

## Taxonomy of Triple Helix Innovation

### Overview

The purpose of this document is to: (1) Present an operational definition of “triple helix innovation”; (2) describe traditional collaborative processes; and (3) highlight the unique aspects of triple helix innovation collaborative arrangements, which are fully integrated and overlapping and that may be viewed as “institutional units” or as “functional” paradigms.

### Operational Definition: Triple Helix Innovation

This operational definition is presented in two parts: Triple Helix and Innovation.

**Triple Helix.**—Academia, government, and industry constitute the three helices that engage in triple helix innovation. Educational institutions of higher learning (colleges and universities) primarily represent academia in this paradigm; however, educational institutions at other levels are not precluded from contributing to, and participating in, triple helix innovation processes. Government may be represented by any of the three levels of government and their owned corporations: Federal (national), state (provincial), and local (municipal). There are no restrictions on the types of industry (firm) involvement in triple helix innovation processes: i.e., industry may be represented by private corporations, partnerships, or sole proprietorships.

**Innovation.**—Innovation is a complex event that results when a confluence of contextual, structural, and dynamic-process factors produce new social benefits, greater economic efficiency, and enhanced sustainability. Operationally, innovation is characterized by a five-phase process: (1) A social mission is defined, usually by government; (2) in response to that mission, new knowledge, technology, or products and services (inventions) are created through a scientific research and development (R&D) endeavor; (3) the new knowledge, technology, or products and services are transferred to intended final users; (4) final users consume the new knowledge, technology, or products and services or they are adopted/incorporated into production processes; and (5) the new knowledge, technology, or products and services spill over into initially unintended areas.<sup>1</sup>

Combined, triple helix innovation is a process by which academia, government, and industry collaborate (i.e., engage in a process of mutually beneficial leveraging of resources) to create or discover new knowledge, technology, or products and services that are transmitted to intended final users in fulfillment of a social need. Final users then consume the knowledge, technology, or products and services or they use them to produce new goods and services that are ultimately

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<sup>1</sup> In phase four, the final users’ production processes represent the production of a new good or service—to include goods or services for resale or for own consumption.

sold or consumed. In addition, serendipitous benefits of the new knowledge, technology, or products and services accrue to unintended final users.

### **Traditional Collaborative Processes**

There are three fundamental functions that combine to produce new knowledge, technology, or products and services: (1) Identification of a new area of research and the required funding (facilitative); (2) the actual R&D (discovery); and (3) commercialization (diffusion).

In traditional collaborative processes, the need for new knowledge, technology, or products and services may surface from any of three traditional collaborating units: Academia, government, or industry. Usually, the unit that identifies the need initiates efforts to bring the remaining two units into a nonintegrated and sectorally independent collaborative process. This effort entails the aforementioned facilitative, discovery, and diffusion functions.

Generally, academia and industry tend to invest in collaborative processes in accordance with the expected returns of those processes. Hence, academia and industry attempt to spread the cost of efforts to create new knowledge, technology, or products and services to the remaining sectors. Government, on the other hand, which has a responsibility to resolve market failures and to produce social benefits, is generally more willing to bear the cost of these efforts when the latter are expected to produce significant increases in the social good. Therefore, the amount and type of expected return guides decision to facilitate traditional collaborative processes.

Academic institutions usually possess the human and physical capital required to conduct R&D. In addition, it has been argued that students in academic environments are a good source of new, innovative ideas. Consequently, in traditionally collaborative processes, academic institutions are often selected to undertake the R&D (discovery) processes that lead to the creation or realization of new knowledge, technology, or products and services. Nevertheless, it is also quite common to find government and industry performing R&D.

More so than educational institutions and government, industry possesses the human and physical capital that are typically required to adopt/incorporate new knowledge and technology into manufacturing processes to produce new products and deliver new services and to commercialize (diffuse) them. These products and services may be sold to intended final users for further use or for consumption. It is the expected revenues from these sales that motivate industry to participate in, and contribute to, traditional collaborative processes.

Spillovers may occur during any stage of the innovation process. However, large spillover effects can result after a first-round of commercialization when initially unintended users come to enjoy the benefits of new knowledge, technology, or products and services. Government and academia, more so than industry, are often motivated to participate in traditional collaborative efforts by these spillovers. The latter may not be able to capture the benefits of spillovers, while the former may be positioned to do so.

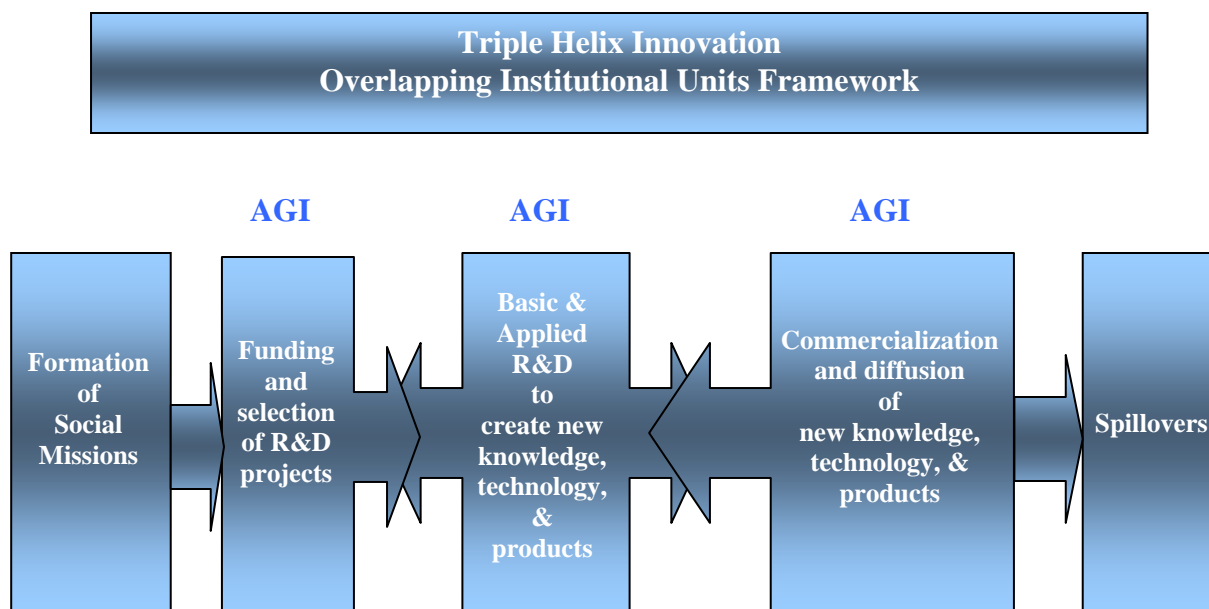
Therefore, traditional collaborative processes are characterized by academia, government, and industry playing nonintegrated, virtually independent, but well-established roles to produce new knowledge, technology, or products and services.

### Triple Helix Innovation: An Institutional Units Framework

The Triple Helix Innovation process, on the other hand, is characterized by academia (A), government (G), and industry (I) playing fully integrated and overlapping roles (see Figure 1). This process typically begins with the formation of a social mission, which may arise in any sector but is often championed by government. Once the social mission is established, AGI institutional units are drawn into collaborative funding, R&D, and commercialization processes.

Under such collaborative arrangements, it is not surprising that academia, government, and industry may fund R&D to achieve a social mission. Similarly, all three institutional units may perform the R&D. To a lesser extent, academia and government may commercialize new knowledge, technology, or products and services—a pursuit traditionally reserved for industry.

Figure 1



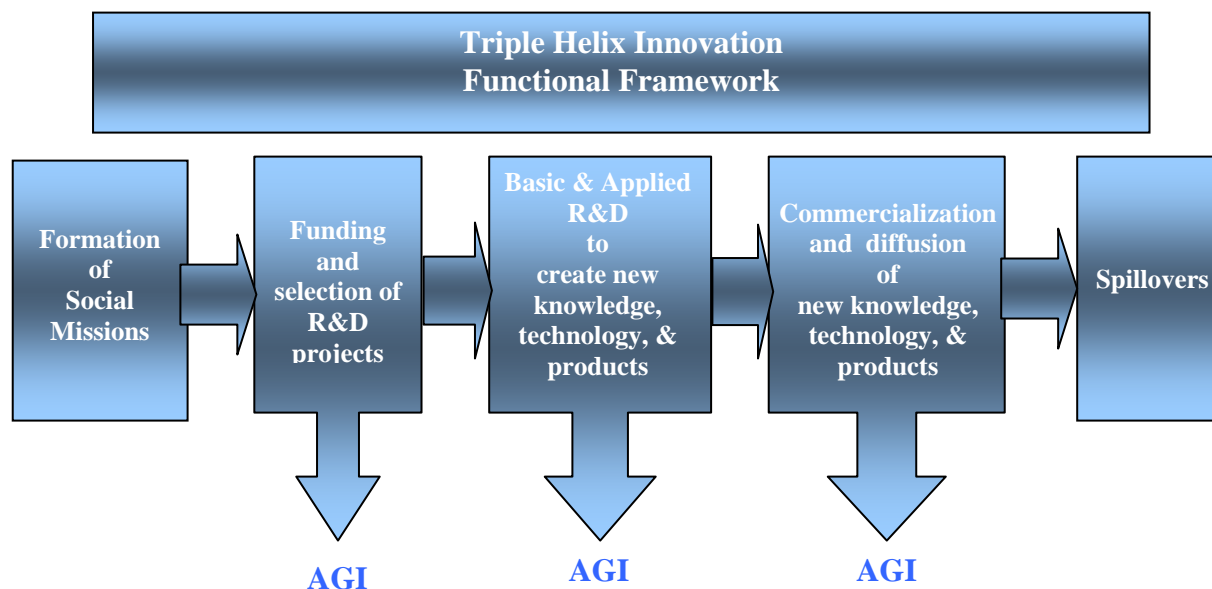
### Triple Helix Innovation: A Functional Framework

Triple helix innovation may also be cast in an alternative, functional framework (see Figure 2). Instead of characterizing triple helix innovation as institutional units collaborating to perform functions, it is reasonable to forego institutional unit considerations and to focus on the

functional framework. Therefore, triple helix innovation may be fully delineated by the aforementioned functions: (1) Funding (facilitative); (2) research and development (R&D, discovery); and (3) commercialization (diffusion).

This functional framework is parsimonious, yet it is broader in scope than the previously described institutional units framework. In fact, the earlier institutional units characterization of triple helix innovation serves as a special case of this more general functional characterization. It is noteworthy that this functional framework facilitates the recognition of other institutional unit types (e.g., nonprofit organizations and households) as possible participants in the triple helix innovation process.

Figure 2



### Institute for Triple Helix Innovation research program

The Institute for Triple Helix Innovation is engaged in a research effort to fully articulate triple helix innovation processes. The goal of the research is to discover and document existing and new triple helix innovation frameworks and systems that represent successful collaborative efforts.<sup>2</sup> Whether the innovation process fits the traditional institutional units or the more general functional paradigms discussed above, the Institute will dissect the process to determine which combination of financial, human and physical capital, material, locational, cultural, and organizational inputs converge to produce successful triple helix innovation. Indeed, it is only through such study that the social, economic, and sustainability benefits of triple helix innovations can be fully articulated.

<sup>2</sup> The Institute recognizes that the definition of “success” is often situationally-dependent.