Measuring Innovation

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Challenges for measuring innovation

- Innovation = the process of discovering new ideas (e.g. technologies) and implementing them in the real world so as to have a positive effect (e.g. value as a new product)
  - Therefore, innovation = one or more changes in one or more values over time
- But: (1) difficult to establish a benchmark for comparison
  - Can only guess what would have happened if no innovation; the baseline value may changed, anyway
- (2) Should include value of indirect benefits that result
  - E.g., knowledge gained by the inventor
  - Aggregate licensing fees may be only small part of true value of an innovation

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First, why measure? Process (efficiency, impact) or specific instance (valuation)

- Impact of an innovation policy instrument (process of innovation is focus)
  - Exclude differences in the abilities of those who use it
- Comparison of several innovating groups (process of innovation and value of instances)
  - May include the creativity etc. of the people involved
- Determine appropriate rewards to inventors and other relevant participants (e.g. product developers) -- valuation of specific instances

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Comparison: consideration for tenure of university professor

Innovation measurement	Consideration for tenure
Measuring impact; number of patents, licensing fees is only part of story	Measuring impact; number of papers and citations is only part of story
Impact: include subjective valuation by experts?	Probable future impact: include subjective evaluations by external reviewers
Better measurement if devote large amount of time, effort	Use large amount of time and effort to evaluate candidate
Output is quantitative value	Quantitative measurement used for yes / no decision

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Criteria for tenure at Stanford
(source: Faculty Handbook)

1. Scholarship
   - "be the best scholar available … at his or her level of professional development in the relevant field"
2. Teaching
   - Evidence that "candidate is capable of sustaining a first-rate teaching program"
     - Knowledge of material, clarity of exposition
     - Performance in mentoring and advising students
     - Curriculum innovation a plus

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Informal metrics: probable future impact on field and in world

- On the way to becoming one of top five scholars worldwide in area of specialization
- Research output: important papers, an important book, patents
- Impossible to generate sufficient output unless has attracted outside sponsors for research
- Likely success of Ph.D. advisees: will their specialty be in demand at universities or companies? Data from first graduates
- Quality and impact of teaching: but teaching reaches fewer people than does a major textbook or research publication

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Pre-tenure review

- Two years before end of assistant professor contract
  - Preparation of preliminary tenure application packet by the assistant professor under review
    - List of publications, citations, classes taught; peer teaching evaluations, awards, (letters)
  - Department chair or representative gives recommendations to make changes, improvements
- Review for tenure takes entire year
  - Almost like a new hire, not just a promotion

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Items considered at Stanford

- Packet: list of papers, numbers of citations, other indications of productivity (patents etc.), awards, teaching evaluations, peer reviews of teaching
- Referee letters about scholarship: minimum 6, usually 12
  - Referees must compare candidate to 4 -6 similar scholars (by name) at other universities who would probably receive tenure at Stanford
- Evaluations from prior and current Ph.D. advisee students: usually letters or confidential interviews
  - Consideration of hiring patterns of Ph.D. students
- In some departments: 6 - 12 letters from undergrad students taught (student referees chosen by random sample)
- Assessments relevant to *intended* role, too (e.g. lab head)

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Lessons for measurement of innovation

- Measurement of total impact is the crucial point
  - Can be measured up to date, but likely future impact is (more) important
  - For example, an important “basic” patent may not generate revenue until several years after it issues
- Measurement of impact may require subjective evaluation (valuation) by external experts
  - Multiple evaluators reduce probability of skewed results
  - Qualitative responses by experts in the technical area are analyzed by experts in innovation > output looks quantitative
- Good measurement requires time, effort

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