Logic Models for Strategic Planning & Evaluation

ERC Model Development Practicum

October 14, 2020



Learning Objectives

Session attendees will be aware of the:

- Pre-kick-off Introduction
 - Evaluative inquiry cycle
 - Role of models in strategic planning and evaluation
 - Terms used in creating a theory of change and logic model
- Kick-off-Model Development Practicum
 - Concepts and terms from the introductory material
 - Steps in creating models
 - Steps to align models and strategic plan
 - Role of feedback and refinement

Introduction Refresh

Evaluative Inquiry Process

Strategic Plan

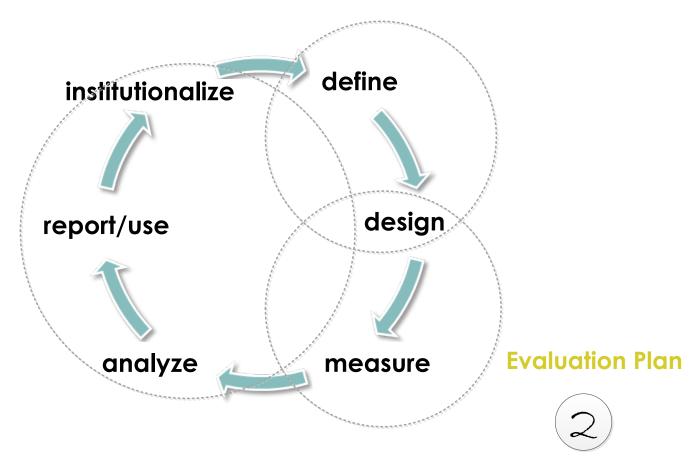
criteria for what constitutes evidence





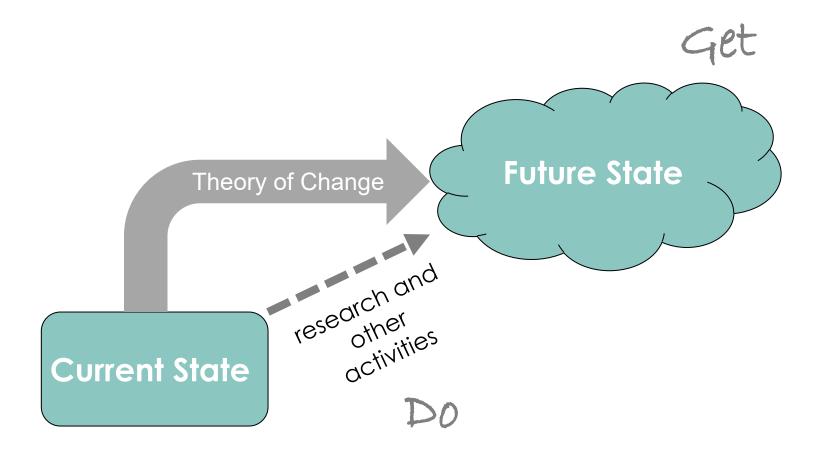
how evidence, once analyzed and synthesized, can be used

Annual Report

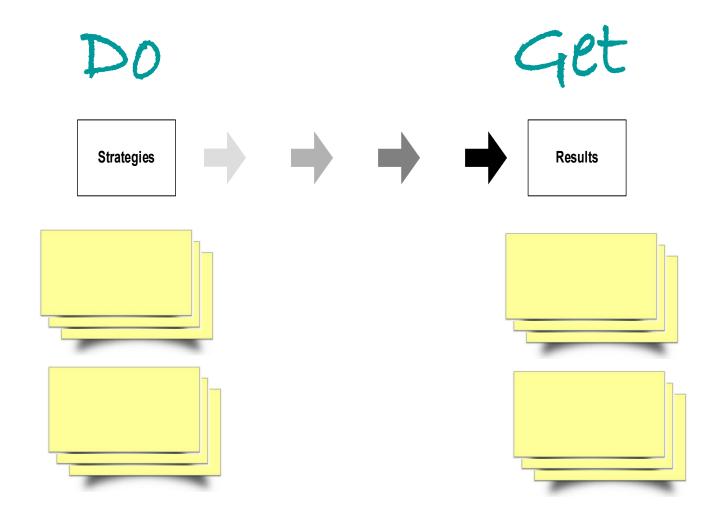


processes & methods for obtaining evidence

Mapping & Assessing Progress



Theory of Change (ToC)



Research Engineering Workforce **Development** Innovation Ecosystem Culture of Inclusion Infrastructure &

Management

Generic ERC ToC

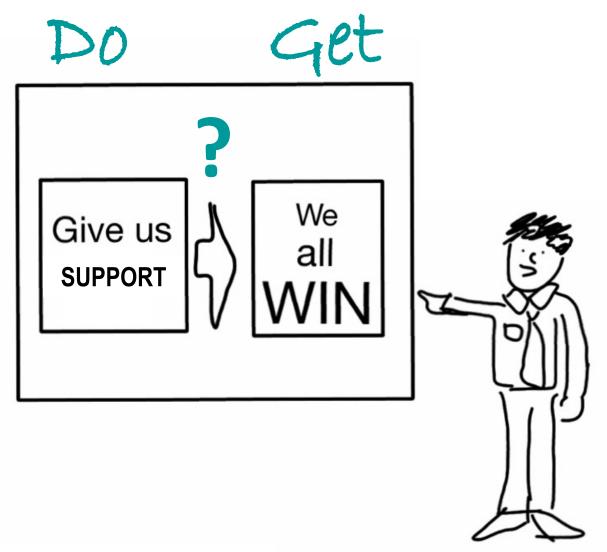
Increased research capabilities and new knowledge

Diverse, globally competitive, teamoriented workforce

Improved value chain, technology transfer, and entrepreneurial culture

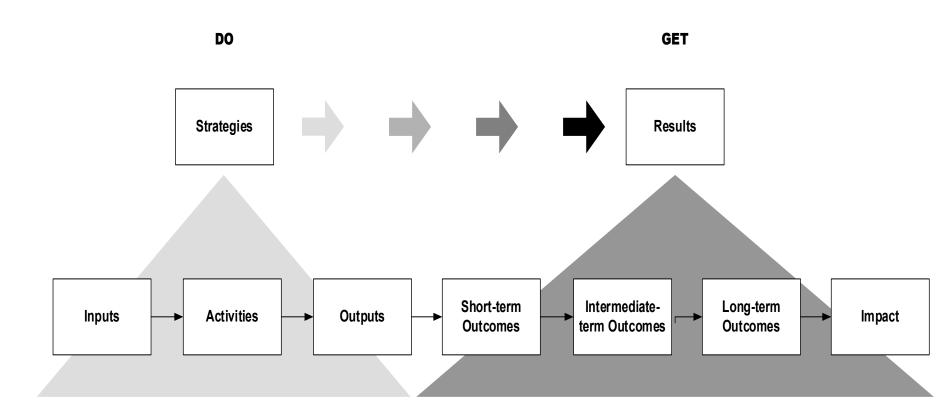
Increased engagement of underrepresented groups at all levels

Improved management, infrastructure, and implementation



freshspectrum.com

Simple Logic Model



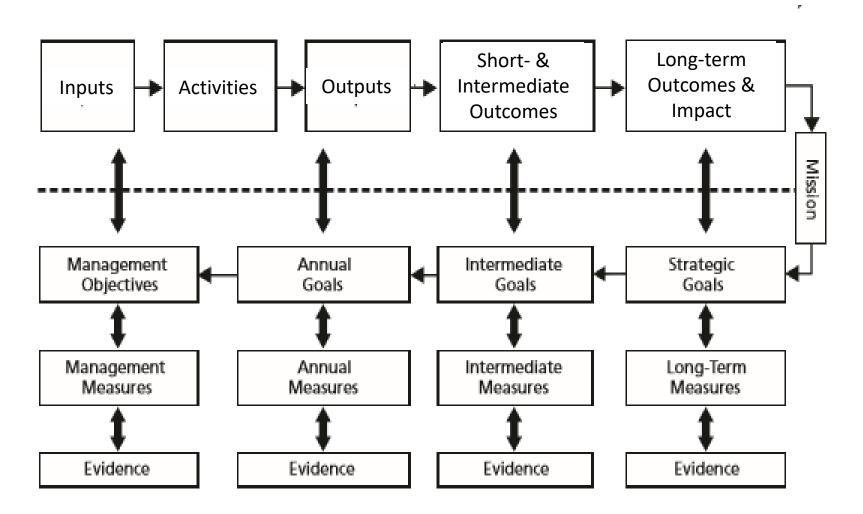
Logic Model Component Definitions

Term	Definition
Inputs	Include financial, human, organizational, community or systems resources essential to implement the project.
Activities	The specific actions that make up the project. They can include tools, processes, products, events, technology and other aspects of the intervention deployed to achieve desired results.
Outputs	Include descriptions of the types, levels and audience or targets for the project. Countable attributes of the activities if accomplished. (Frequency, Intensity, Targets)
Outcomes	The changes in project participants or organizations, as a result of the project. Can include changes in awareness, knowledge, skill, and behavior. (Specific, Measurable, Actionable, Realistic, Timed)
Impact	The ultimate change in an organization, community or other system. Often occurs after the grant cycle has ended.

Developing Models

Strategic Plans are Roadmaps for Success
Logic Models Show How Success will be Measured

Evidence & Strategic Plan



Evaluative Inquiry Process

Strategic Plan

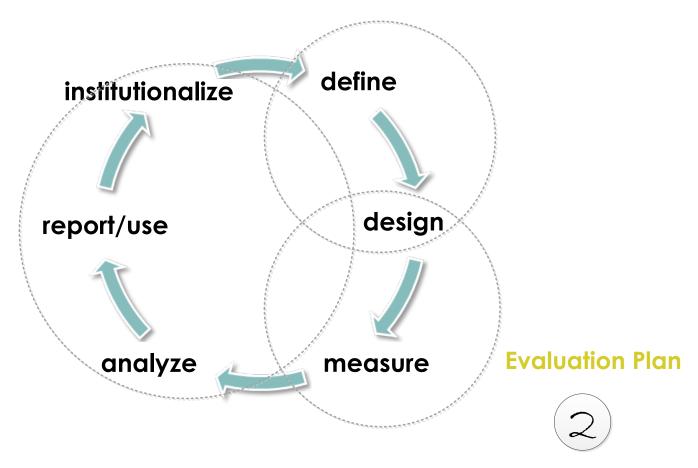
criteria for what constitutes evidence





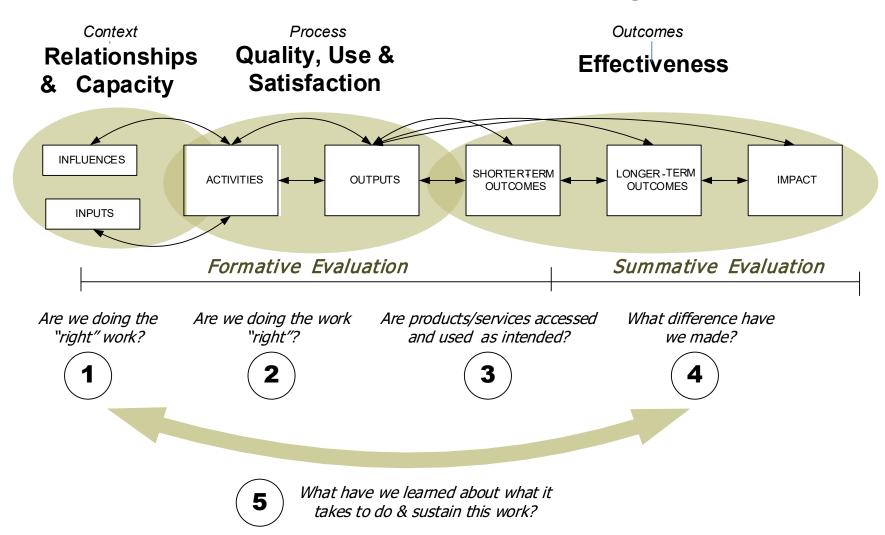
how evidence, once analyzed and synthesized, can be used

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processes & methods for obtaining evidence

Models for Evaluation Planning



Program-level Logic Model Examples

Updated Logic Model for NSF EFRI Program Resources/Input Activities Outputs Short-term outcomes Long-term outcomes Grantees develop new methodologies Grantees engage in Grantees receive Grantees research cutting Grantees build additional funding increases in high-risk edge/frontier knowledge base from NSF or other **Funding** projects research with new findings funders Grantees or project NSF Program Grantees advance Grantees participants from Companies partner Officers to manage collaborate: theory based on traditionally with EFRI grantees empirical results logistics across disciplines underrepresented groups across remain in career fields Grantees publish institutions New researchers begin Other coordinating supported by EFRI results with internationally working in fields entities coauthors supported by EFRI Schools and universities - from other Grantees recruit Researchers with disciplines change curricula to traditionally under-New technology is transformative incorporate knowledge and from other represented groups ideas institutions licensed discoveries to participate in internationally projects Diverse research Discoveries lead to a Grantee teams make distinct paradigm shift contributions are Students work in contributions to recognized by labs science Grantees start new awards/promotions Exchange with companies based on EFRI labs in different research Students Increase in scientific disciplines at Form research own institution contributions made by groups Exchange with traditionally under-Continue in other institutions represented groups research fields Make contributions

BIC LONG-TERM LOGIC MODEL

INPUTS

- · Initial discovery
- Funding and Logistics (up to \$800K for 3 years)
- Expertise of engineers, computer scientists, cognitive, social, or behavioral scientists, and other researchers and industry participants
- Resources to help connect BIC awardees with industry participants
- · Pl training
- Process, Materials and Resources (facilities contributed by industry and academic)
- Descriptions of the potential impact
- Other coordinating entities
- Student and Postdoc Mentoring Plans
- Cooperative Research Agreements between partners and Partnership Letters detailing their

PROJECT ACTIVITIES

- Interdisciplinary research considerations of service systems as they relate to needs of the users and to advance the platform technology
- Inclusion of service industry R&D
- Partners jointly identify possible markets and commercial applications for the platform technology
- Partners jointly identify and overcome technical and/or market barriers to the success of the platform technology
- Establishment of a sustainable relationship between academic research team and industry partners
- Education of students in design process
- Leveraging of additional capital from sources outside the university or NSF

OUTPUTS

- Interdisciplinary publication on platform technology are developed from BIC-funded awards
- Technical barriers to commercialization feasibilit are overcome
- Marketing obstacles to commercialization are overcome
- A subset of partners continue the relationship after the life of the award
- Students are trained in interdisciplinary approach to service system engineering
- Memoranda of Understanding or Cooperative Research Agreements between partners are renewed if appropriate for continuation of the relationship
- A business plan for commercialization is developed, where appropriate

IMMEDIATE OUTCOMES

- Feasibility of commercialization is tested
- New research directions are developed
- Patent and license applications of new technology developed fror BIC awards (a subset of awardees)
- Researchers and/or students (academic and/or industry) working on BIC research become innovators and/or entrepreneurs in other contexts
- Researchers and/or students pursue further funding for the platform technology
- Students contextualize their attitudes to and proclivities for innovation

INTERMEDIATE OUTCOMES

- Platform technologies tested in new contexts considering needs of customers
- Platform technology iteration cycle shortened due to involvement of industry participants and customers
- Licensing of platform technology to industry
- Partnerships from BIC awards sustained over time to work on new technologies
- New academia-industry partnerships formed by BIC awardees
- Student participants pursue career in similarly interdisciplinary research
- Research and partnership increase academic institutional reputation as an "innovation hub"
- "Best practices" for academic-industry partnerships established and disseminated
- Workforce development as new positions or employee training opportunities are created by BIC partnership

LONG-TERM OUTCOMES/ IMPACT

- Improved "smart" technology available to the service industry
- Increased retention of BICfunded students to engineering careers/research and/or entrepreneurship
- A subset of BIC awardees form start-up or spin-off companies
- Continuation of the cycle of innovation as BIC funded students become PIs with industry partnerships or industry researchers with academic partnerships
- University continues to promote and support similar partnerships via BIC or other
- Adoption/dissemination of the BIC partnership model by other institutions

Life of award 1 yr post-award 2-5 yrs post-award 5-10 yrs post-award

Inputs and Activities

Outputs

Outcomes Relative to Comparison Groups

Individual-Level

- Research findings: pre-award publications, grants, patents, clinical trials and business development
- · Research discipline
- Organization associations (location, Title/Rank, department)
- · Degrees received
- · Other demographics

Center-Level

- Primary leading physical scientist and cancer researcher
- Research framework: 3-5 projects
- Shared Resources: 1-3 nonredundant core facilities
- · Pilot Projects
- Transdisciplinary lectures, workshops, working groups, courses

Network-Level

- Coordinate Expertise
- Trans-network Projects
- Physical or virtual infrastructure
- · Integrative training
- Data Coordinating Center
- Research Contracts to further support clinical translation, cross-validation and integration of datasets, techniques, technologies, biospecimens
- Communicate with PS-OC and Broader Research Community

Individual-Level

- Publications
- Patents
- Grants (NIH, other)
- Science Awards (innovative, translational, training)
- Clinical Trials
- Conference presentations
- · Courses and workshops taught
- Trainee disciplines

Center-Level

- Cost, content and people involved in research projects, pilot projects and cores
- Stage, content and people involved in collaborations
- Datasets, techniques, technologies and bio-specimens generated and utilized
- Enumeration and content of transdisciplinary team science activities

Network-Level

- Cost, content and people involved in trans-network projects and outside network pilot projects
- Stage, content and people involved in collaborations
- Datasets, techniques, technologies and bio-specimens generated and utilized
- People and centers involved in trainee exchanges
- Location and content of outreach activities

Generated Robust Collaborations that Resulted in Significant Transdisciplinary Research

- Accelerated the formation of a greater quantity of transdisciplinary collaborations
- Accelerated the creation of a greater quantity of field convergent research
- Communicated effectively across disciplines to form optimal team sizes
- · Effectively contributed to team based activities and outreach

Connected Physical Sciences Perspectives with Clinical Research

- Accelerated the formation of a greater quantity of collaborations among physical and physician scientists
- Reduced the time between the appearance of a physical sciences perspective or technology to its application in translational research
- Acted as key investigators leading a convergence of physical sciences perspectives within translational research and motivating transdisciplinary translational research

Bridged Oncology Research Gaps

 Accelerated the generation of innovative and impactful transdisciplinary solutions to outstanding questions in oncology (e.g. integrated transdisciplinary datasets, technologies and bio-specimens, prominently positioned in citation networks and commercialized cancer-relevant patented technology)

Trained a New Generation of Transdisciplinary Scientists

- · Conducted a greater quantity of transdisciplinary training activities
- · Attracted a greater volume of training grant applications to the PS-OC program
- Graduated a greater quantity of transdisciplinary scientists
- Accelerated the trainee development path toward a career in physical sciences-oncology

Generated a Sustainable Transdisciplinary Infrastructure

- PS-OC alumni sustained a transdisciplinary perspective by integrating team science into their infrastructure and attracting new investigators to the field
- Motivated the formation of other inter-/intra- national programs promoting physical sciences perspectives in cancer research

PS-OC Program Logic Model: Dec 2013

GOALI LONG-TERM LOGIC MODEL

INPUTS

Funding and logistics

- GOALI provides 18-20% of award, reviewing program provides the remainder
- Industry commitmen to the partnership with documentation Intellectual Property agreement

Expertise NSF-funded researchers Process, Materials, and Resources

- Industry professionals compensated time
- Industry equipment and maintenance
- Proprietary data Student and Postdoc Mentoring Plans Dissemination Plan

PROJECT ACTIVITIES

Educate and train academics to consider commercialization for research products

Provide on-the-job experience in industry for graduate students, postdocs, and faculty

Establishment of a relationship between academic research and industry partners

Leveraging of additional capital from sources outside the university or NSF e.g. other Federal agencies

OUTPUTS

Students, Postdocs an Pls are trained for industrial positions

Transfer of new knowledge about industry practices and standards

Facilitation of Hig Risk/High Reward projects

Publications with industry partners are developed

Intellectual Property is created

A subset of partners continue the relationship after the life of the award

IMMEDIATE OUTCOMES

Industry Enlarged recruiting talent

Diverse perspectives improve R&D

Patent and license applications for technology developed during GOALI collaborations

Academia Extension of in-hous

research capability

Alignment of efforts with viable technology options

Direct and more immediate impact of research on technology

New applications of GOALI research are developed

Researchers and/or students pursue further funding for the technology

NSF

GOALI funds enable collaboration across directorates

INTERMEDIATE OUTCOMES

Industry

Increased fundamental research efforts

Increased number of cross-trained professionals which can be resources for both industry and academic projects

Improved manufacturing processes

Increased efficiency due to fresh perspectives and new insight from academic partners

Academia

Increase in academically trained staff transitioning to industry careers

Increased appeal of classes delivered by educators with industry experience

Academics incorporate new companies and apply for NSF transition funds (I-Corps, SBIR)

LONG-TERM OUTCOMES/ IMPACT

Industry

Small and medium sized businesses have continued opportunities for mutually beneficial partnerships

Highly qualified and diverse workforce

Academia

Improved transition of GOALI funded trainees to careers in industry

University continues to supports and promote similar partnerships

Goals Characterized by Measurable Outputs & Outcomes

Goals	Outputs & Outcomes	Metric		
Breakthrough Technologies	New products	#/5 years/#university partners		
	New methods			
	New processes			
	Papers	# of journal publications/5 years/# partners		
Stakeholder Satisfaction	IAB member satisfaction	% of membership renewals averaged over a 4-year period		
	Leveraged funding	\$ other new sources : \$ NSF/5 years		
	Researcher satisfaction	Likert scale satisfaction		
Student Outreach	Graduate research grants	# of grants for theses and dissertations		
	Student participation	# of student members/5 years		
Student Development	Student projects	# of student publications/presentations/5 years		
	Mentorships	Median ratio researcher : graduates/5 years		
Technology Commercialization	# Degrees	# (BS + MS + PhD)/5 years		
	Licensing	# of new licenses/5 years		
	Students hired by IAB member	% of participating graduates hired by IAB member firms averaged/5 years		
	Consulting	# of consulting contracts for researchers to IAB member companies/5 years		
Knowledge Transfer	Website	Quality of information dissemination on website		
	Prof org memberships	# of professional memberships held by IAB members/5 years		
	Papers	# of co-publications (researcher and industry member)/5 years		
	Conference presentations	# of conference presentations/5 years		
	Workshops	# of seminars and workshops held		

Gibson, E. and Daim, T. (2016). A measurement system for science and engineering research center performance evaluation. *Engineering and Technology Management. 2016 Proceedings of PICMET '16: Technology Management for Social Innovation.*

Logic Model Practicum

Break out Session

Research Strand

Get Do Activities Outputs STOutcomes LT Outcomes Inputs

Workforce Development Strand

DO

	70			
Inputs	Activities	Outputs	STOutcomes	LTOutcomes

Get

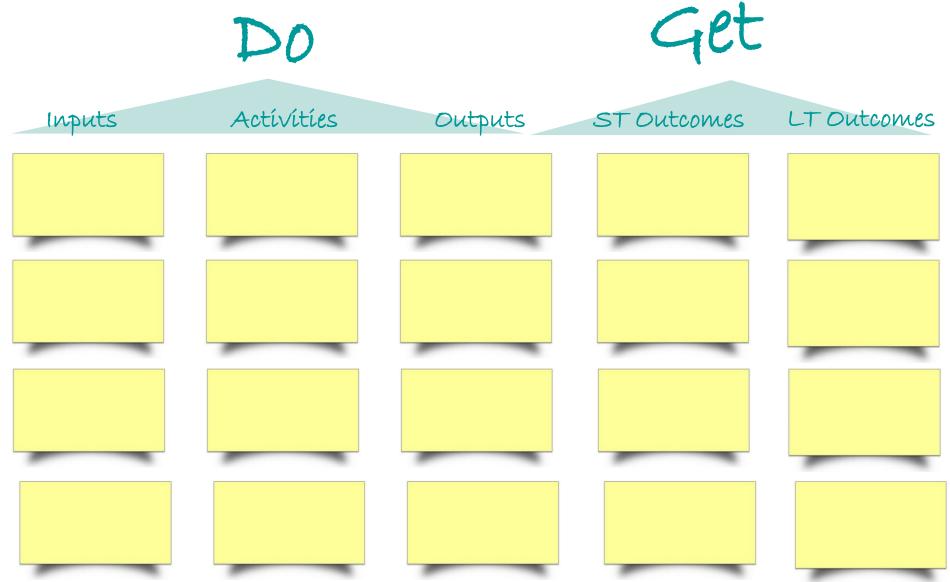
Innovation Ecosystem Strand

Get DO Activities Outputs Inputs ST Outcomes LT Outcomes

Culture of Inclusion Strand

	Do	Get		
Inputs	Activities	Outputs	STOutcomes	LTOutcomes

Infrastructure & Management Strand



Proposal Logic Model Strategic Plan Feedback Loop

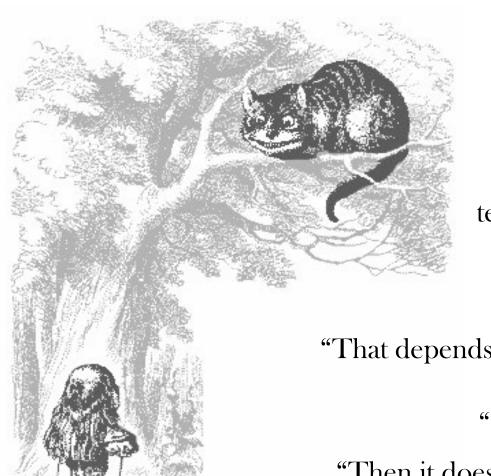
- For each foundational component and strategy, complete the activities column.
- 2. List the expected results (goals) and show interrelationships if needed.
- 3. Fill in the gaps (inputs, outputs, short- and intermediate term outcomes) to show the links between your "do" and "get."
- Check to assure the links from left to right are in a logical, feasible, sequence.
- 5. Ensure that the model represents the project (w/o unnecessary detail.
- 6. Revise and update the model periodically to reflect changes in the project.

Questions to Guide Review of the Logic Model & Strategic Plan

- 1. Are the major inputs, activities, and outputs consistent and sufficient to achieve desired outcomes?
- 2. Are the strategic goals outcome oriented?
- 3. Are there missing strategic goals?
- 4. How do colleagues not familiar with your project, interpret your model?

Resources

- https://www.wkkf.org/resourcedirectory/resource/2006/02/wk-kellogg-foundationlogic-model-development-guide
- https://fyi.uwex.edu/programdevelopment/logicmodels/
- http://ctb.ku.edu/en/table-ofcontents/overview/models-for-community-health-anddevelopment/logic-model-development/main
- http://www.pointk.org/client_docs/File/logic_model_w orkbook.pdf
- http://www.sagepub.com/sites/default/files/upmbinaries/23938 Chapter 3 Creating Program Logic Models.pdf



"Cheshire Puss," she began, rather timidly, as she did not at all know whether it would like the name: however, it only grinned a little wider.

"Come, it's pleased so far,' thought Alice, and she went on. `Would you tell me, please, which way I ought to go from here?

"That depends a good deal on where you want to get to," said the Cat.

"I don't much care where—" said Alice.

"Then it doesn't matter which way you go," said the Cat.

"--so long as I get *somewhere*," Alice added as an explanation.

"Oh, you're sure to do that,' said the Cat, `if you only walk long enough"

Thank you!

Cynthia C. Phillips, PhD Evaluator, OD/OIA/EAC cphillip@nsf.gov