Content and Values in the Management of R&D Portfolios

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Presentation Outline

- Project on Content-Value Dimensions for Portfolio Management
- Literature perspectives on R&D portfolios
- Content and Values in R&D portfolios
  - Strategic dimensions of R&D portfolios
  - Implementation and impact assessment
- Case application: NIDRRR portfolio
- Lessons and next steps
Categorical demand for performance:
- Make a difference in the life of people with disabilities
- Mission seems clear conceptually but hard to demonstrate how research makes a difference

Very complex agency portfolio
- Based on themes that articulate priorities improving life of people with disabilities
- Thoroughly inter- and multi-disciplinary
- Institutional convergence for the field of rehabilitation
- Underlying epistemic fragmentation
  - Composed by many fields with strong epistemic traditions of their own
NIDRR Portfolio

- Disability and Rehabilitation Research Agency (US Dept. of Education)
  - 8 project areas (defined by targeted needs: employment, health and function, technology for H&F, participation and community living, KT, disability demographics, ADA assistance, capacity building)
  - Approx. $105M research budget
  - About 30 Rehab. Research and Training Centers
    - $600K-800K a year in 5 year periods.
  - About 30 Rehab. Engineering Res. Centers
    - $800K – 1M per year in 5 year periods.
  - Utilization and Field Initiated Projects
Project on NIDRR Portfolio

- Management challenge
  - Internally: Determine the optimal composition of the portfolio
    - Regular dimensions of risk, resources, payoff, etc.
    - Maintain coherence of the portfolio as a whole
  - Externally: Facilitate the knowledge flow from the portfolio for maximal impact
    - Diverse constituencies that include people with disabilities, their activist organizations, care givers, etc.
  - Dual translation:
    - meaning of impact into research priorities
    - Available results into applications, uses and practices that have an impact
Perspectives on R&D portfolios

- Literature on portfolio management doesn’t address this situation
- Analogy from financial investments
  - Partition of investment assets into a set of diverse financial instruments with relatively uncoupled risk factors
- Two main types of R&D portfolio
  - A set of projects pursuing different technical approaches to solve the same overall problem
  - A set of projects focused on the same technical problem executed in competition with each other
Perspectives on R&D portfolios

- Analysis of R&D portfolios:
  - Economic approaches
    - Cost-benefit analysis
    - Internal Rate of Return; Net present Value; ROI
    - Option pricing
  - Management approaches
    - Project selection techniques
    - Operations research
    - Scoring schemes
    - In general, ways to translate priorities held by groups into a single algorithmic framework
Perspectives on R&D portfolios

- Broader value context of these approaches
  - Organizational goals for R&D activity are very clear
    - Market competition or strategic technical goal (defense)
    - Winner take all game
    - Public good is realized independently of who wins (challenged by globalized markets)
    - Allows optimality calculation for aligning project set with organizational objectives
  - The knowledge field of projects is essentially uniform
    - Infrastructural concerns are not a priority
    - Process and criteria for knowledge validation are clear
      - Basic or exploratory research is treated as borderline (research is demand driven, it varies according to who is doing the demanding)
Perspectives on R&D portfolios

- Applicability of financial investment analogy
  - Doesn’t work well for looking at R&D portfolios
  - Different configuration of principal-agent problem
    - Finance: individual investments selected to have different levels of risk (eggs in several baskets)
    - Research: not oriented to risk of individual projects so that some failures are compensated by the successes
      - Complementarity and coherence of the research front
      - Incentives for scientists are affected by the criteria for selecting projects (i.e. individual components of the portfolio)
Content and Values in R&D portfolios

- Portfolios in the public sector
  - Constitution of relevant knowledge fields (capacity)
    - Epistemic values (rigor, validity) and the research infrastructure (ability to address certain problems)
  - Performance measured outside of jurisdiction
    - Content-value in patterns of use

- Definition of balance or optimality
  - Degree to which validation criteria of contributing fields are met in interdisciplinary portfolios
  - Degree to which values favor knowledge flow along path to desired outcome

- Similar problems also perceived in corporate environments with multiple businesses and markets (Herfert and Arbige 2008)
Content and Values in R&D portfolios

- Content-Value issues internal to portfolio:
  - Exemplars of “good science” in the “evidence-based” movement (foundation of knowledge translation)
    - Highly significant statistical results
      - Sampling: size, representativeness,
      - Controlled experiments: measured effects of causal factors
  - Skepticism of qualitative methodology
  - Diversity of validation “cultures” in interdisciplinary portfolios
    - Epistemic values are content dependent
    - “How a demographer sees a cultural anthropologist”
    - Makes collaboration very difficult
  → Boundaries that must be managed by “science management”
Content and Values in R&D portfolios

- Content-Value issues in the use-impact field
  - Heterogeneity of “clients”, stakeholders, users
    - Each has a local view of the application
    - Each will engage in appropriation of the knowledge and change it (more or less)
    - Each responds to different forms of presentation of the knowledge and what it is about (different attribution of meaning)
    - They are in a variety of relations to each other as well as the knowledge production system (systemic interactions in the application field)
    - Content-value interaction at the impact point (e.g. mental health theories and measures of impact)
  - Lack of uniformity of knowledge flows is analogous to trading without a currency
    - We cannot have a single currency for knowledge trading because the exchange value is irrelevant
    - The linear model and diffusion of innovations are attempts to simplify these problems of “knowledge markets”

→ Managers are responsible for proving the value of what they do for their customers
NIDRR Portfolio

- Empirical determination of phenomena
  - Internal to portfolio
  - External to portfolio

- Internal:
  - Determine what managers know about the portfolio
  - Determine what researchers know about the portfolio
  - Analyze portfolio from perspective of organizational learning
    - Formal and enacted theory of the portfolio
    - Feedback loops in managerial frame
NIDRR Portfolio

- Empirical approach,
  - External
    - Determine the user field
      - Variety of uses and roles
      - Attributions of meaning to knowledge at each point (e.g. evidence-based practices that have barriers to adoption due to redefinition of roles and shifting of burdens of implementation)
    - Determine links and types of interactions
    - Determine articulations of value
      - Documentation
      - Evidence of past action
    - Compare description of user field with mission and strategic goals for portfolio
NIDRR Portfolio

- Components of information gathering tool:
  - Knowledge production (fields, types of output, organization, professional roles)
  - Links and knowledge flows (types of uses, expected and unexpected, types of users, intermediaries, networks)
  - Values (own values, researchers, users, audiences, articulation)
  - Content dependence and other patterns
NIDRR Portfolio

- The portfolio as investment in a field
  - Disciplines of project participants
    - Medical specialties:
    - Engineering specialties:
    - Architecture and Industrial Design:
    - Social Sciences:
    - Psychology:

  ➔ Value: Coherence of epistemic practices
    - Integration of theoretical discourse
    - Integration of data and methods

  ➔ Management role: epistemic mediation
    - Optimality criterion: minimum fragmentation
NIDRR portfolio

- Portfolio as tool for knowledge “market”
  - Markets of the NIDRR portfolio
    - Populations by disability
      - People with disabilities
      - Families and close circles
    - Practitioners and deliverers of care
  - Government bodies in the accountability chain

→ Value: Rapid adaptation of knowledge in locale
  - Attributions of meaning
  - Optimality criterion: minimum translation distance
Lessons and Next Steps

- Managers are hard pressed to respond to demands of complex portfolios
  - Competing epistemic values of interdisciplinary portfolios
- Managers and researchers often have misperceptions of each other
- The field of use seems like “outer space with a sprinkle of stars” where known spots are
  - No systematic understanding of knowledge flows
  - End points are defined abstractly
  - No unified categorization of the targets as results of known phenomenological mechanisms
- Determine patterns of content-value on both sides of the portfolio