Barriers/ facilitators and/ or implement strategies	Monitor knowledge use and/or evaluate outcomes	Sustain knowledge use	Individual	Organizational	System	
Framework of Dissemination in Health Services Intervention Research	x						x	x	x	x	x	x	[95]
General Theory of Deviant Behaviour				x			x			x			[96]
Goal Directed Theory				x			x			x			[97]
Goal Framing Theory				x			x			x			[98]
Goal Setting Theory				x			x	x		x			[99]
Health Action Process Approach (HAPA)				x			x			x			[100]
Health Behavior Framework			x		x		x			x			[101]
Health Behaviour Goal Model			x				x			x			[102]
Health Behaviour Internalization Model			x				x			x			[103]
Health Belief Model			x	x			x			x			[104]
Health Communication Program Cycle	x					x	x	x		x	x	x	[105]
Health Promotion Model			x				x			x			[106]
Health Promotion Technology Transfer Process	x					x	x	x		x	x	x	[107]
Healthcare Improvement Collaborative Model (HICM)	x						x	x	x		x		[108]
Hierarchical Model of Intrinsic and Extrinsic Motivation			x	x			x			x			[109]
I-Change Model (or Integrated Change Model)			x				x			x			[110-111]
Implementation Effectiveness Model					x		x	x			x		[112-113]
Implementation Process Model	x					x	x	x	x	x	x		[114]
Information Technology Adoption Model (ITAM)		x	x				x	x		x			[115]
Information-Motivation-Behavioural (IMB) Skills Model of AIDS-Preventive Behavior				x			x			x			[116-118]
Institutional Theory				x			x			x			[119]

Name of TMF	Taxonomy					KTA stage				Change level			Reference
	Process model	Evaluation framework	Determinant framework	Classic theory	Implementation theory	Select and adapt knowledge	Barriers/ facilitators and/ or implement strategies	Monitor knowledge use and/or evaluate outcomes	Sustain knowledge use	Individual	Organizational	System	
Integrated Mobile Ecological Model for the Promotion of Physical Activity			x				x			x	x	x	[120]
Integrated Social-Cognitive Framework			x	x			x			x			[121]
Integrated Theoretical Model for Alcohol and Drug Prevention			x	x			x			x	x	x	[122]
Integrated Theory of Drinking and Behaviour			x	x			x			x	x	x	[123]
Integrating Factors Influencing Smoking Behaviour and The Model of Attitude and Behaviour Change			x	x			x			x			[124]
Integrative Factors Influencing Smoking Behaviour Model			x	x			x			x			[124]
Integrative Model of Behavioural Prediction			x				x			x	x	x	[125]
Integrative Model of Health and Attitude Behaviour Change				x			x			x			[124]
Integrative Theory of Health Behaviour Change			x	x			x			x			[126]
Interactive Systems Framework (ISF) for Dissemination and Implementation	x		x			x	x				x	x	[127]
Intervention Mapping Framework	x					x	x	x	x	x	x	x	[128-129]
Iowa Model of Evidence-based Practice to Promote Quality Care and revision	x					x		x	x	x	x		[130]
Knowledge Exchange Framework			x			x	x		x	x	x	x	[131]
Knowledge Exchange-Decision Support (KE-DS) Model	x		x			x	x	x		x	x	x	[132-133]

Name of TMF	Taxonomy					KTA stage				Change level			Reference
	Process model	Evaluation framework	Determinant framework	Classic theory	Implementation theory	Select and adapt knowledge	Barriers/ facilitators and/ or implement strategies	Monitor knowledge use and/or evaluate outcomes	Sustain knowledge use	Individual	Organizational	System	
Knowledge Translation Model of Tehran University of Medical Sciences	x		x			x	x			x	x		[134-135]
Knowledge-to-Action (KTA) Framework	x					x	x	x	x	x	x	x	[136]
KT Framework for AHRQ Patient Safety Portfolio and Grantees	x					x	x		x	x	x		[137]
Language Expectancy Theory				x			x			x			[138]
LEAN Methodology and Transformation Process	x							x			x		[139]
Lewin's Change Theory	x					x	x		x	x	x		[140]
Model by Davis et al.	x					x	x	x	x	x	x	x	[141]
Model by Huberman	x					x	x			x	x	x	[142]
Model by Landry et al. (or The Ladder of Knowledge Utilization)	x						x			x			[143]
Model for Improvement	x					x	x	x			x		[144]
Model of Community-Based Program Sustainability		x	x						x			x	[145]
Model of Pro-Environmental Behavior			x				x			x			[146]
Model of Research Utilization in Occupational Therapy	x					x	x			x			[147]
Motivation-Opportunities-Abilities (MOA) Model of Consumer Behavior			x	x			x			x			[148]
Multilevel Conceptual Framework of Organizational Innovation Adoption			x				x			x	x		[149]
National Center on Health, Physical Activity and Disability (NCHPAD) Knowledge, Adaptation, Translation and Scale-up (N-KATS)	x					x	x	x	x	x	x	x	[150]
Navigation Chart	x						x	x	x		x		[151]

Name of TMF	Taxonomy					KTA stage				Change level			Reference
	Process model	Evaluation framework	Determinant framework	Classic theory	Implementation theory	Select and adapt knowledge	Barriers/ facilitators and/ or implement strategies	Monitor knowledge use and/or evaluate outcomes	Sustain knowledge use	Individual	Organizational	System	
Needs-Opportunities-Abilities (NOA) Model of Consumer Behaviour			x				x			x			[152]
NHS Sustainability Model		x	x						x	x	x		[153]
Normalization Process Theory					x		x			x	x		[154-156]
Organizational Development Theory	x	x	x		x	x	x	x			x		[157-158]
Organizational Readiness for Change (ORC) Theory			x		x	x	x				x		[159]
Organizational Theory of Implementation Effectiveness			x		x		x	x			x		[160]
Ottawa Model of Research Use (OMRU)	x		x				x	x		x	x	x	[161-163]
Participatory Innovation Diffusion Model			x				x				x	x	[164]
Participatory Organization Development (OD) Framework for Scaling Up Quality-of-Care Innovations			x				x					x	[165]
Pathways to Evidence Informed Policy (or Evidence-Informed Policy and Practice Pathway)	x					x	x			x	x	x	[166]
PEN-3 Cultural Model			x				x			x			[167-168]
Plan-Do-Study-Act (PDSA) Cycles	x						x	x		x	x	x	[169]
Political Economy of Health				x			x			x	x	x	[170]
PPRNet-TRIP Quality Improvement Model	x						x				x		[171]
Practical Robust Implementation and Sustainability Model (PRISM)		x	x				x	x	x	x	x	x	[172]
Practice Change and Development Model			x				x			x	x		[173]
Precaution Adoption Process Model (PAPM)					x		x			x			[174]
PRECEDE-PROCEED Model	x						x	x		x	x	x	[175-176]

Name of TMF	Taxonomy					KTA stage				Change level			Reference
	Process model	Evaluation framework	Determinant framework	Classic theory	Implementation theory	Select and adapt knowledge	Barriers/ facilitators and/ or implement strategies	Monitor knowledge use and/or evaluate outcomes	Sustain knowledge use	Individual	Organizational	System	
PRIME Theory of Motivation				x			x			x			[177-178]
Priming Theory				x			x			x	x	x	[179]
Problem Behavior Theory		x	x				x	x		x			[180]
Problem Solving Model	x						x	x		x			[181]
Process Marker Model	x							x		x	x	x	[182]
Program-Planning Model	x					x	x	x		x			[183-184]
Promoting Action on Research Implementation in Health Services (PARIHS) Framework		x	x		x	x	x			x	x	x	[185-187]
Pronovost's 4E's Process Theory	x					x	x	x	x	x	x	x	[188]
Prospect Theory				x			x			x			[189-190]
Public Health Action Model for Cancer Survivorship			x				x			x	x	x	[191]
Push-Pull Capacity Model			x				x				x		[192-194]
Quality Implementation Framework	x					x	x	x		x	x	x	[195]
Quality Improvement Supply Chain Model	x					x	x			x	x	x	[196]
Reach Effectiveness Adoption Implementation Maintenance (RE-AIM)		x						x	x	x	x	x	[197]
Real-World Dissemination			x				x			x	x	x	[198-199]
Regulative Research Cycle	x					x	x	x		x	x	x	[200]
Regulatory Fit Theory				x			x			x			[201-202]
Replicating Effective Programs Plus Framework	x					x	x	x	x	x	x	x	[203]
Research and Policy in International Development (RAPID) Framework			x				x			x	x	x	[204-205]
Research Knowledge Infrastructure			x				x				x		[206]
Risk as Feelings Model				x			x			x			[207]
Self-Determination Theory				x			x			x			[208]
Self-Efficacy Theory				x			x			x			[209-211]
Self-Regulation Theory				x			x			x			[212]

Name of TMF	Taxonomy					KTA stage				Change level			Reference
	Process model	Evaluation framework	Determinant framework	Classic theory	Implementation theory	Select and adapt knowledge	Barriers/ facilitators and/ or implement strategies	Monitor knowledge use and/or evaluate outcomes	Sustain knowledge use	Individual	Organizational	System	
Sequential Model of Behavioral and Social Change (or The Seven Doors Social Marketing Approach)			x				x			x			[213]
Six Staged Model of Communication Effects	x						x			x			[214]
Social Action Theory			x	x			x			x	x		[215]
Social Change Theory				x			x			x	x	x	[216]
Social Cognitive Theory				x			x			x			[217-218]
Social Consensus Model of Health Education			x				x			x	x	x	[219]
Social Ecology			x	x			x			x	x	x	[220]
Social Ecology Model for Health Promotion	x		x				x	x		x	x	x	[221-223]
Social Influence Model of Virtual Community Participation			x	x			x			x			[224]
Social Learning Theory				x			x			x			[225]
Social Marketing Framework			x				x				x		[226-227]
Social Marketing Planning Model	x					x	x	x		x	x	x	[228-229]
Social Norms Theory				x			x			x		x	[230]
Social Problem-Solving Model for Health Behaviour Change			x				x			x			[231]
Soft Systems Theory/Methodology	x					x	x	x			x	x	[232-233]
Stage Theory of Organizational Change	x					x	x		x		x		[234-235]
Stages of Research and Evaluation	x					x	x	x	x	x	x	x	[236]
Stetler Model of Research Utilization	x					x	x	x		x	x		[237]
Sticky Knowledge	x		x			x	x		x		x		[238-239]
Structural-Ecological Model			x				x			x	x	x	[240]
Systems Model of Health Behaviour Change				x			x			x		x	[241]

Name of TMF	Taxonomy					KTA stage				Change level			Reference
	Process model	Evaluation framework	Determinant framework	Classic theory	Implementation theory	Select and adapt knowledge	Barriers/ facilitators and/ or implement strategies	Monitor knowledge use and/or evaluate outcomes	Sustain knowledge use	Individual	Organizational	System	
Technology Acceptance Model			x	x			x			x			[242]
Technology Adoption Criteria in Health (TEACH) Model (or Technology Adoption Curve and its Critical Success Factors)	x						x			x			[243-244]
Temporal Self-Regulation Theory				x			x			x			[245]
Ten Steps to Systems Thinking	x						x	x				x	[246]
The Black Dog Institute Integrated Model of Knowledge Translation Exchange	x					x	x	x	x	x	x	x	[247]
Theoretical Domains Framework			x				x			x	x		[248-249]
Theories of Change Evaluation Model	x	x						x		x	x	x	[250]
Theory of Meaningful Learning (including Model)	x			x			x			x			[251-252]
Theory of Normative Conduct				x			x			x			[253]
Theory of Normative Social Behaviour				x			x			x			[254]
Theory of Planned Behaviour				x			x			x			[255]
Theory of Reasoned Action				x			x			x			[256]
Theory of Research Utilization Enhancement for Occupational Therapists (TRUE-OT)				x			x			x			[257]
Theory of Triadic Influence				x			x			x			[258]
Transcontextual Model of Motivation			x	x			x			x			[259]
Transtheoretical Model of Behaviour Change				x			x			x			[260]
University of Hawai‘i Center for ‘Ohana Self-Management of Chronic Illnesses (COSMCI) Conceptual Framework			x				x	x		x			[261]
Utilization-Focused Surveillance Framework			x			x	x	x			x	x	[262]

Name of TMF	Taxonomy					KTA stage				Change level			Reference
	Process model	Evaluation framework	Determinant framework	Classic theory	Implementation theory	Select and adapt knowledge	Barriers/ facilitators and/ or implement strategies	Monitor knowledge use and/or evaluate outcomes	Sustain knowledge use	Individual	Organizational	System	
Value Belief Norm Theory			x	x			x			x		x	[263]
Western Australia Health Network Policy Development and Implementation Cycle	x					x	x	x				x	[264]
Yin's Routinization Framework	x		x		x		x		x	x	x	x	[265-266]
Total	**86**	**16**	**97**	**59**	**12**	**61**	**192**	**76**	**41**	**172**	**126**	**96**	

Appendix 5. References for 210 TMFs from mapping exercise

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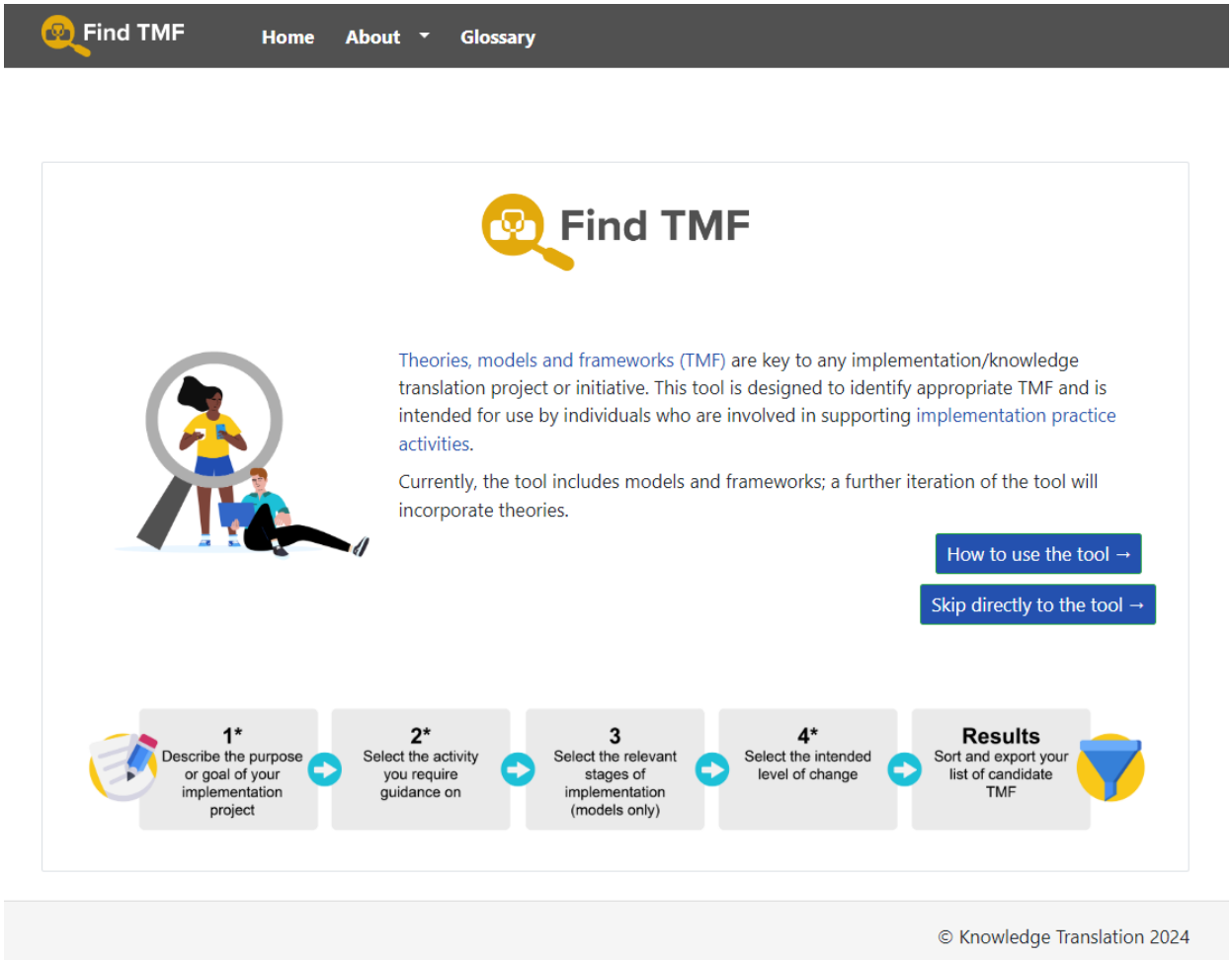
Appendix 6. Screenshots of final tool homepage and results page

Screenshot of tool homepage



Screenshot of tool results page