Figure 1. Planning and Evaluating Technology-Based R&D: Role of KT from Beginning to End

CONTEXT EVALUATION: Project's Needs Analysis Based Upon Sponsoring Program's Situational Analysis /Priorities

KT

SHORT-TERM OUTCOMES

MID-TERM OUTCOMES

INPUT EVALUATION

Available Versus Needed Resources

PROJECT
- Objectives
- Structure

PROCESS

KT G

R

OUTPUT

Research Findings (Discovery)

KU Groups Aware of Discovery — KT → KU Interest and Use — KT → Discovery Influences Practice and Policy — KT →

KU Groups Apply Discovery via Development Method — KT → KU Interest and Use — KT → Invention Influences Practice and Policy — KT →

Prototype (Invention)

KU Groups Aware of Invention

G KT D

PROCESS EVALUATION

Optimal Process for Desired Results

G KT P

Device / Service (Innovation)

KU Groups Apply Invention via Production Method — KT → KU Interest and Use — KT → Innovation Influences Practice and Policy — KT →

KU Groups Aware of Innovation

Innovation Launched — KT → KU Satisfaction and Market Success Tracked — KT → Sustained Use Changes Practice, Policy and System — KT →

LONG-TERM (Impact): Sponsor Program's Long Range Goal is Achieved.

PRODUCT/OUTPUT EVALUATION: *Assesses Product Quality and Value*

FORMATIVE: Shapes Output Quality

SUMMATIVE: Documents Output Quality

OUTCOMES AND IMPACT EVALUATION: Assesses and Documents Outcomes, Benefits and Risks

SPONSOR: Program Data Base

R	Research
D	Development
P	Production
G	Gate
KT	Knowledge translation
KtA	Knowledge to action
KU	Knowledge user

Note. The data in Figure 1 are from Figure 7 in "Modeling Technology Innovation: How Science, Engineering, and Industry Methods Can Combine to Generate Beneficial Socioeconomic Impacts," by V. I. Stone and J. P. Lane, 2012, *Implementation Science, 7*(44). Copyright 2012 by authors. Adapted by SEDL in compliance with open-access permission under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/2.0), which permits unrestricted use, distribution, and reproduction in any medium provided the original work is properly cited. Available from http://www.implementationscience.com/content/7/1/44
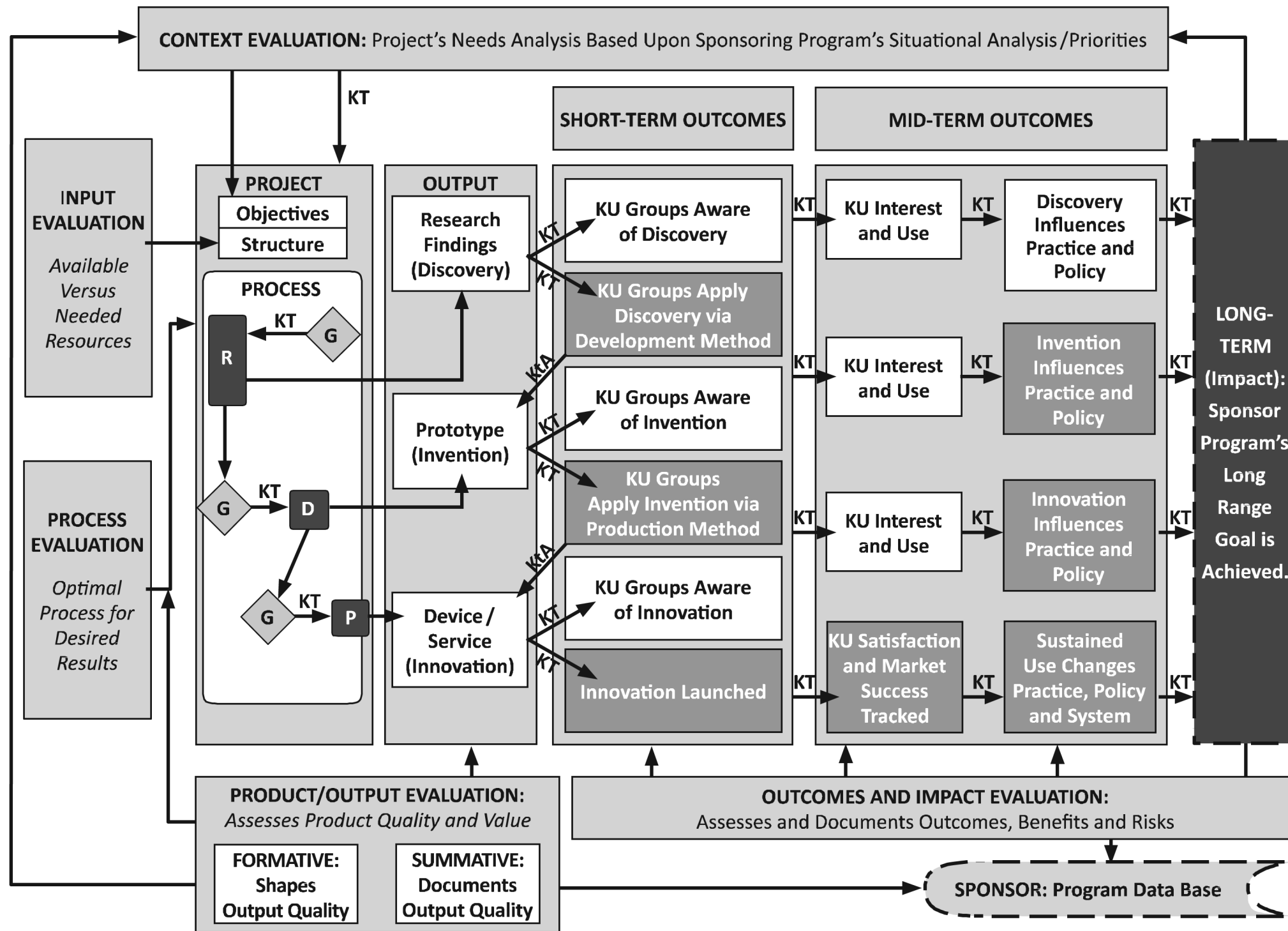
Figure 1 presents an overview of planning and evaluating a technology-based research and development (R&D) program. The overview explicitly summarizes the role of knowledge translation (KT) in increasing the likelihood of obtaining the intended beneficial impacts from project outputs. The model is structured around six columns sequentially connected by arrows suggesting progressive motion. Columns 1 and 2 refer to project activities and project output and show how KT is embedded in the interactions that result in outputs from research (R), development (D), and production (P) processes. Columns 3, 4, 5, and 6 present a detailed view of the KT connections through the progression from outputs (Column 2) to long-term impact (Column 6). This progression takes two alternate effect paths that cut across short-term (Column 3) and mid-term (columns 4 and 5) outcomes. The model shows the difference in time between the two paths for achieving an impact from an R output: the shorter path, where knowledge users (KUs) become aware of the output in the short term, and the longer path, where KUs proceed further by implementing knowledge to action (KtA) to achieve the intended technological innovation. Figure 1 captures the above concepts to show the role of KT in effective planning of technology-based R&D programs for impacts.