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A shared terminology for implementation research impact: Global Impact Analytics Framework (GIAF) glossary

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Sue Lukersmith, Luis Salvador-Carulla, Mencia Colosia, Cindy Woods, Elisabeth Zeilinger, Giulio Castelpietra, Frederico Trujillo, Kim Bulkeley, Tom Chen, Marleen Mul, Ana Fernández, James Gillespie, Matthew Hamilton, Kelvin Hill, Gillean Hilton, John Mendoza, Beatriz Guzman, David Perkins, Danny Rock, Sebastian Rosenberg, Carla

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Title:

A shared terminology for implementation research impact: Global Impact Analytics Framework (GIAF) Glossary

Authors

Sue Lukersmith[1] sue.lukersmith@canberra.edu.au

Luis Salvador-Carulla[1] luis.salvador-carulla@canberra.edu.au

Mencia Ruiz Gutiérrez Colosia[2] menciaruiz@uloyola.es

Cindy Woods[1] cindy.woods@canberra.edu.au

Elisabeth Zeilinger[3] elisabeth.zeilinger@univie.ac.at

Giulio Castelpietra[1] Giulio.castelpietra@canberra.edu.au

GIAF Taxonomy and Glossary Expert Panel Group (Group co-authors)

GIAF Taxonomy and Glossary Expert Panel Group (Group co-authors)

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1. Health Research Institute, Faculty of Health, University of Canberra, Australia

2. Universidad Loyola, Spain,

3. University of Vienna, Austria

Corresponding author: Sue Lukersmith sue.lukersmith@canberra.edu.au

Expert Panel Group (Group co-authors)

Frederico Alonso Trujillo	Consejería de Salud y Consumo de la Junta de Andalucía, Spain	Frederico-alonso@juntadeandalucia.es
Kim Bulkeley	University of Sydney, Australia	kim.bulkeley@sydney.edu.au
Tom Chen	University of Kent, England	t.chen-606@kent.ac.uk
Marleen de Mul	Erasmus University, Rotterdam, Netherlands	demul@eshpm.eur.nl
Ana Fernández	Agència de Salut Pública de Barcelona, Spain	afernand@aspb.cat
James Gillespie	University of Sydney, Australia	james.gillespie@sydney.edu.au
Matthew Hamilton	Monash University	Matthew.hamilton2@monash.edu
Kelvin Hill	Stroke Foundation, Australia	KHill@strokefoundation.org.au
Gillean Hilton	Austin Health, Australia	Gillean.hilton@austin.org.au

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John Mendoza	ConNetica, Australia	jmendoza@connetica.com.au
Beatriz Olaya Guzman	Parc Sanitari Sant Joan de Déu, Spain	beatriz.olaya@sjd.es
David Perkins	University of Canberra, Australia	Davidallanperkins@gmail.com
Danny Rock	WA Primary Health Alliance, Australia	daniel.rock@wapha.org.au
Sebastian Rosenberg	University of Canberra, Australia	Sebastian.Rosenberg@canberra.edu.au
Carla Sabariego	Swiss Paraplegic Research, Switzerland	carla.sabariego@paraplegie.ch
Ginny Sargent	MND Australia, Australia	Ginny.sargent@gmail.com
Annette Schmiede	Digital Health CRC, Australia	annetteschmiede@gmail.com
Antoni Serrano	Parc Sanitari Sant Joan de Déu, Barcelona	antoni.serrano@sjd.es
Judit Simon	Medical University of Vienna, Austria	judit.simon@meduniwien.ac.at
Germain Weber	University of Vienna, Austria	germain.weber@univie.ac.at

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Author Contributions

S.L. made a substantial contribution to the concept of the article, creation of the GIAF Glossary, project administration, acquisition of data, formal analysis, validation, writing the original draft and revising it critically for important intellectual content.

L. S-C. made a substantial contribution to the concept of the article, creation of the GIAF Glossary, acquisition of data, formal analysis, validation and revising the article critically for important intellectual content.

M.R.G.C made a substantial contribution to the concept of the article, creation of the GIAF Glossary, and revising the article critically for important intellectual content.

C.W. made a substantial contribution to revision of the GIAF Glossary, revising the paper critically for important intellectual content.

E.Z contributed to the acquisition, analysis, and interpretation of data for the article, and revising it critically for important intellectual content.

G.C. acquisition, analysis, and interpretation of data for the article, and revising it critically for important intellectual content.

GIAF Taxonomy and Glossary Expert Panel Group (Group co-authors) substantially contributed to the research process and data/evidence collection and revised the article critically for important intellectual content. Panel members who participated in at least two meetings were invited to be group authors.

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All authors approved the version to be published and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Competing interests

The authors declare that they have no competing interests.

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Ethical approval and consent to participate

Ethics approval was initially granted by the Human Research Ethics Committee at the Australian National University in 2020 (#2020/768). Ethics approval was then transferred and approved by the Human Research Ethics Committee at the University of Canberra in 2022.

All expert panel members completed a written consent form and a conflict-of-interest declaration prior to participation.

Consent for publication

Not applicable

Availability of data and materials

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

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Abstract

Background

Over the past two decades, the growing number of theories, models and frameworks developed in implementation research has generated a significant problem of terminological variability. Evidence shows that implementation research has reached a point in time, when the absence of a common vocabulary and a related taxonomy is hampering the advancement of comparative research in impact analysis, particularly in the "process" or throughput phase. The Glossary of terms is part of the Global Impact Analytics Framework (GIAF) Toolkit.

Aim

This paper details the development of the GIAF Glossary for disambiguation of implementation research terms related to the process of impact analysis, and to document the development and adoption of agreed definitions within the GIAF Taxonomy (15 domains and 82 sub-domains) and toolkit Checklists.

Methods

We followed an ontoterminology approach and the Technology Readiness Level adapted to implementation sciences. The iterative and multiple steps involved a scoping review of the terminology and definitions in theories, models and frameworks related to the process domains of implementation research, followed by the development of an inventory of terms, assessment of the definitions for ambiguity and vagueness to develop the Alpha version. The GIAF Glossary was developed concurrently with the development of the GIAF Taxonomy and a Beta version created. Subsequently, an international expert panel (n=32) critiqued, refined the Beta version and final definitions reached through consensus. Further testing of its usability in the real world occurred over 8 years across 35 project evaluations.

Results

The final comprehensive GIAF Glossary has n=189 terms. Of these 72% of the definitions were developed during this study, 12% were adopted verbatim from a published source and 16% adapted from a published source. The completed GIAF Glossary is in Appendix 3.

Conclusions: This study demonstrated that numerous existing definitions of terms used in research, evaluation and impact analysis of implementation processes are ambiguous or vague. We demonstrate the combined use of two important methodologies, that of ontoterminology and the Technology Readiness Level-IS. We introduce the GIAF Glossary, developed as part of the GIAF Toolkit which includes the GIAF Taxonomy, Checklists and Ladders/Scales. The GIAF Glossary provides clear and consensus-based definitions that support consistent communication and understanding across international contexts for impact analysis and implementation research broadly. To our knowledge the GIAF Glossary is the most comprehensive Glossary for the impact analysis of implementation research and science.

Contribution to the literature

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- Ambiguous and vague definitions in impact analysis increase the risk of inappropriate interpretations and uncertainty in implementation science.
- The GIAF Glossary contains 189 agreed terms and definitions, is designed as an accessible tool supporting the GIAF Taxonomy, Checklists, and impact analysis in implementation research.
- The GIAF Glossary provides consistent definitions for implementation processes, and some commonly used concepts used in the evaluation of implementation research.
- When planning implementation initiatives, the GIAF Glossary may reduce barriers for interdisciplinary researchers internationally by providing a common terminology and understanding across disciplines and practice.

Key words: Glossary, vocabulary, Global Impact Analytics Framework, Impact analysis, Implementation research, onto-terminology, terminology, taxonomy,

Background

Evaluation of health and social research impact in implementation science has gained global attention, becoming increasingly important and a priority to policy makers, funders, governments, researchers and program implementers (1-3). By employing more rigorous and standardised methodologies to evaluate research impact, evaluations can provide deeper insights that enhance the value and generalisability of the research (4, 5). The interest on impact analysis has been accompanied by a growing number of theories, models and frameworks (TMF) to support standard evaluation. Despite these TMFs, researchers and policymakers often wrestle with the challenge of defining and then measuring impact in a comprehensive way to enable comparisons (6, 7). Furthermore, the development of frameworks and tools has increased terminological variability, to the point that the absence of a common vocabulary and a related taxonomy (knowledge map and classification) is hampering the advancement of comparative research in implementation science (6, 8, 9).

The issue of standardising methodologies and creating a shared or consensus-based understanding of definitions within research domains is not a recent concern (10, 11). This challenge has a longstanding history, and there have been endeavours to develop consistent terminology, especially in scientific research. The primary issues related to terminology stem from a lack of clarity resulting from the ambiguity and/or vagueness of terms (12). Ambiguity exists when a term can reasonably be interpreted in more than one way. It applies when a definition is imprecise and can be translated into more than one code in the reference classification system. An example of an ambiguous definition of Acceptability in implementation research is *'the reaction of stakeholders and the likelihood of encountering potential organisational or programmatic risks'* (13). The definition suggests the reaction can be neutral, positive or negative (both directions) but it is not clear how that is measured. Further there may be barriers but not necessarily risks. Vagueness exists when a word or phrase is underspecified or includes more than three meanings making it unclear, admits borderline cases or relative interpretation (12). An example of a vague definition of Acceptability is '*how the intended individual recipients—both targeted individuals and those involved in implementing programs —react to the intervention*'(14). This definition focuses on reaction but not on the directionality, and so it is not a measurable definition. Words such as "reach" can be used with different meanings (15, 16). For example "Reach" defined in the RE-AIM framework as **"**the *absolute number, proportion, and representativeness* of individuals who are exposed to, participate

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in, or are affected by an intervention or policy, as well as the *processes that influence participation and engagement*"(17). This umbrella definition of "reach" includes the target population, the target audience, their engagement, and all the processes involved in their participation. The definition is broad and presents an operationalisation barrier.

When this terminological variability occurs, it reduces the comparability and increases the overall lack of clarity in the field (8, 10, 18). In service research these problems translate into inconsistencies between the names assigned to services and the actual activities they perform, making like-with-like comparisons difficult (19). Recent studies support the development of operational, comprehensive and specific definitions that should be linked to existing taxonomies (8). A glossary is a structured list of terms arranged alphabetically, which is specifically separate from other text on a topic. It must include precise and detailed definitions related to the topic. Glossaries containing commonly used terms with internationally recognized definitions can help to resolve terminological ambiguity, reducing confusion and misunderstanding during implementation (20-22).

The combined use of glossaries with formal ontologies or taxonomies s falls within the domain of ontoterminology (23, 24). This discipline is concerned with systematically organizing and developing an agreed definition of terms to eliminate ambiguity and enhance precision in communication (12, 25).

The ontoterminology approach has been used for disambiguation in information technology, and service and implementation research. For example, a recent study drew attention to a notable problem in how the term 'psychotherapy' was used, particularly regarding the consistency of its definition and application at international level; and highlighted the importance to differentiate it from overlapping terms like counselling or emotional support. For clearly defining "psychotherapy", the authors combined three international classifications: the International Classification for Health Interventions (ICHI), the International Standard Classification of Occupations (ISCO) for the classification of the professionals providing the intervention, and the Description and Evaluation of Services and Directories (DESDE) for describing the services where the intervention takes place (12). The study emphasized the importance of the proper classification of psychotherapy, for the allocation of public funds for mental health care. Another study in services research highlighted the difficulty of measuring effectiveness of care coordination/case management or navigation services because of a lack of agreed terms for the actions (interventions) performed by case managers in different sectors (26); which has subsequently been applied as a tool to evaluate case manager activities effectiveness in implementation studies in different contexts and with people with different health conditions (27-29)

The challenge of terminological variability pertains to all sectors, not only to health and social sectors. A disambiguation study conducted on education services, revealed that gathering data through a top-down approach, involved aggregating information at a higher, often national level, where data was interpreted with a national or centralized perspective in mind (30). This meant that, the nuances and variations that exist at the local level were not captured. The application of a specific classification to disambiguate a list of education services, showed that only 9% were based on consistent and clear definitions.

A glossary of terms enhances clarity and consistency in the interpretation of concepts within a specific domain through a shared understanding and improved communication. A glossary provides

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a formal definition of the relationships among terms to support the understanding and communication between stakeholders from users (senders) of the information (e.g. health and social services researchers) and recipients (receivers) of the information (e.g. policy makers, funders and program end users). A Glossary also supports accuracy for data sharing and analysis.

The Global Impact Analytics Framework (GIAF) is a comprehensive approach with a Toolkit for evaluating the impact of processes of implementation. The GIAF Toolkit includes:

- Taxonomy (knowledge map and classification) of 15 domains and 82 sub-domains
- Glossary (for a common understanding and language) with defined terms for each domain and sub-domain
- A Checklist (for data collection) for each domain in the Taxonomy to collect, track and map quantitative and qualitative information on each of the sub-domains.
- A Ladder or Scale used to assess, rate and code the information collected to a level on the corresponding GIAF Ladder or Scale.

The GIAF approach evaluates the project implementation and enables comparisons across projects and settings. Figure 1 illustrates the GIAF process domains/sub-domains across the three phases of implementation (initiation, maturity, evolution).

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Figure 1 GIAF Taxonomy phases, domains and subdomains

Our team undertook three studies to develop the GIAF Taxonomy and Glossary. The first was a scoping review on the theories, models and frameworks (and their associated tools) in the peer reviewed literature, that have been applied in the real world (6). The second study was to develop the GIAF Taxonomy (31). The third study was to develop the GIAF Glossary concurrently with the GIAF Taxonomy using an ontoterminology approach.

In the first published study of the scoping review, we found that the theories, models and frameworks typically focused on the resources and results, less on the implementation processes. (6). Our focus was the evaluation of the implementation process. This included process domains such as readiness, dissemination, adoption, usability but excluded resource domains such as implementation strategies, result domains such as outcome measurement, and the contextual factors such as barriers and enablers.

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The second study aimed to address the gap concerning the evaluation and impact analysis of the processes of implementation research through the development of the GIAF Taxonomy (31).

The aim of the third study was to develop a glossary of consensus -based definitions of terms for each domain and sub-domains of the Global Impact Analytics Framework (GIAF) Taxonomy as a companion to the GIAF toolkit.

The aim for the Glossary was not to provide a full ontoterminology of implementation sciences, rather an ontoterminology of the terms used in the GIAF toolkit to evaluate the impacts of process in implementation research. We also sought to include any relevant general common implementation research terms. By providing a standardised glossary which accompanies the GIAF Taxonomy, this resource enables and promotes a shared understanding among implementation researchers, practitioners, policymakers and end users, who frequently operate across disciplines and sectors and require accessible, interpretable frameworks including terminology.

This paper presents the third study (occurring concurrently to the second) to develop a glossary of terms to accompany the GIAF taxonomy. The purpose of this paper is to report the third study methods to develop the GIAF Glossary for the terms for the GIAF Taxonomy process domains, and some additional terms and concepts widely used in the evaluation of implementation research.

Method

The Glossary is part of the development of the onto-terminology and the evaluation tools of GIAF, concurrently developed over 10 years (2015-2025) with an international research network (31). The approach to develop the Glossary followed the Technology Readiness Levels adapted to implementation sciences (TRL-IS) (32). The TRL is a globally accepted approach for determining the stage of developmental maturity of the research defined in nine levels grouped in four major functions. These include

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I. Prototyping: foundational knowledge and gaps identified (Level 1), formalisation of the knowledge base (e.g., scoping reviews, analysis of barriers and facilitators) (Level 2), proof of concept (Level 3) and prototype (Level 4);
II. Evaluation and piloting: validation (Level 5), piloting in a relevant environment (Level 6);
III. Demonstration in real world environments (Level 7);
IV. Deployment: pre-release and release or commercialisation (Levels 8 and 9).

The GIAF Taxonomy and Glossary was co-designed with a panel of experts. Expert panel members were targeted in Europe and Australia, identified through the research team's professional networks and selected for their diverse disciplinary backgrounds, organisational roles, and their experience relevant to health and social implementation research. Individuals with recognised expertise in implementation science – such as health service planners, clinical guideline developers, health economists, epidemiologists, policy analysts, psychologists, and psychiatrists – were invited via email to participate. Those who accepted the invitation were included in the panel and are listed in the group co-authorship. Digital conferencing was used to run the panels in two separate series, one in 2020-2021, and a second series of nominal groups in 2022. The expert panel comprising 32 subject matter experts (female = 56%, n = 18) on implementation research and planning from Australia (n = 14) and Europe (n = 18 from 7 countries – Austria, France, Italy, Netherlands, Spain, Switzerland,

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United Kingdom) participated in the expert panel to review, refine and reach consensus on definitions of terms.

The method and steps involved in the development of the GIAF Glossary are shown in summary in Table 1 followed by further detail.

Table 1 The method and steps involved in the GIAF Glossary development

Method and steps in the development of the GIAF Glossary based on the Technology Readiness Levels in Implementation Science (TRL-IS)	
TRL-IS Level 1 **Basic principles**	Foundational knowledge established. Review of the terminology and definitions in theories, models and frameworks (TMF) combined with hand searching to identify terms related to implementation research. Agreement of the use of the TRL and ontoterminology approaches with the expert panel.
TRL-IS Level 2 **Concept formulated**	Formulation of prior knowledge base. Preliminary inventory of terms listed in alphabetical order with a selection of at least two definitions for each term (from the implementation literature scoped in TRL1 and one identified by the team through single term targeted internet searches.
TRL-IS Level 3 **Proof of concept**	The research team critically assessed the first group of terms and their definitions for clarity (lack of ambiguity, vagueness) and meaning. The research team selected an appropriate existing definition, or a new definition developed by the team was proposed.
TRL-IS Level 4 **Prototype development**	The prototype version of the GIAF Glossary was produced and tested internally to resolve issues, identify gaps and inconsistencies.
TRL-IS Level 5 **Validation of prototype**	The terms and definitions were refined with critique and multiple revisions by the GIAF expert panel members. Refinement continued until consensus reached on terms and definitions. Feasibility of this (Alpha) version was tested and validated.
TRL-IS Level 6 **Tested in a relevant environment (Pilot)**	Testing of the Alpha version of terms and definitions using the GIAF Checklists (Data collection tool) and Ladders/Scales (Measurement and coding system) commenced through their use by the core research team and external researchers in subsequent international implementation studies.
TRL-IS Level 7 **Demonstrated in the real world**	Beta version tested in the real world. Ongoing refinement to ensure the consistency of terms across the Glossary for use. Multiple papers are published on the impact analysis of 35 implementation project evaluations using the GIAF toolkit (Taxonomy, Glossary, Checklists and Ladders).
TRL-IS Levels 8 & 9 **Pre-release and release**	Final version approved. IP agreement completed and the GIAF Glossary was made available for non-commercial use. GIAF Checklists and toolkit training materials were developed and a training course conducted using the Glossary within training materials.

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Development of a Protype - Technology readiness Level 1-4

The following section expands on the detail of the TRL steps outlined in Table 1.

TRL-IS Level 1-2

Our team conducted a scoping review of the TMFs and identified the seminal documents of TMFs that contained a Glossary or list of definitions (6). The initial search was conducted in 2020 and then updated in 2024. The methods, search terms, inclusion criteria for the first study of the TMFs scoping review has been published and a brief overview is provided here (6). Literature searches were conducted in Medline and Scopus databases, hand searches from identified papers and expert directed searches. This paper reports on the subsequent steps and specific methodology to develop the GIAF glossary.

We conducted a review of relevant terms and their definitions for the GIAF Taxonomy, organising them alphabetically to develop an inventory of terms aligned with the GIAF taxonomy domains (15 domains and 82 subdomains). For each term, we identified at least two definitions from the literature, selecting entries that demonstrated semantic variation until conceptual saturation was reached. We first identified the definitions available in the frameworks (n=50 typologies, n=1 taxonomy, no ontoterminology) identified through the scoping review. Where definitions were not available from the scoping review literature, further hand searches were undertaken, drawing on online dictionaries, grey literature and organisational reports.

TRL-IS Level 3

The research team then critically assessed this first group of terms and their definitions for ambiguity, vagueness and clarity of meaning. The approach facilitated learning from the definitions of other conceptually related terms. The research team also grouped the terms into first level relationships of the GIAF implementation phases and domains in parallel with developing the Checklists for each domain. An appropriate existing definition was identified, or a new definition was proposed where gaps or inconsistencies were identified. The concurrent development of the Glossary, and Checklists identified gaps in the preliminary inventory. Additional terms and corresponding definitions were identified for the domains and sub-domains of the three GIAF implementation phases: Initiation, Maturity and Evolution.

TRL-IS Level 4

The prototype of the GIAF Glossary was produced with the research team. It was tested internally and workability assessed to resolve issues, identify gaps and inconsistencies.

Validation of Prototype TRL-IS Level 5

The terms and their definitions in the prototype version were subsequently reviewed, critiqued and refined, through a structured expert panel process using a nominal group technique (NGT) to ensure the Glossary accurately defined key aspects of the domains and sub-domains of the GIAF Checklists. The terms were presented to the expert panel systematically per domain and sub-domains of the proposed Checklists (not alphabetically) to support conceptualisation of implementation and the GIAF implementation phases (Initiation, Maturity and Evolution), domains in each phase and sub-domains. The aim was to enable a common understanding for GIAF users their stakeholders, and the broader implementation research sector. NGT is a structured approach to reach consensus (33, 34).

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A step-by-step process is followed where the expert panel received a synthesis of the background information on the previous preparatory work of the research team to identify key terms and definitions, in the order of the GIAF phases, domains and sub-domains in each phase. Each term was discussed in the context of the GIAF Checklists, followed by facilitated discussion. The facilitated discussion ensures that the experts talk through their ideas and concerns, which is then followed by a voting process, for an agreed definition of the term.

to

Testing in a relevant environment (piloting) TRL-IS Level 6

The Alpha version of the Glossary was tested by the core research team and external researchers in subsequent international implementation studies (refer to Appendix 2 for the projects and publication details). The Checklists are the data tracking and collection tool, one for each domain in the GIAF Taxonomy. The Ladders/Scales are the measurement coding system which assigns a number to the data collected into a Ladder/Scale. Thus, each term in the Glossary was tested through use of the Checklist and associated Ladder. There was only minor refinement of the definitions in the GIAF domains and sub-domain definitions. Significant gaps in implementation research terms beyond the GIAF Checklists) were identified and a series of key terms with their definitions were added during this phase.

The terms were revised for lay out, consistency across the Glossary, ensuring that each definition was consistent and coherent on its own and could be understood independently of the Glossary for its use in different contexts. A beta version was used in single projects and multi-project evaluations (Taxonomy, Glossary, Checklists) (35-37).

Pre-release and Release TRL-IS Levels 8 and 9

The demonstration in real world cases allowed further refinement of the glossary and the preparation of its final version. The intellectual property (IP) for the GIAF Taxonomy, Glossary and Checklists were registered under an international creative commons license and made available for non-commercial use, and additional a DOI for the GIAF Glossary. Training materials were developed. A Training course was developed and conducted on the use of GIAF Toolkit (Taxonomy, Glossary, Checklists).

These preparatory activities established the knowledge base and consensus processes that underpinned the GIAF Glossary development. The Results section that follows presents the outputs of this process.

Ethical considerations

Ethical approval for the work with the expert panel to develop the GIAF was granted by the Human Research Ethics Committee at the Australian National University in 2020 (#2020/768). When the team relocated to the University of Canberra the transfer of the ethical approval was granted on 29/4/2022.

All expert panel member participants gave written informed consent and completed a disclosure of interest's declaration prior to taking part in the nominal groups. No potential conflicts of interest were raised.

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Results

Frameworks are defined as a description of a defined system or topic without providing causality, which serve as guides for developing theories, models or conducting analysis (6). By their systematic nature, frameworks were more likely to contain a Glossary or a list of terms and their definitions. Of the 51 frameworks identified in the scoping review, we selected documents which contained glossaries or a list of terms with > 8 defined terms relevant to the process of implementation research (n=13).

We selected as the indicator for analysis, those frameworks that contained eight or more terms with definitions relevant to the process of implementation research. Table 2 provides the details of the analysis of the quality characteristics of the frameworks selected, such as number of terms and the description of the methodology to develop the Glossary. Of these frameworks, only 53% described the methods to develop the Glossary, a potential barrier to feasibility, acceptance and usability across implementation researchers.

Table 2: Frameworks identified that incorporate a Glossary of terms and their quality related characteristics

No	Author	Brief description of framework	Examples of terms identified for the potential use in the GIAF Checklists	Number of terms available	Related to impact assessment	Describe the Glossary development methods
1	Affret A, Prigent O, Porcherie M, Aromatario O, Cambon L. (38)	Development of a taxonomy of knowledge translation activities specifically in health prevention	Activity, Strategy/Intervention/Initiative, Process, Framework	9	No	No
2	Chase D, Rosten C, Turner S, Hicks N, Milne R.(39)	Development of a toolkit and Glossary to aid in the adaptation of Health Technology Assessment (HTA) reports for use in different contexts.	Context, Partnership, Adaptation, Adoption, Applicability, Effectiveness Efficacy, Relevance, Reliability, Transferability	42	No	Yes
3	Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC. (40)	CFIR provides a pragmatic structure for approaching complex, interacting, multi-level and transient states of constructs in the real world – a guide for formative evaluations and implementation knowledge	Adaptability, complexity, available resources, planning, engaging	39	Yes	Yes
4	Freiler A, Muntaner C, Shankardass K, Mah CL, Molnar A, Renahy E, et al.(41)	Glossary for the implementation of Health in All Policies (HiAP)	Implementation, Awareness, Capacity	11	No	No
5	Kings Improvement Science. (42)	A resource created for those working in quality/improvement and implementation science. It uses existing terminology and definitions from	Adoption, Context, Co-production, De-implementation, Dissemination, Diffusion, Outputs, Outcomes	238	Yes	Yes

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		these fields and health economics, patient and public involvement, evaluation and research.				
6	Leeman J, Birken SA, Powell BJ, Rohweder C, Shea CM. (43)	Classification of the full range of implementation strategies used in implementation science and practice	Dissemination, Implementation Process, Integration, Scale-up.	9	No	Yes
7	Mindell J, Ison E, Joffe M.(44)	A Glossary for health impact assessment.	Screening, Scoping, Appraisal, Evaluation, Impact, Effect	48	Yes	No
8	Montagni I, Salvador-Carulla L, Mcdaid D, Straßmayr C, Endel F, Näätänen P, et al (21)	The REFINEMENT Glossary of Terms: An International Terminology for Mental Health Systems Assessment	Acceptability, Appropriateness, Effectiveness, efficiency, Intensity, Monitoring, Resource allocation	432	No	Yes
9	Rabin BA, Brownson RC, Haire-Joshu D, Kreuter MW, Weaver NL. (20)	A Glossary for dissemination and implementation research in health	Adoption, Fidelity, Sustainability, Maintenance, Institutionalization, Diffusion, Dissemination, Implementation, Implementation research, Effectiveness	28	Yes	No
10	Rychetnik L, Hawe P, Waters E, Barratt A, Frommer M.(45)	A Glossary for evidence based public health.	Evidence, Taxonomy, Evaluation, Relevance	77	Yes	No
11	Salvador-Carulla L, Alvarez-Galvez J, Romero C, Gutiérrez-Colosía MR, Weber G, McDaid D, et al (46)	Evaluation of an integrated system for classification, assessment and comparison of services for long-term care in Europe: the eDESDE-LTC study	Product, Impact, Validity, Reliability, Feasibility	13	Yes	No
12	Smith BJ, Tang KC, Nutbeam D.(47)	WHO Health Promotion Glossary: new terms	Sustainability, capacity, health impact assessment	9	No	No
13	Vanherle K, Werkman AM, Baete E, Barkmeijer A, Kolm A, Gast C, et al (48)	Proposed standard model and consistent terminology for monitoring and outcome evaluation in different dietetic care settings: Results from the EU-sponsored IMPECD project	Monitoring, Outcome, Impact, Efficacy, Effectiveness, Efficiency,	9	Yes	No

In the next step, an inventory of terms (n=102) was developed with at least two definitions per term. This inventory was assessed by the research team, their definitions for ambiguity, vagueness and clarity. When deemed necessary the team adapted or developed a new definition. Appendix 1 provides examples of the terms, existing definitions, whether they were considered ambiguous or vague, were accepted or adapted. Some of the inventory terms were changed as closer examination resulted in redundancy (e.g. intensiveness related to engagement and the GIAF engagement sub-domains). The research team mapped the terms to the domains of the three phases of

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implementation research established in the GIAF Taxonomy: Initiation (pre-implementation), and Maturity (early implementation), Evolution (Later Implementation) and adapted some definitions to an implementation research context.

The glossary followed the standard levels of instrument development (Prototype – alpha version – beta version and final product). The first group of terms and their accepted or developed definitions formed the prototype of the GIAF Glossary. Subsequent iterative steps in the development of the Glossary occurred concurrently with the taxonomy, critique, revisions and refinement with the expert panel members until consensus was reached. The draft Alpha version was presented to the expert panel. The Beta version of the GIAF Glossary is the definitions developed and finalised with the expert panel. The Beta version of the GIAF Checklists included n=180 terms.

Over 8 years the GIAF Toolkit (consisting of a Taxonomy, Glossary, Checklists and Ladders/Scales) were continuously tested through use with real world evaluations of 35 implementation projects in 10 countries and revised to be fit for purpose. A list of these projects and their associated publications are provided in Appendix 2. During this time of testing, some minor revisions were made to the Glossary to enhance the definitions. An example of this transition of definitions is shown in Table 3, with an example from the TRL-IS ladder, published in 2024 (32).

Table 3 Revisions of TRL-IS ladder domain and sub-domain definitions

Domain or sub-domain of Readiness	**Development of definition**		
	Alpha Glossary definition (2020-2021)	**Beta Glossary definition (Expert Panel) (2021-2022)**	**Final Glossary Refined definition (2022-2024)**
Readiness	The level of preparedness of new scientific knowledge or its application for commercialisation and/or generalised use in the real world.	Is the level of preparedness of an application of the emerging scientific knowledge to be used in the real world and for its' commercialisation or open access.	The level of preparedness of an application of the emerging scientific knowledge (e.g., policy, program, service, initiative, product or technology) to be used in the real world and for its' release, marketing, commercialisation or open access. **Pre-readiness** refers to the level of preparedness of an application of the emerging scientific knowledge, where the knowledge base is established, a scientific concept is formulated, there is proof of the concept, a protype is developed, validated, and tested in a relevant environment.
Basic Principles	Basic scientific research has been conducted, and associations or effects have been observed and reported, (e.g., literature or scoping review), and potential outcomes and implications identified.	Prior scientific research has been conducted, and associations or effects have been observed and reported, (e.g., literature or scoping review), and potential outcomes and implications identified.	Foundational understandings derived from prior scientific research and the associations or effects that have been reported (e.g., literature or scoping review) and the potential outcomes and implications that have been identified.
Concept formulated	General ideas of what something is or how it works. Concept can be abstract or theoretical. A way to order thinking, a type of	General idea of what something is or how it works. Typically, a concept can be abstract or theoretical. A way to order thinking, a type of	General idea of what something is or how it works. A way to order thinking, a type of cognitive grouping. Typically, a concept can be abstract or theoretical. (49)

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	cognitive grouping.	cognitive grouping.	
Proof of concept	Indication of the proof of principle of the application of the emerging scientific knowledge.	Confirmation of the principle of the application of the emerging scientific knowledge, as the basis for subsequent activities (e.g., prototype development).	An investigation to determine the workability of a policy/program/service/initiative/product. It forms part of the early development of the policy/program/service/initiative/product, to be used as the basis for subsequent activities (e.g., prototyping, piloting, demonstration). It involves the design of a conceptual model that confirms the principles and its workability, whether the policy/program/service/initiative/product could work as intended, solve the specific problem or meet a particular need. This early stage of development includes methods to validate the potential use of the policy/program/service/initiative/product such as the prior knowledge base, experts' feedback, exploratory surveys, previous laboratory/experimental studies, secondary analysis of relevant databases, modelling, simulation. (50)
Prototype	A first or preliminary version of an application of the emerging scientific knowledge (concept, process or product). Prototyping is part of the readiness in the initiation phase of the implementation project.	A preliminary version/s of an application of the emerging scientific knowledge (process or product). Prototyping is part of the readiness in the initiation phase of the implementation project.	A working model or preliminary version/s of a policy/program/service/initiative/product (concept, process or product) that has been developed and tested in an experimental or simulated environment. Prototyping is part of the readiness in the initiation phase of the implementation project. (Salvador-Carulla et al 2024)
Validation (of prototype)	The study of the metric properties of an instrument or an application.	The study and verification of the metric properties of an application of the emerging scientific knowledge (e.g., an instrument)	The study and verification of the standard metric properties of a policy/program/service/initiative/product. (e.g., metrics of an instrument, benchmarks for a policy, standards for an initiative).
(Test in a) Relevant environment	Refers to a simulated or somewhat realistic setting similar to the actual intended operational setting.	Refers to a simulated or somewhat realistic setting similar to the actual intended key aspects of the operational or implementation setting.	A simulated or somewhat realistic setting in which there are similar key aspects to the actual intended operational or implementation setting. Adapted from (51)
(Demonstration in a) Real world environment	The surrounding circumstances or conditions that exist, as opposed to one that is theoretical or imaginary. The environment includes physical, virtual, and blended ecosystems	The surrounding circumstances or conditions that exist, as opposed to one that is theoretical or imaginary. The environment includes physical, digital, and blended ecosystems	The surrounding circumstances or conditions that exist, as opposed to those that are theoretical or imaginary. It includes physical, digital, and blended ecosystems in everyday settings where individuals typically live and interact with each other, and with their natural and build in environment. This captures the complexity and diversity of the real-life context, including various social, environmental, and cultural factors that may influence the research outcomes.
Pre-release	Pre-marketing -Actions	Pre-release -Actions or	Actions or activities to make the

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	or activities to provide information or communication prior to, and in preparation for implementation in the maturity phase.	activities to make it ready and available to the market (e.g., gaining a license, registration, steps for commercialisation) in preparation for implementation in the maturity phase.	policy/program/service/initiative/product available to the market (e.g., gaining a license, registration, steps for commercialisation) in preparation for implementation in the maturity phase.
Release	Marketing- Actions to attract an audience to the product or services through high-quality messaging (publicity) in the maturity and evolution phase of implementation.	Release- The application of the emerging scientific knowledge is ready to be made available to end users in the maturity and evolution phase of implementation (e.g., license or patent is approved).	The point at which the policy/program/service/initiative/product is made available to end users in the maturity and evolution phase of implementation (e.g., license or patent is approved, or the product is marketed).

Following the iterative process during real world demonstration of the Glossary, nine terms were added to the final GIAF Glossary in 2023-2024. The final version of the GIAF Glossary has n=189 terms with definitions. Table 4 provides further detail on the origins of the definition for each term.

Table 4. Source of the definition

Source of definition	Number and percent of terms in the glossary
Verbatim definition from a published source	22 (12%)
Adapted definition from a published source/s	31 (16%)
New definition developed during this study	136 (72%)
Total definitions	**189**

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The number of new definitions developed during this study represent 72% of the terms in the GIAF Glossary. The final GIAF Glossary including all terms and definitions is provided in Appendix 3.

Discussion

This study provides the comprehensive GIAF Glossary of terms for impact analysis of implementation research. It accompanies a sequential taxonomy of 15 domains and 82 sub-domains and their related Checklists (52). The Glossary incorporates consistent definitions for essential terms and concepts that are widely used in implementation research. It is important to note, that whilst the team sought to use definitions already published, the magnitude of the terminology problem in impact analysis of implementation research was significant. Almost two thirds of the terms used in the literature were ambiguous or vague and could not be incorporated into an ontology system that would allow computing and semantic interoperability. This could be partly attributed to: a) the relative novelty and complexity of the field, b) the broad diversity of keywords and terms featured

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in the literature, c) the lack of an international taxonomy that could support mutually exclusive and clear definitions of the terms, and d) the absence of a standard method for the development of the glossary of terms.

When developing and planning implementation initiatives, the GIAF Glossary increases clarity by facilitating a common language and has the potential to reduce significant barriers for interdisciplinary researchers seeking guidance from the literature in this field.

The methods used to develop standard terms and glossaries was variable and poorly documented in the published literature. Over half of the identified implementation and impact analysis frameworks with definitions of terms (refer to Table 2), did not explain the methods to identify the key terms and define them.

Previous research has indicated that using ambiguous and vague definitions increases the risk of inappropriate interpretations and uncertainty in the implementation of practice, service delivery and evaluation. The impact of terminological inconsistencies was identified for research study designs (53) and the inadequacies of clinical practice guideline use in particular (54, 55). The high degree of terminological ambiguity in mental health services and case management research was observed to have contributed to adverse impacts, partially due to inadequate and inconsistent terminology (25, 26, 56). This lack of terminological clarity in implementation research undermines the replicability and comparability of studies, as well as the usefulness and adoption of evaluation assessment and impact analysis tools (10, 11).

This study addresses this gap and demonstrates solutions to a range of issues regarding terminology, ambiguity and vagueness using a multi-step approach and accepted methodologies. We utilised the methodological steps aligned with the steps articulated in the GIAF TRL-IS tool for the domain of Readiness assessment (32). The methods to develop the GIAF Glossary of terms involved sequential steps starting 10 years ago with the development of a framework building on peer-reviewed literature and refinement through expert consensus and in the past 8 years of real-world testing.

We also recognised that the systematic classification of terms within an agreed taxonomy constitutes a critical foundation for the glossary's development. The use of this ontoterminology approach, in which the Taxonomy, Glossary, Checklists and Ladders/Scales are developed concurrently, helps to clarify the key characteristics of the terms and their relationships across the different domains of impact analysis. The Glossary is fundamental to and intertwines with the GIAF Taxonomy. The Glossary provides a key rule for the Taxonomy by defining its terms (is-a), whilst the Taxonomy provides the hierarchy of the terms within the Glossary (part-of). For example, the combined used of the taxonomy and the terminology allows the researcher to understand the relationship between the definition of terms and its hierarchy, contributing to clarity and disambiguation. This relationship was re-affirmed in the use of expert panels and nominal group techniques using structured information in conceptually coherent and accessible formats, to facilitate discussion, operational management, and consensus development with expert panel members. Using an ontological approach to Glossary development provides an important clarification of the terms under a specific domain, which can be useful to ultimately validate a taxonomy of the system (57). Although the GIAF Glossary of terms is mainly focused on the process components of impact analysis (relevant for the GIAF Taxonomy) it also includes a significant range of terms related to implementation research generally. Shared terminology definitions are critical to

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ensure research findings are comparable, replicable and usable across different real-world settings such as community, clinic or organisational. To our knowledge the GIAF Glossary is the most comprehensive Glossary for the impact analysis of implementation research and science.

Limitations

The GIAF Glossary was developed specifically to accompany the GIAF taxonomy for the impact analysis of implementation research with a particular focus on the implementation processes (throughputs). It includes some relevant general implementation science terms. However, it does not cover all possible domains for the evaluation of implementation research including resources and results (inputs and output domains including outcomes), measures of context (e.g. barriers and facilitators/enablers) nor adaptations or tailoring approaches.

The process we followed to develop this Glossary of terms is not without its limitations. We faced challenges in identifying appropriate terms from our database searches. We needed to trial numerous search terms to achieve the maximum number of relevant literature. The final definitions we provided, focus on operational definitions, and the context of impact analysis of implementation research with a broader perspective of implementation research at the macro to micro levels, across sectors and disciplines.

We recognise that our proposed definitions may be subject to disagreement, or a lack of consensus by researchers and stakeholders in micro level practice-based intervention research. The GIAF Glossary presented in this paper will be revised as it is continued to be used, feedback received, new terms added and definitions revised through expert consensus to develop subsequent Glossary editions.

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Conclusion

This paper demonstrates that numerous existing definitions of terms used in implementation research and impact analysis are ambiguous or vague. We have developed a useful and accessible Glossary of terms and definitions designed not only for use with the GIAF Toolkit but also for impact analysis in implementation research broadly. The GIAF Glossary provides clear and consensus-based definitions that support consistent communication and understanding across international contexts. Its development aimed to identify and define key terms commonly used in impact analysis, thereby promoting a shared vocabulary among researchers, implementers, and policy makers. The GIAF Glossary may help researchers in the field use a common terminology. Thereby contribute to advancing the science and value of implementation research, enhance and enable comparisons across highly heterogenous projects. Given the rich disciplinary diversity and new applications by implementation researchers, the GIAF Glossary signifies a step towards advancement, although may not adequately address the diverse needs of all researchers, implementers and policymakers. The GIAF Glossary can continue to be used by Implementation researchers separate to the GIAF Taxonomy for a common language to enhance clarity and consistency in the use and representation of concepts. The research team consider the GIAF Glossary to be a ‘living’ tool that will continue to be iteratively revised as needed.

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List of Abbreviations

CFIR	Consolidated Framework for Implementation Research
eDESDE-LTC	electronic Description and Evaluation of Services and DirectoriEs for Long Term Care
GIAF	Global Impact Analytics Framework
HTA	Health Technology Assessment
IMPECD	Improvement of Education and Competencies in Dietetics
IP	Intellectual Property
TRL-IS	Technology Readiness Level – Implementation Science
TMF	Theories, Models, Frameworks
WHO	World Health Organization

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