From Theory to Practice: Operationalizing Knowledge Translation for Successful AT Commercialization

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Outline

• **Overview of Knowledge Translation (KT)**
  – Definition
  – Knowledge to Action Model

• **Need to Knowledge Model**
  – Structure and Supporting Evidence
  – Three Opportunities for KT
    • KTA Diagrams & Tables

• **KT Resources**
What is Knowledge Translation?

- A process for moving research-based knowledge into stakeholder action.
- **Definition** – Canadian Institutes for Health Research
- **Origins** – Evidence-based Medicine to justify Federal & Public investment.
- **Current models** focus on linear model, and assume conduct of research activity.
KTA Model – CIHR

ACTION CYCLE (Application)

- Identify Problem
- Identify, Review, Select Knowledge
- Adapt Knowledge to Local Context
- Assess Barriers to Knowledge Use
- Select, Tailor Implement Interventions
- Knowledge Creation
  - Knowledge Inquiry
  - Knowledge Synthesis
  - Knowledge Tools/Products

- Telling Knowledge-Distribution
- Evaluate Outcomes
- Sustain Knowledge Use
- Monitor Knowledge Use
Analogies between KT and TT

• “End of Grant” KT = Supply Push TT – Applying discovery from basic inquiry (Mode 1 science).

• “Integrated KT” = Collaborative TT – Creating discovery from validated need (Mode 2 science).

• “Prior to Grant” KT = Demand Pull TT – Identify Problem for which Knowledge offers Solution.

• Science Rigor + Industry Relevance = Impact!
Successive Trends

• **Convergence of Science & Technology**
  - Public funding for *Basic Research* generates a repository of conceptual knowledge;
  - Innovation expected via *Diffusion Model*.

• **Convergence of Science, Technology & Society**
  - Public funding for *Applied R&D* generates a repository of prototype devices/services;
  - Innovation expected via *Linear Model*.

• **Convergence of Government, Academia, Industry**
  - Integrate three sectors in *Problem Solution*.
  - “Open” innovation and “Challenge” orientation.
Convergence of Science & Industry:

- **Knowledge embodied in three distinct states**: generated by Research, Development and Production methods respectively.

- **Industry is critical missing partner**: Government and academia projects intended to benefit society fail to cross gaps to becoming market innovations.

- **Evidence-based framework exists**: Links three methods, communicates knowledge in three states, and integrates key stakeholder.
“Translating Three States of Knowledge: Discovery, Invention & Innovation”

Lane & Flagg (2010)

Implementation Science

http://www.implementationscience.com/content/5/1/9
3 Methods = 3 Knowledge States

- **Research** methods generate knowledge in *gas state* of **Conceptual Discoveries**.
- **Development** methods create knowledge in *liquid state* of **Tangible Inventions**.
- **Production** methods formulate knowledge in *solid state* of **Market Innovations**.
1) Discovery State of Knowledge

✓ Research methods create new knowledge.


✓ Output – **Conceptual Discovery** expressed as manuscript or presentation.

✓ Value – **Novelty** as first articulation of new concept as contributed to knowledge base.
2) Invention State of Knowledge

 ✓ Development methods apply knowledge.
 ✓ Process – Trial and error experimentation and testing demonstrates proof-of-concept.
 ✓ Output – **Tangible Invention** embodied as operational prototype.
 ✓ Value – **Novelty** of conceptual discovery + **Feasibility** of tangible invention.
3) Innovation State of Knowledge

✓ Production methods codify knowledge.

✓ Process – Systematic specification of components and attributes yields final form.

✓ Output – **Market Innovation** embodied as viable device or service in a defined context.

✓ Value – **Novelty, Feasibility + Utility** defined as revenue to company and function to customers.
Delivering Solutions to Problems involves progress across three Knowledge States

Research → Discovery → Translation → Utilization ↓

Development → Invention → Transfer → Integration ↓

Production → Innovation → Release → Lifecycle ↓
Need to Knowledge (NtK) Model
http://kt4tt.buffalo.edu/knowledgebase/model.php

• **Integration** – PDMA’s NPD practices with CIHR’s KTA Model.

• **Validation** – All R&D projects intending impact must start with a real problem and potential solution validated by stakeholders.

• **Orientation** – Actors need to know problem, stakeholders, methods and role in advancing process toward the Goal.
Elements of NtK Model

• Full range of activities includes 3 Phases, 9 Stages & Gates, Steps, Tasks and Tips.

• Supported by primary/secondary findings (scoping review of 250+ research and practice articles), and A/T case examples.

• Logic Model orientation – “Begin with the end in mind” (Stephen Covey), and work backwards through process to achieve it.
<table>
<thead>
<tr>
<th>Phases</th>
<th>Stages and Gates</th>
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<tbody>
<tr>
<td>Discovery (Research)</td>
<td>Stage 1: Define Problem &amp; Solution</td>
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<td>Stage 2: Scoping</td>
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<td>Stage 3: Conduct Research and Generate Discoveries ➔ Discovery Output!</td>
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<tr>
<td>Invention (Development)</td>
<td>Communicate Discovery State Knowledge</td>
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<td>Stage 4: Build Business Case and Plan for Development</td>
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<td>Stage 5: Implement Development Plan</td>
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<td>Stage 6: Testing and Validation ➔ Invention Output!</td>
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<td>Innovation (Production)</td>
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<td>Stage 7: Plan and for Production</td>
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<td>Stage 8: Launch Device or Service ➔ Innovation Output!</td>
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<td>Communicate Innovation State Knowledge</td>
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<td>Stage 9: Life-Cycle Review/Terminate?</td>
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Knowledge Translation
Technology Transfer

3.8 Results - integrate findings. [Supporting Evidence]

3.9 Conclusion – evaluate discovery in light of solution. [Supporting Evidence]

If role ends at completion of discovery phase, conduct knowledge translation activities to ensure that others will continue to work towards commercialization of the new device or service. For more detail on ways to reach each knowledge user group, see [KTA Table for Discovery Outputs (new window)]. If role continues, the following knowledge translation activities are not yet necessary up to Gate 3.

Gate 3: Begin Invention Phase? Does the discovery have merit on its face? If no, terminate and go to [KTA for projects terminated at completion of discovery phase]. If yes, conduct stage 4 to validate merit and worth. [Supporting Evidence]

KTA 1: Discovery Outputs

- KTA1.1 Use initial need assessment, valubility assessments, and value proposition to match the discovery to the knowledge gap. [Supporting Evidence]
- KTA1.2 Use need and valubility assessments to demonstrate how the discovery will benefit each separate knowledge user (KU) group. [Supporting Evidence]
- KTA1.3 Assess barriers (B) to use of the discovery for each KU group. [Supporting Evidence]
- KTA1.4 Depending on B, select and implement interventions. [Supporting Evidence]
- KTA1.5 Monitor use of the discovery. [Supporting Evidence]
- KTA1.6 Evaluate outcomes – may have to develop new outcome measures. [Supporting Evidence]
- KTA1.7 Sustain use of the discovery. [Supporting Evidence]

Invention Phase

Stage 4: Build Business Case and Establish Development Plans
[Supporting Evidence]

- 4.1 Seek key co-development partners. [Supporting Evidence]
- 4.2 Propose draft solution. [Supporting Evidence]
- 4.3 Outline preliminary business case. [Supporting Evidence]
- 4.4 Implement IP strategy in collaboration with technology transfer office or patent attorney. [Supporting Evidence]
**Discovery Creation**

**Stage 1 - Problem/Solution**

**Stage 2 - Scoping**

**Stage 3 - Research**

**Discovery Outputs**

**Generate Discovery**

**ACTION CYCLE**

- Use initial need assessment, valiability assessments and value proposition to match the Discovery to the knowledge gap.

- Assess barriers to use of the discovery by each knowledge user group. Survey groups to see why they may not use the discovery.

- Depending on barriers identified, select and implement interventions (e.g. - broadly disseminate tool info, provide multiple access points).

- Evaluate outcomes - May have to develop new outcome measures.

- Sustain use of the discovery. Use feedback to modify tools and interventions as needed.

- Monitor use of the discovery. (e.g. website hits, citations, phone and e-mail inquiries, survey user groups).
<table>
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<tr>
<th>KU Group Group</th>
<th>Consumers</th>
<th>Clinicians</th>
<th>Policy Makers</th>
<th>Researchers</th>
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<tr>
<td><strong>What to Share</strong></td>
<td>Strategic Use: Use initial needs assessment paired with research findings to develop talking points that demonstrate how knowledge (K) could lead to product development and improved Quality of Life (QoL)</td>
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<td>Strategic Use: Use initial needs assessment paired with research findings to develop talking points that demonstrate how K could lead to cost savings and improved QoL.</td>
<td>Conceptual Use: Disseminate non-proprietary K to stimulate additional research (R).</td>
<td>Instrumental Use: Use needs assessment, valuability assessments and value proposition to demonstrate value of K. Develop preliminary commercialization package to promote benefits (financial and otherwise) to brokers and their clients.</td>
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<td><strong>How to Reach</strong></td>
<td>Network with consumer advocacy organizations (CIL, Cerebral Palsy Association, AARP, etc.) and ask them to publish an article in their newsletter or have them email their constituents. Present at organizational meetings. Ask the organizations to have a link on their website to your website. Use fliers, emails, phone calls and face to face meetings.</td>
<td>Present findings at clinician oriented conferences (AOTA, APTA, CSUN, ISS, etc.). Use research papers, power point presentations, mailings, emails, presentations at conferences.</td>
<td>Presentations communicated to program directors, reply to invitations for comments or talk with elected officials. Use email, calls, face to face meetings, power point presentations.</td>
<td>Present findings at research oriented conferences (RESNA, etc.); publish in clinical and in AT research journals. Use research papers and power point presentations.</td>
<td>Face to face meetings with University TTO may be most effective. Utilize their invention disclosure processes. Develop a preliminary commercialization package (soft or hard copies) and use power point presentations.</td>
<td>Conduct face to face meetings with individual manufacturers at their home office, or at conferences/tradeshows (Medtrade, ATIA, etc.). Develop preliminary commercialization package (soft or hard copies) and use power point presentations and tailored emails.</td>
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<td><strong>Anticipated Knowledge Translation Outcomes</strong></td>
<td>Consumers can use talking points to contact politicians to advocate for reimbursement of potential devices, or contact manufacturers and distributors to stimulate product demand.*</td>
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<td>Policy makers can use talking points as a basis for introducing and supporting legislation to provide reimbursement for potential devices.*</td>
<td>Researchers can use findings as a basis for additional research on related topics.*</td>
<td>Brokers can use preliminary commercialization package to stimulate discussions between manufacturers and researchers pertaining to application of research findings.*</td>
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<td><strong>What to Share with Each KU Group</strong></td>
<td>Strategic Use: Use business case and focus group/field test results to develop talking points to demonstrate how prototype could lead to product development and improved Quality of Life (QoL).</td>
<td>Strategic Use: Use business case and focus group/field test results to develop talking points that demonstrate how a product based upon the prototype design could lead to improved QoL and cost savings.</td>
<td>Conceptual Use: Disseminate non-proprietary information regarding prototype to stimulate additional R.</td>
<td>Instrumental Use: Develop full commercialization package including information from initial need assessment, valuability assessments, value proposition, focus group/field test results, description of features and specifications and technical details of prototype.</td>
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<td>Present prototype/findings at clinician oriented conferences (AOTA, APTA, CSUN, ISS, etc.). Use research papers, power point presentations, mailings and emails.</td>
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<td>Face to face meetings with University TTO may be most effective. Commercialization package (soft or hard copies) and power point presentations.</td>
<td>Conduct face to face meetings with individual manufacturers at their home offices or at conferences/tradeshows (Medtrade, ATIA, etc.). Commercialization package (soft or hard copies), power point presentations and tailored emails.</td>
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<td>Researchers can use findings as basis for additional research on related topics.</td>
<td>Brokers can use a commercialization package to demonstrate the value of a product to manufacturers and encourage them to move to production.</td>
<td>Manufacturers can use a commercialization package to understand the value of a product, thereby encouraging them to move to production.</td>
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Stage 8: Launch Innovation. Depending on barriers, select and implement inventions (e.g. broadly disseminate product info, provide multiple access points).

Stage 8: Monitor innovation use. Provide product support and fix bugs.

Stage 9: Evaluate outcomes - Review results against expectations based on performance metrics.

Sustain innovation use. Repeat process.

Create final value proposition statement and post-launch evaluation plan with performance metrics specific to the innovation.

Use test marketing to explore ways the innovation can be used by knowledge user groups. Consider instrumental, conceptual and/or strategic uses of the innovation for each group.

Stage 7 (continued): Review test-market results, make changes to the innovation and marketing strategy to demonstrate how the innovation will benefit each group.
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<td>What to Share with Each KU Group</td>
<td>Instrumental Use: Must demonstrate value of product to end users via product packaging and marketing efforts.</td>
<td>Instrumental Use: Must demonstrate value of product to end users (clinician or their clients) via informational literature, conference presentations and marketing efforts.</td>
<td>Strategic Use: If public funds were used for product development, demonstrate return on investment (ROI).</td>
<td>Conceptual Use: Provide information on path to market, barriers encountered and carriers used to overcome barriers to provide product development insights to other researchers.</td>
<td>Conceptual Use: Demonstrate ROI (financial, university publicity, student training, etc.).</td>
<td>Strategic Use: Demonstrate ROI and identify partnering opportunities with companies producing complementary products.</td>
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<tr>
<td>How to Reach Each Group</td>
<td>Use news media (targeted print, broadcast and internet based forms); product placement in stores; demonstration packages and trial use of product.</td>
<td>Use sales representatives, product training sessions, news media (print, broadcast and internet based forms); product placement in stores. Offer product demonstrations at conferences and tradeshows. Offer assessment tools that help determine if a product is appropriate for a client, or the ideal configuration, accessories, etc. for product. Provide demonstration packages and trial use of product.</td>
<td>Use email, phone calls and web links to news stories regarding the product. Report in formal annual performance report.</td>
<td>Present findings at research oriented conferences (RESNA, etc.). Use research papers and power point presentations.</td>
<td>Use formal reports, email, phone calls and face to face meetings.</td>
<td>Face to face meetings may be most effective. Seek out manufacturers at offices, conferences and tradeshows.</td>
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<td>Anticipated Knowledge Translation Outcomes</td>
<td>Consumers can use products, leading to a better QoL.</td>
<td>Clinicians may use products directly or recommend products, leading to improved QoL.</td>
<td>Policy makers can share ROI information with oversight organizations (ex. Office of Management and Budget).</td>
<td>Researchers will gain a greater appreciation and understanding of the Knowledge to Axion (KTA) process, leading to an increased likelihood that new research will be conducted using the Need to Knowledge and KTA models.</td>
<td>Brokers can use ROI information to justify future investments in similar products.</td>
<td>Manufacturers can increase ROI by teaming up with companies selling complementary products.</td>
</tr>
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</table>
Review three key points

- Knowledge embodied in three distinct states: generated by Research, Development and Production methods respectively.

- Industry is critical missing partner: Government and academia projects to benefit society fail to cross gaps to become market innovations.

- Evidence-based framework available: Links three methods, communicates knowledge in three states, and integrates key stakeholder.
KT Resources

• *KT4TT’s Publications and News Pages:* http://kt4tt.buffalo.edu/publications/index.php

  • Training modules
  • Journal articles
  • Conference Presentations
KT Resources

- **National Center for the Dissemination of Disability Research**
  - FOCUS Technical Briefs
  - Webcasts
  - KT Library
    - Articles
    - Guidelines
    - Models
    - Organizations
    - Research Registries
KT Resources

- **Agency for Healthcare Research and Quality**
  - Innovations Exchange

- **Canadian Institutes of Health Research**
  - Definitions; Strategies; News.

- **Canadian Health Services Research Foundation**
  - Resources & Tools
    - Acquisition, Assessment, Adaptation, and Application
ACKNOWLEDGEMENT

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