

First Annual

Triple Helix Summit

February 12 – 13, 2007



University of Hawaii • East West Center • Hawaii Imin International Conference Center • Honolulu, Hawaii

What Are the Economic Advantages of Triple-Helix Innovation?

by

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Overview

- Economic framework – prospective advantages of Triple-Helix Innovation: Efficiencies and positive externalities (spillovers).
- Statistical research program: MegaTrend Analysis and analysis of research projects.



Advantages

- What are all of the advantages of Triple-Helix Innovation?
- Uncertain!
- Expectation is that material well-being is enhanced through positive externalities (spillovers) and efficiencies are engendered by Triple-Helix Innovation.



Production of Goods & Services

- Goods and services are produced using a production function:

$$Q = f(K, L, E, M, S, I)$$

Where K is capital, L is labor, E is energy, M is materials, S is for purchased services, and I is innovation.



Innovation

- The production of innovation, too, can be characterized by a production function:

$$I = f(K, L, E, M, S).$$



Triple Helix Innovation

- Three types of institutional units produce Triple-Helix innovation: Academia (a), Industry (i), and Government (g):

$$I = f(K_{a,i,g}, L_{a,i,g}, E_{a,i,g}, M_{a,i,g}, S_{a,i,g}).$$



Efficient Production

- Efficient production means optimal mixes of *KLEMS* and optimal contributions to production processes by a, i, and g.
- *KLEMS* inputs are produced through specialization.
- Specialists use *KLEMS* inputs to produce goods and services and innovation.
- Goods, services, and innovation are exchanged (traded) to enhance material well-being.



Research

- The institute is conducting research to determine which combination of inputs (*KLEMS*) and of contributors (a,i,g) produces innovation optimally.
- The following types of measures should provide insights concerning optimal combinations of inputs and contributors:

$$\frac{\partial Q}{\partial I} \frac{\partial I}{\partial K_{a,i,g}} ; \frac{\partial Q}{\partial I} \frac{\partial I}{\partial L_{a,i,g}} ; \frac{\partial Q}{\partial I} \frac{\partial I}{\partial E_{a,i,g}} ;$$
$$\frac{\partial Q}{\partial I} \frac{\partial I}{\partial M_{a,i,g}} ; \text{ and } \frac{\partial Q}{\partial I} \frac{\partial I}{\partial S_{a,i,g}}$$



Externalities (Spillovers)

- Production processes that embody innovation may supersede those that do not, because innovation is an additional factor input, and because the returns-to-scale parameter (λ) is expected to be greater under innovation than otherwise: i.e.,

$$Q_I = f(K, L, E, M, S, I)^{\lambda_I} > Q = f(K, L, E, M, S)^{\lambda} .$$

- Innovations may be adopted in unanticipated ways to produce other goods and services.

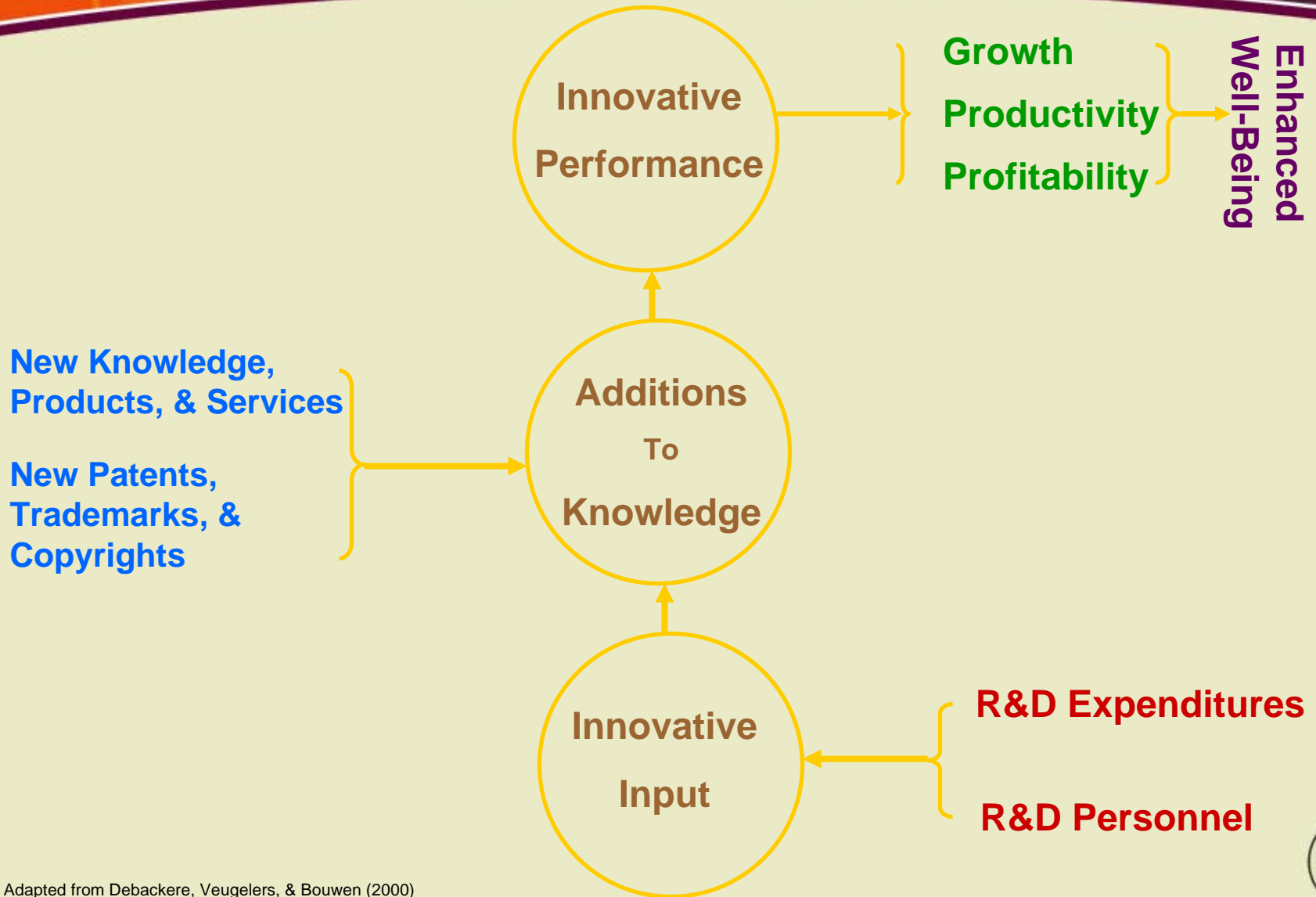


Advantages of Triple Helix Innovation

- Optimal production of innovation and of downstream goods and services implies efficiency.
- The transfer of innovative technology and its adoption in unexpected ways represent positive externalities (spillovers).



Innovation: Production, Use, & Advantages



Statistical Research Program: I

- MegaTrend Analysis is designed to assess technological, economic, demographic, and ecological trends in six locales: The states of California, Hawai'i, and Washington; and the nations of China, Japan, and Singapore.
- Jue Wang, a University of Hawai'i cybrarian, is collecting 46 time series for each locale = 276 series.
- Data collection is 60 percent completed.



Statistical Research Program: II

- Analyze research projects' outcomes and impacts by:
 - Identifying 21 projects in each of the six locales = 126 projects.
 - Circulating questionnaires to the 126 projects and 630 of their principal and lead researchers.
 - Assessing project characteristics: Funding; competitiveness; capital use; institutional attitudes toward innovation; institutional collaborations; technology use; and the production of intellectual property.



Expected Outcomes

- The analysis will:
 - Identify patterns that are unique to innovative research.
 - Characterize successful helix mixes.
 - Identify underlying factors for efficient innovative research and for producing positive externalities.



Forthcoming Results

We await the results of this research.



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