Dataset 1: Frameworks and Pathways for Research Impact Assessment

ABSTRACT

This dataset comprises two detailed tables derived from a comprehensive literature review, each providing insights into the classification of research types and their impact assessment frameworks. Table D1-1 highlights key focus areas, dimensions, and prominent indicators across disciplines to evaluate and enhance research relevance and effectiveness. Frameworks such as the RE-AIM Model, Payback Framework, and CSIRO Impact Evaluation are categorised by their emphasis on dimensions like health policy influence, economic impact, and stakeholder engagement, offering a guide for evidence-based decision-making and accountability.

Table D1-2 classifies research types based on distinctive dimensions—including disciplinary approaches, methodologies, data sources, and reasoning processes—and maps each type to potential impact pathways such as dissemination, co-creation, policy influence, and societal transformation. This classification captures how various research approaches, from interdisciplinary studies to longitudinal research, contribute uniquely to advancing knowledge and addressing societal needs. Together, these tables provide a valuable resource for researchers, funders, and policymakers, offering a structured view of how research can be effectively designed, assessed, and translated to maximise societal impact in response to contemporary challenges.

RESEARCH IMPACT ASSESSMENT FRAMEWORKS

Table D1-1: Research impact assessment frameworks – focus on impact, key dimensions and prominent indicators

Framework Name	Description	Focus of Impact	Key Dimensions	Prominent Indicators
Health and Biomedical Research				
CETS (Jacob & McGregor, 1997)	The Conseil d'évaluation des technologies de la santé du Québec (CETS) was established in 1988 to evaluate health technologies and advise the Minister and stakeholders in Quebec's healthcare system. Its core focus is on conducting assessments that inform the adoption of health technologies through cost-effectiveness analysis and other rigorous methodologies. This aligns with national and provincial healthcare priorities to optimise expenditures and enhance health outcomes.	Health policy, cost management	Impact on Health Policy, Impact on Health Costs	Ministry decisions on health services, hospital rules, cost minimisation, optimisation of healthcare system
RE-AIM Model (Glasgow et al., 1999)	The RE-AIM Model, developed in 1999, is a research impact assessment framework focusing on the impact of interventions on public health. Originating from the United States, it emphasises five dimensions: Reach (who is affected), Effectiveness (the outcomes), Adoption (settings and staff willing to implement), Implementation (the fidelity of delivery), and Maintenance (long-term sustainability). This framework helps evaluate and translate research into practice by considering external validity and practical applications in diverse settings.	Public health interventions, long-term sustainability	Reach, Efficacy, Adoption, Implementation, Maintenance	Proportion of target population, Success rate, Adoption rate, Implementation, Program sustainability
The Matrix (Wiegers et al., 2015)	The Matrix is a metric-based evaluation system designed to assess the productivity of preclinical faculty at an academic medical centre. It focuses on research, education, scholarship, and	Health, economy, policy influence, knowledge dissemination	Knowledge Transfer, Economic Impact, Health and Social	Publications, patents, training programs, policy changes, health outcomes, social engagement

Framework Name	Description	Focus of Impact	Key Dimensions	Prominent Indicators
	administration. Developed in 2004 in the United States, it has evolved through various iterations to enhance its relevance in measuring faculty engagement.		Outcomes, Policy and Practice Impact, Capacity Building	
Canadian Institutes of Health Research (CIHR) Impact Framework (Bernstein et al., 2006)	The Canadian Institutes of Health Research (CIHR) Impact Framework, established in 2005, aims to measure the multifaceted impacts of health research in Canada. Developed in response to the need for practical performance evaluation, the framework is informed by the Payback Model, which categorises impact into five dimensions: knowledge production, benefits to health, economic benefits, capacity building, and policy impacts. This framework aligns with national priorities by enhancing accountability and demonstrating the value of research investments to stakeholders, supporting Canada's healthcare system and promoting effective health services.	Knowledge dissemination, health outcomes, economy	Knowledge Production, Research Targeting, Policy Impact, Health Benefits, Economic Impacts	Publications, Citation Impact, Public health improvements (PYLL), Patents, Commercialization, Cost savings
Medical Research Logic Model (Weiss, 2007)	The Medical Research Logic Model, introduced in 2007, shifts the focus of medical research assessment from outputs to outcomes, emphasising the impact on disease prevention and treatment. Developed in the U.S., it utilises a framework that includes inputs, activities, outputs, and outcomes, thereby promoting a more precise return on investment for funders. This model aims to bridge the efficacy-effectiveness gap in clinical care by encouraging researchers to assess the quantity of research and its real-world impact on patient health.	Healthcare improvements, patient outcomes	Initial, Intermediate, Long-term impacts	Awareness of scientific evidence, Change in clinical practice, Improvement in patient well-being
Canadian Academy of Health Sciences Framework (CAHS) (CAHS, 2009)	The Canadian Academy of Health Sciences Framework (CAHS), published in 2009, originated in Canada. It aims to measure the returns on investment in health research by providing a structured framework with associated indicators. This framework is based on various established evaluation models, incorporating insights from health research to assess impacts across different pillars, including basic biomedical research, applied clinical research, health services, and population health. It aligns with national health priorities by emphasising the importance of demonstrating the societal benefits of health research and informing funding decisions to enhance public health outcomes.	Health outcomes, knowledge generation, policy	Advancing Knowledge, Capacity Building, Decision Making, Health Impacts, Health System Indicators, Economic and Social Impacts	Relative citation impact, funding levels, research use in healthcare, morbidity/mortality data, QALYs, PROMs, commercialisation, social benefits
The Wellcome Trust's Assessment Framework (Wellcome Trust, 2009)	The Wellcome Trust's Assessment Framework, established in 2009 in the UK, measures the impact of Wellcome-funded research through various strategic indicators. Drawing on models like the Payback Framework, it emphasises the contributions of research to health outcomes and policy influence. This framework aligns with national health priorities by promoting evidence-based practices and maximising the impact of funded projects.	Knowledge generation, health outcomes, policy	Knowledge Generation, Researcher Development, Health Impact, Technology Development, Policy Development	Publications, citations, RBI, awards, fellowships, patents, policy impact, capacity-building, media coverage
The Becker Model (Sarli et al., 2010)	The Becker Model, established in 2009 by the Becker Medical Library at Washington University, expands on traditional citation analysis by assessing research impact through various indicators beyond citation counts. It features a logic framework that includes stages such as research output, knowledge transfer, clinical implementation, and community benefit, enabling the documentation and quantification of research outcomes. This model supports national research priorities by emphasising the translation of scientific findings into practical health applications and serves as a resource for researchers and librarians to enhance the visibility of their work.	Biomedical research, clinical implementation	Research Output, Knowledge Transfer, Clinical Implementation, Community Benefit	Biological materials, Patents, Medical devices, Clinical guidelines, Health care outcomes, Quality of life
NIOSH Logic Models (Williams et al., 2009)	The Medical Research Logic Model, introduced in 2007, shifts the focus of medical research assessment from outputs to outcomes, emphasising the impact on disease prevention and treatment. Developed in the U.S., it utilises a framework that includes inputs, activities, outputs, and outcomes, thereby promoting a more precise return on investment for funders. This model aims to bridge the efficacy-effectiveness gap in clinical care by encouraging researchers to assess the quantity of research and its real-world impact on patient health.	Workplace safety, health hazard reduction	Construction Program, Mining Program, Health Hazard Evaluation Program, Personal Protective Technology Program, Overall NIOSH Program	Peer-reviewed articles, Safety guidelines, Workplace policies, Best practices, Technology adoption, Standards & Regulations
Societal Quality Score (Leiden University Medical Centre) (Mostert et al., 2010)	The Societal Quality Score from the Leiden University Medical Centre (LUMC), introduced in 2010, assesses the societal impact of health research alongside scientific metrics. It evaluates outreach to stakeholders, including the public and healthcare professionals, using a four-step process with indicators for knowledge production and use.	Knowledge dissemination, stakeholder engagement, economic gains	Knowledge Production, Knowledge Exchange, Knowledge Use, Earning Capacity	Contributions to media, patents, speeches for companies, use of medical protocols, charity funding, indirect funding, contract funding
Institute for Translational Health Sciences (ITHS) Kellogg Logic Model - WHO Health Services Assessment Model	The Institute for Translational Health Sciences (ITHS) combines the Kellogg Logic Model with the World Health Organization's (WHO) Health Services Assessment Model to enhance evaluations of translational research funded by the Clinical and Translational Science Award (CTSA) program. Established in 2007 in the USA, this hybrid framework incorporates value-based indicators focusing on relevance, process, impact, equity, sustainability, adequacy, efficiency, and	Health service improvements, capacity building, translational research	Inputs, Activities, Outputs, Outcomes/Impacts	Relevance: The degree to which services meet translational research needs. Efficiency: How well the research processes are streamlined. Adequacy: The extent to which services are suitable for achieving positive health impacts.

Framework Name	Description	Focus of Impact	Key Dimensions	Prominent Indicators
	effectiveness. It aligns with national priorities for improving public health through collaborative research initiatives.			Effectiveness: The ability of the services to improve research outcomes. Equity: Access to resources for diverse cultural groups. Impact: The influence of research on population health. Sustainability: Long-term viability of resources and services
Payback Framework (Donovan & Hanney, 2011)	First published in 2011 in the UK, the Payback Framework uses a logic model to assess the impact of health services research. It categorises research benefits, emphasising academic outputs like knowledge production and broader societal impacts. The framework facilitates data collection and analysis to capture relevant information and align with national priorities, demonstrating the value of health research to policymakers and stakeholders.	Knowledge dissemination, health, economy	Knowledge, Future Research, Policy/Product Development, Health/Health Sector Benefits, Economic Benefits	Journal articles, development of research skills, political decisions, pharmaceutical products, cost reduction, commercial exploitation
Monetary Value Approach (Deloitte Access Economics, 2011)	The Monetary Value Approach assesses the economic benefits of NHMRC-funded health research and development in Australia. Published in 2011, the report evaluates investments made from 2000 to 2010, concentrating on cardiovascular disease, cancer, SIDS, asthma, and muscular dystrophy. It employs net benefits and ROI metrics, demonstrating NHMRC R&D's potential to alleviate disease burden and lower future healthcare costs. The findings support national healthcare priorities, underscoring the role of R&D in enhancing health outcomes and reducing expenditures.	Economic impact, health system efficiency	Well-being Gains, Avoided Health Costs, Productivity, Commercialization of R&D	DALYs, value of a statistical life (VSL), avoided health costs, productivity gains, commercialisation benefit/cost ratio, ROI
Banzi's Research Impact Model (Banzi et al., 2011)	Banzi's Research Impact Model, published in 2011 in Italy, provides a comprehensive framework for assessing the impact of health research. It integrates concepts from various foundational models, including the Payback Framework and Logic Models, to evaluate impacts across multiple dimensions, such as policy influence and societal benefit. The model aligns with national health priorities by emphasising evidence-based decision-making and promoting research funding and outcomes accountability.	Knowledge, health outcomes, economic, social	Advancing Knowledge, Capacity Building, Policy/Product Development, Health/Sector Benefits, Economic Benefits	Peer-reviewed publications, patents, epidemiologic data, QALYs, social benefits, product sales, spin-off companies
Research Performance Evaluation Framework (Schapper et al., 2012)	The Research Performance Evaluation Framework, developed at the Murdoch Children's Research Institute and introduced in 2011, assesses research performance in medical research. It evaluates the social and economic impacts of health research funding through eight indicators that cover knowledge creation, research inputs, and various outcomes. This Australian framework supports strategic planning and internal funding distribution, aligning with national health research priorities to ensure accountability and promote research excellence.	Knowledge creation, commercialisation, public health	Knowledge Creation, Research Inputs, Commercial, Clinical & Public Health Outcomes	Peer-reviewed publications, funding, research students, patents, commercialisation, adoption and implementation of research findings
Translational Research Organizations Performance Model (Pozen & Kline, 2011)	The Translational Research Organizations (TRO) Performance Model, proposed by Robert Pozen and Heather Kline in 2011, offers a framework for assessing the effectiveness of TROs in enhancing the clinical impact of scientific discoveries. Based in the USA, this model emphasises seven key dimensions: funding, talent, creation, validation, dissemination, external uptake, and collaboration. It encourages organisations to establish specific goals and develop Key Performance Indicators (KPIs) to track progress, facilitating accountability and strategic alignment while addressing the unique challenges of translational research. This model aligns with national priorities for improving healthcare outcomes by efficiently translating research into practice.	Research funding, validation, collaboration	Funding KPIs, Talent KPIs, Creation KPIs, Validation KPIs, Dissemination KPIs, Uptake KPIs, Collaboration KPIs	Grant dollars secured, Peer-reviewed publications, Citations, Licensing agreements, Patents, Spinoffs, Partnerships, Co-authorship
Health Services Research Impact Framework (Buykx et al., 2012)	The Health Services Research Impact Framework, developed in 2012 in Australia, provides a structured approach to measuring the impact of primary healthcare research. This framework integrates elements from existing models, emphasising the dissemination (producer push) and uptake (user pull) of research findings. It categorises impacts into four main areas: research-related, policy, service, and societal impacts, ensuring a comprehensive evaluation of how research influences various stakeholders, including policymakers and the general public. The framework aligns with national priorities to enhance the relevance of research to health policy and practice, ensuring accountability in funding and promoting evidence-based decision-making.	Knowledge, policy, services, societal impact	Advancing Knowledge, Policy Impact, Service Impact, Societal Impact	Peer-reviewed publications, Clinical guidelines, Capacity building, Policy briefs, Validated research adoption, Health outcomes
Translational Research Impact Scale (Dembe et al., 2014)	The Translational Research Impact Scale (TRIS) was published in 2014 in the United States. This framework provides a systematic approach to assessing the impact of translational research through a set of 72 indicators organised into three primary domains: research-related impacts, translational impacts, and societal impacts. It aims to bridge the gap between research findings and their practical applications, aligning with national health priorities to enhance health outcomes and the effectiveness of research investments.	Research quality, clinical practice, societal impact	Research Impacts, Translational Impacts, Societal Impacts	Research networks, IRB processes, grant submissions, patents, clinical guidelines, health care improvement, job growth, policy changes

Framework Name	Description	Focus of Impact	Key Dimensions	Prominent Indicators
Hunter Medical Research Institute Framework (Searles et al., 2016)	The Hunter Medical Research Institute (HMRI) Framework, known as FAIT (Framework To Assess the Impact from Translational Health Research), was developed in 2016 in Australia to measure and encourage research translation and impact on health research. This conceptual framework integrates elements from existing models, including a modified program logic model, the Payback Framework, and Social Return on Investment (SROI). It emphasises that research translation is essential for achieving research impact and incorporates performance monitoring to guide researchers' translation efforts. The FAIT framework aligns with national priorities for improving healthcare outcomes and ensuring accountability for public research funding.	Health outcomes, policy influence, economic impact	Advance Knowledge, Clinical Implementation, Community Benefit, Legislation, Economic Impact, SROI, Case Studies	PhD completions, Clinical guidelines, Quality of life (QoL) improvement, Policy citations, Cost avoided, SROI ratio
Research Impact Assessment Framework (Ward et al., 2023)	The Research Impact Assessment Framework for Health and Medical Research was first published in 2019 and originated in Australia. This framework integrates various foundational models, primarily leveraging the logic model approach to effectively map research inputs, outputs, and outcomes. It aligns with national health priorities by emphasising the translation of research into health policy and practice, ensuring that health and medical research contribute significantly to improving health outcomes and informing healthcare systems. The framework also aims to enhance stakeholder engagement, demonstrating accountability and value for public investment in research.	Health outcomes, Policy and practice change, Economic benefits, Improved health systems, Enhanced research capability	Research quality, Research relevance, Research engagement, Research translation, Research sustainability	Publications and citations, Research funding, Collaboration with stakeholders, Translation of research into practice, Impact on health outcomes, Policy influence, Economic return on investment
Environmental Health and Safety Research				
NIEHS Logic Model (Engel-Cox et al., 2008)	The National Institute of Environmental Health Sciences Logic Model was developed in 2008 in the United States. This framework is designed to guide the evaluation of programs related to environmental health by outlining the relationships between inputs, activities, outputs, and outcomes. It emphasises the importance of assessing both short-term and long-term impacts of environmental health interventions. The NIEHS Logic Model aligns with national health priorities by facilitating evidence-based decision-making and improving public health outcomes through targeted research and community engagement.	Environmental health, societal impacts	Awareness, Policy Assessment, Knowledge Accumulation, Environmental/Health Impact, Societal Change	Environmental hazard awareness, policy changes, reduction in emissions, new grant programs, public behaviour change
Policy and Social Science Research				
Decision-Making Impact Model (Lavis et al., 2003)	The Decision-Making Impact Model, introduced in 2003, is designed to assess the impact of applied health research on various target audiences, including the public, patients, clinicians, and policymakers. Originating from Canada, this model emphasises a tailored approach to measuring research impact based on the needs of specific user groups, avoiding a one-size-fits-all methodology. It incorporates concepts from the Payback Framework, focusing on user-pull and interactive measures of impact, which assess how research knowledge is utilised in decision-making. The model aligns with national priorities for improving health outcomes and promoting evidence-based policy by fostering a culture that supports the ongoing use of research knowledge.	Knowledge transfer, policy impact	Producer-push Process, User-pull Process, Exchange Process	Publications, Policy briefs, Decision-makers awareness, Commissioned research projects, Involvement in decision-making processes
Research Impact Framework (RIF) (Kuruvilla et al., 2006)	The Research Impact Framework (RIF), first published in 2006 in the UK, aids researchers in assessing their work's impact across four categories: research-related, policy influence, service changes, and societal impact. It builds on frameworks like the Payback Framework and focuses on demonstrating research value beyond academia. The RIF supports national and organisational goals by highlighting the real-world applications of research, fostering accountability and enhancing the relevance of research initiatives.	Knowledge, policy, services, societal impact	Research-related, Policy, Service, Societal Impacts	Publications, patents, leadership awards, policy networks, cost-effectiveness, health literacy, empowerment, sustainable development
Flows of Knowledge, Expertise and Influence (Meagher et al., 2008)	The "Flows of Knowledge, Expertise and Influence" model (2008) assesses social science research's impact on public policy and practice. Created by Laura Meagher, Catherine Lyall, and Sandra Nutley, it emphasises knowledge transfer's complex and non-linear nature, identifying key actors such as researchers, policymakers, and knowledge intermediaries as essential to effective research uptake. The model responds to UK national priorities for demonstrating societal value from research investments, particularly in public health and quality of life.	Knowledge transfer, social impact on policy and culture	Policy and Practices, Culture and Attitudes, Influences on Processes Leading toward Impacts	Policy formation, Conceptual impacts, Professional practice changes, Knowledge dissemination, Networks, Engagement processes
Higher Education and Academic Research				
Research Assessment Exercise (RAE) (Boaden & Cilliers, 2001)	The Research Assessment Exercise (RAE) was established in 1992 in the United Kingdom to evaluate the quality of research across higher education institutions. It is a framework for allocating public funding based on research performance, significantly influencing university funding decisions. The RAE utilises a peer-review process conducted by expert panels to assess	Academic excellence, policy influence, societal benefit	Research Quality, Research Output, Research Environment, Research Impact	Publications, research income, collaborations, impact on policy, societal benefits

Framework Name	Description	Focus of Impact	Key Dimensions	Prominent Indicators
	submissions from academic departments, measuring research quality and impact. In 1993, Hong Kong adopted the model through the University Grants Committee (UGC) to assess research outputs, impact, and environment in UGC-funded universities.			
VINNOVA (Swedish Governmental Agency for Innovation Systems) (Marika Kolbenstvedt, 2007)	The Swedish Governmental Agency for Innovation Systems (VINNOVA) was established in 2001 to promote sustainable growth through needs-driven research and innovation. Its impact logic assessment framework focuses on funding collaborative projects among industry, academia, and public entities to effectively use new technologies and knowledge. This model supports national priorities by enhancing Sweden's competitiveness and addressing societal challenges, ensuring that research investments translate into practical innovations.	Academic impact, public safety, economic impacts	Academic Results, Effects for Users, Diffusion of Research, Economic Impacts	Publications, PhDs, patents, traffic safety measures, public finance, public debate, workforce migration
Matrix Scoring System (Wiegers et al., 2015)	The Matrix Scoring System, established in 2004 at Temple University in the USA, is a metric-based framework designed to evaluate the productivity and engagement of nonclinical faculty within academic medical centres. This system incorporates a modified program logic model and integrates elements from the Payback Framework and Social Return on Investment methodologies. The Matrix assesses faculty contributions across four domains: research, education, scholarship, and administration/services, ensuring a balanced evaluation that recognises diverse roles. It aligns with institutional priorities by promoting accountability and facilitating resource allocation in response to budget constraints in academic medical settings.	Academic productivity, research performance	Research, Education, Authorship, Administration/Service	Direct & indirect costs, Peer-reviewed publications, Patents, Contact hours, Grant submissions, Committee service
Excellence in Research for Australia (ERA) (ARC, 2018)	The Excellence in Research for Australia (ERA) is a national research assessment initiative administered by the Australian Research Council (ARC), first implemented in 2010. This program evaluates the quality of research produced by Australian higher education institutions by comparing it against international benchmarks. It employs various indicators, such as citation metrics and peer reviews, to assess research performance across disciplines. The ERA aligns with national priorities to enhance research quality and promote funding accountability, incentivising institutions to improve their research output.	Academic output, creative works, funding	Traditional Research Outputs, Non-Traditional Research Outputs, Research Income	Books, Journal articles, Creative works, Curated exhibitions, Competitive grants, Industry research income
Research Excellence Framework (REF) (Research Excellence Framework, 2014)	The Research Excellence Framework (REF) is the UK's system for evaluating the quality of research in higher education institutions (HEIs), first implemented in 2014. It was developed to replace the earlier Research Assessment Exercise and is overseen by four UK funding bodies, including Research England and the Scottish Funding Council.	Health outcomes, economic growth, policy impact	Quality of outputs, Health and Welfare, Society and Culture, Economy, Commerce, Public Policy, Production, Environment, Practitioners	Bibliometrics, impact statement, case studies
Engagement and Impact Framework (ARC, 2017)	The Engagement and Impact Framework (EIF) was introduced in 2015 as part of a broader initiative to evaluate research engagement and its societal impacts on Australian universities. Developed by the Australian Research Council, the EIF assesses research engagement through economic and social impact metrics, industry collaboration, and contributions to public policy. It aims to ensure that research advances knowledge and effectively contributes to community and industry needs, fostering greater accountability and alignment with national priorities.	Academic engagement, socioeconomic impact	Research-related, Socio-economic, Healthcare	Mobility of researchers, Patents, Licencing agreements, Co-authorship, Spin-outs, Public lectures and seminars
World University Ranking Model (Times Higher Education, 2018)	The Times Higher Education World University Ranking Model, first published in 2004, originates from the United Kingdom. This model employs a comprehensive methodology based on 18 performance indicators encompassing teaching, research, knowledge transfer, and international outlook. Key aspects include academic reputation, research productivity, citation impact, and industry income, each weighted to reflect its importance in assessing university quality. The model aligns with national and international educational priorities, serving as a tool for students, university leaders, and policymakers to evaluate institutional performance and make informed decisions.	Academic reputation, research influence	Teaching, Research, Citations, International Outlook, Industry Income	Teaching environment, Research volume, Citation impact, International collaboration, Knowledge transfer
Multidisciplinary Research				
Research Utilization Ladder (Landry et al., 2001)	The Research Utilization Ladder, established in 2001, outlines the stages of knowledge utilisation: transmission, cognition, reference, effort, influence, and application. It highlights barriers to advancing through these stages, particularly between transmission and cognition. The model underscores the need for effective research dissemination and strategies to engage users, enhancing research relevance to decision-makers. Understanding these stages can inform policies to improve research impact in practical settings.	Research utilisation, knowledge transfer	Technology, Economic, Institutional, Social Interaction	Transmission, Cognition, Reference, Effort, Influence, Application
Royal Netherlands Academy of Arts and Sciences -Standard	First introduced in 1993, the Standard Evaluation Protocol (SEP) is a Dutch framework created by KNAW, VSNU, and NWO. It reviews publicly funded university research every six years, focusing on research quality, societal relevance, and viability. SEP emphasises contributions to	Academic reputation, societal relevance	Research Output, Earning Capacity, Academic Reputation, Societal Relevance, Viability	Number of publications, PhDs, project funding, prizes, socio-cultural/economic quality, resource management, innovative capacity

Framework Name	Description	Focus of Impact	Key Dimensions	Prominent Indicators
Evaluation Protocol (SEP) (VSNU et al., 2010)	society, including economic, social, and cultural impacts, aligning academic research with national priorities and international standards			
SIAMPI (Spaapen et al., 2011)	The Social Impact Assessment Methods for Research and Funding Instruments through the Study of Productive Interactions between Science and Society (SIAMPI) framework, first published in 2011, originated in the Netherlands. It focuses on assessing the social impact of research by emphasising "productive interactions" between researchers and stakeholders. The framework builds on existing evaluation models, incorporating insights from social sciences to capture complex interactions that lead to societal benefits. SIAMPI aligns with national and EU priorities by aiming to enhance the relevance of scientific research to society and promote responsible innovation	Stakeholder engagement, societal, economic	Knowledge Dissemination, Stakeholder Interest, Impact and Use of Results	PhDs in industry, joint roadmaps, patents, market launch of new products, spin-offs, staff exchanges
Researchfish (Hinrichs et al., 2015)	Researchfish is a UK-based online platform launched in 2012 for researchers to report and manage the outcomes of their work across multiple funders. It functions as a data collection service that allows researchers to document a wide range of research outputs, outcomes, and impacts, facilitating accountability and enabling funders to assess the effectiveness of their investments. The platform originated from the Research Assessment Impact Scoring System (RAISS) and evolved through collaboration with the Medical Research Council (MRC) and other funding organisations. Researchfish supports data-driven decision-making in research funding, capturing diverse impacts from publications to policy changes.	Regular monitoring of research outputs and impacts	Publications, Collaboration, Further Funding, Engagement, Policy Influence, Clinical Trials, Awards	Publications, collaboration data, further funding, policy influence, clinical trials data, IP data, awards and recognition
Multidimensional Assessment Model (Moed & Halevi, 2015)	The Multidimensional Assessment Model, established in 2014, focuses on selecting metrics for research assessment based on the assessment unit and policy context. It integrates various metrics, including bibliometrics and altmetrics, to evaluate individual, group, and institutional performance. This model aids in funding decisions and enhances accountability, aligning with national and institutional research priorities for quality improvement.	Knowledge growth, societal and economic impacts	Knowledge Growth, Research Networks, Publication Outlets, Social Impact, Technological Impact, Economic Impact, Cultural Impact	Publications and citations, Co-authorship, Patents, Revenues from commercialisation, Employability, Social media mentions
Realist Evaluation (Rycroft-Malone et al., 2015)	Realist Evaluation, first introduced by Ray Pawson and Nick Tilley in 1997, is a theory-driven evaluation method developed in the UK. This framework emphasises understanding how and why interventions work in specific contexts, focusing on the interplay between context, mechanisms, and outcomes (the CMO framework). By acknowledging that different contexts can significantly affect the effectiveness of interventions, Realist Evaluation aims to generate insights that are more relevant to policymakers and practitioners than traditional evaluation methods. The approach aligns with organisational priorities for evidence-based decision-making, particularly in complex social programs.	Knowledge mobilisation, collaboration, cultural change	Direct, Processual & Conceptual Impacts, Personal Impacts, Collaboration for Leadership Impact	Tool/project impacts, publications, grant capture, cultural change
CSIRO Impact Evaluation Framework (Commonwealth Scientific Industrial Research Organisation (CSIRO), 2020)	The CSIRO Impact Evaluation Framework, first published in 2020, is an initiative from Australia designed to systematically assess the impact of research conducted by the Commonwealth Scientific and Industrial Research Organisation (CSIRO). It is based on a logic model and emphasises a theory of change approach that tracks the process by which research translates into environmental, social, and economic benefits. This framework aligns with national priorities by addressing local, regional, national, and global needs, ensuring that research activities contribute meaningfully to Australia's competitiveness and well-being.	Knowledge dissemination, societal well-being, environmental sustainability, policy influence, economic growth	Knowledge Creation, Societal Well-being, Economic Impact, Environmental Impact, Policy Impact, Capacity Building	Publications, patents, collaborations, policy changes, environmental improvements, economic returns
Horizon Europe Key Impact Pathways (European, 2021)	The Horizon Europe Key Impact Pathways is a framework established in 2021 by the European Union to enhance the evaluation and communication of research and innovation funding impacts. This approach is based in the EU and focuses on capturing diverse impacts through nine key storylines, including scientific impact, societal benefits, and economic growth. It aims to provide regular insights to policymakers and the public about the outcomes of EU-funded research, aligning with European strategic priorities for sustainable development and innovation. The Key Impact Pathways framework reflects a modernised approach to monitoring and evaluation within the broader context of EU research policy.	Innovation, science-policy interface, social and environmental impact, economic competitiveness	Creating High-Quality New Knowledge, Strengthening Human Capital, Fostering Diffusion of Knowledge, Scientific Impact, Addressing EU Policy Priorities, Delivering Benefits through Research Missions, Strengthening Research Uptake in Society, Generating Innovation-Based Growth, Creating Better Jobs	Number of publications and citations, Collaborations with industry and academia, Skills development and training metrics, Societal engagement, Economic indicators, Policy alignment, Innovation metrics

RESEARCH IMPACT PATHWAYS

Table D1-2: Classification of Research Types Based on Distinctive Dimensions and Their Potential Research Impact Pathways

Research Dimension	Type of Research	Description	Potential Research Impact Pathway
Disciplinary Approaches	Mono-disciplinary Research	Focuses on research within a single academic discipline, leveraging in-depth expertise and established methodologies.	It primarily contributes to the Dissemination pathway, where research findings are shared within a specific field, contributing to disciplinary advancements and knowledge accumulation. Mono-disciplinary research often has a high impact within academic circles but can be limited in addressing broader societal challenges that require multi-faceted solutions. Examples include advances in theoretical physics, medical research, or economics, where the depth of expertise drives scholarly and practical outcomes (Spaapen & Van Drooge, 2011).
	Multidisciplinary Research	It involves collaboration between multiple disciplines, each contributing distinct perspectives to address a common research problem.	Multidisciplinary research is highly effective in the Co-creation pathway, as it fosters collaboration between different fields to generate comprehensive solutions to complex issues. This approach is commonly applied in public health, environmental studies, and urban planning, where integrating knowledge from diverse disciplines is critical to solving societal problems. Multidisciplinary research promotes stakeholder engagement and real-world application, enhancing societal impact through integrated solutions (Banzi et al., 2011; Klein, 2010).
	Interdisciplinary Research	Synthesises knowledge and methods from different disciplines, creating new frameworks and approaches that transcend traditional academic boundaries.	Interdisciplinary research is most impactful in Driving Societal Change, as it combines theoretical and empirical insights across disciplines to address systemic challenges. By bridging diverse knowledge bases, interdisciplinary research can lead to transformative innovations, especially in climate change, social justice, or technological disruption. This type of research often influences policy reforms, education practices, and societal values by creating new paradigms that reshape how problems are understood and addressed (Benneworth & Cunha, 2015).
Methodological Approaches	Qualitative Research	Explores social phenomena through open-ended analysis (e.g., interviews, content analysis).	Generates deep societal insights by uncovering underlying motivations, attitudes, and perceptions that are not easily quantifiable. This can influence cultural change, shape public policy, and inform educational reforms (Spaapen & Van Drooge, 2011). Qualitative research is particularly effective in addressing complex social issues where human experiences and contextual understanding are paramount, such as mental health interventions and social justice movements (Klein, 2010).
	Quantitative Research	It uses numerical data and statistical analysis to quantify variables or test hypotheses.	Produces measurable and scalable impact through evidence-based decision-making in public health, economics, technology, and social sciences (Arsalan et al., 2024). Quantitative research supports policy-making by providing complex data on effectiveness (e.g., randomised controlled trials in healthcare) and helps set benchmarks and standards, making it essential for creating large-scale societal impacts through concrete evidence (Spaapen & Van Drooge, 2011).
	Mixed-Methods Research	Combines qualitative and quantitative methods for a comprehensive understanding.	Mixed-methods research provides a holistic view of numerical trends and contextualised insights, facilitating nuanced policy interventions, social innovations, and technological developments. It is ideal for tackling interdisciplinary challenges like climate change, healthcare reform, and educational policy (Klein, 2010; Spaapen & Van Drooge, 2011). By integrating human experiences and data, this research type ensures more inclusive and comprehensive solutions (Banzi et al., 2011).
Time Dimensions	Cross-Sectional Research	Collects data at a single time for a snapshot of a phenomenon.	Helpful in identifying immediate patterns, trends, or correlations that can lead to short-term policy interventions and societal shifts (Muhonen et al., 2020). For example, cross-sectional studies on public health behaviours or market research can inform urgent responses but are limited in capturing long-term effects (Arsalan et al., 2024).
	Longitudinal Research	Collects data over time to observe trends and developments.	Longitudinal research captures long-term changes, making it invaluable for understanding sustained impacts in healthcare, education, and environmental sustainability (Benneworth & Cunha, 2015). It supports evolving policies and practices and enables tracking societal progress in areas like chronic disease management or economic development (Hughes & Kitson, 2012).
Data Sources	Primary Research	It involves collecting original data directly from experiments, surveys, or interviews.	Creates novel insights that can directly influence policy and societal practices. For instance, primary research in environmental science can lead to the development of new conservation strategies, while sociological surveys can impact public health campaigns (Spaapen & Van Drooge, 2011). Primary data forms the basis for technological innovations and new business models in engineering and biotechnology (Rowe & Frewer, 2005).
	Secondary Research	Uses existing data to analyse or conclude (e.g., literature reviews, databases).	Strengthens evidence-based policymaking and enhances societal impact by synthesising previous research (Rowe & Frewer, 2005). For instance, meta-analyses in healthcare or historical economic data analyses can aggregate past findings to guide policy or business decisions (Klein, 2010; Muhonen et al., 2020).
Experimental vs. Non-Experimental Research	Experimental Research	Manipulates variables under controlled conditions to establish cause-and-effect relationships.	Drives significant innovation by testing hypotheses in controlled environments, leading to breakthroughs in science and technology. Experimental research, such as in medical drug trials or engineering tests, leads to societal and economic impacts by providing safe, proven solutions (Bartels et al., 2012; Larédo & Mustar, 2004).
	Non-Experimental Research	Observe and analyse phenomena without manipulating variables.	Valid in areas where experimentation is impractical or unethical, such as education or social work (Benneworth & Jongbloed, 2012). Non-experimental research offers real-world insights that inform policy decisions in areas like

			environmental regulation and education reform (Spaapen & Van Drooge, 2011).
Theoretical vs. Empirical Research	Theoretical Research	Develops or expands theories without immediate empirical testing.	Provides the intellectual frameworks and paradigms that guide future research. Theoretical contributions, such as game theory or social capital theory, shape future research and can significantly impact policy, scientific advancements, and societal practices (Fricker, 2007; Weiss, 1980).
	Empirical Research	It involves collecting observable data to test hypotheses.	Directly contributes to societal and technological advancements by validating or challenging theories based on real-world data (Rowe & Frewer, 2005). Empirical studies are essential in public health, economics, and environmental science, where policies and interventions are based on observable, tested outcomes (Hughes & Kitson, 2012).
Research Settings	Field Research	Conducted in natural environments to study complex real-world phenomena.	Generates direct societal impact through context-specific findings, particularly in conservation biology, anthropology, and environmental science (Benneworth & Jongbloed, 2012). Field research informs public policy and community practices, such as creating wildlife conservation areas or social interventions for inequality (Spaapen & Van Drooge, 2011).
	Laboratory Research	Conducted in controlled environments, allowing precise experimental manipulation.	Contributes significantly to healthcare, technology, and scientific understanding. Laboratory research in biomedical sciences or materials engineering leads to advancements in drug development and technological innovation (Van Norman & Eisenkot, 2017).
	Simulation Research	Uses artificial models to mimic real-world systems, predicting and analysing outcomes.	Provides a predictive framework for decision-making in policy, engineering, and environmental sciences (Molas-Gallart et al., 2002; Ochi et al., 2022). Simulation models are crucial for forecasting scenarios like climate change impacts or market trends, leading to pre-emptive actions and enhanced societal preparedness (Benneworth & Cunha, 2015).
Outcome Perspective	Exploratory Research	Conducted when there is limited knowledge about a phenomenon, aiming to generate hypotheses.	Identifies gaps and generates innovative ideas, sparking deeper inquiry and often leading to breakthroughs in science, policy, or societal interventions (Fricker, 2007). Exploratory research is essential in fields like disease discovery or emerging technologies, where initial insights shape future studies (Muhonen et al., 2020).
	Descriptive Research	Systematically describes characteristics or functions of a phenomenon.	Informs public policies or societal practices by documenting existing phenomena. For example, descriptive research on population health or environmental conditions is a foundation for policy frameworks and resource allocation (Rowe & Frewer, 2005).
	Explanatory Research	Seeks to understand the reasons or causes behind observed phenomena.	Provides deep insights into mechanisms behind societal issues, leading to policy interventions or technological advances. Understanding educational inequality, for instance, informs teaching reforms while explaining climate change drivers leads to effective environmental policies (Weiss, 1980).
	Predictive Research	Forecasts future events or outcomes based on existing data.	Shapes long-term policies by anticipating societal or environmental trends. Predictive research plays a significant role in sectors like economics (e.g., forecasting market trends), healthcare (e.g., predicting disease outbreaks), and environmental science (e.g., climate change models). Predictive research informs strategic decision-making processes by identifying future risks and opportunities, enabling governments, industries, and organisations to prepare for upcoming challenges (Lee, 2019; Ochi et al., 2022; Simonton, 1997).
Reasoning Process	Deductive Research	Starts with a theory or hypothesis and tests it with empirical data.	Confirms, refines, or challenges existing theories, leading to advancements in policy, technology, or social framework. Deductive research forms the basis of experimental studies where hypotheses are rigorously evaluated (e.g., clinical trials in healthcare or policy assessments). This process directly influences public health, economics, and engineering decision-making by providing evidence-based validation of established theories (Rowe & Frewer, 2005; Spaapen & Van Drooge, 2011).
	Inductive Research	Begins with specific observations to develop broader generalisations or theories.	Generates new theories or frameworks that can lead to innovation and societal transformation. Inductive research is critical in fields where existing theories do not explain new phenomena (e.g., digital economies or shifts in social behaviour). By creating new conceptual models, inductive research can drive technological advancements, legislative reforms, and societal shifts based on emergent patterns (Benneworth & Cunha, 2015; Fricker, 2007).

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