

Measuring Innovation for National Prosperity

Innovation Framework Report

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CONTENTS

EXECUTIVE SUMMARY 3

1. INTRODUCTION 6

2. THE IMPORTANCE OF INNOVATION 6

3. THE NEXT INNOVATION WAVE 7

4. FROM INVENTION TO INNOVATION 8

 4.1 Fundamental Role of Customer Value 8

 4.2 Innovation Practices are Changing 9

5. MEASURING INNOVATION 9

 5.1 Types of Innovation 10

 5.2 Importance of Service Sector Innovation 10

 5.3 Demand for Innovation 11

6. WHAT IS INNOVATION SUCCESS? 11

7. DESIGNING THE INNOVATION FRAMEWORK 12

 7.1 Innovation Inputs: Strategy and Resources 14

 7.2 Innovation Implementation 14

 7.3 Innovation Infrastructure 15

 7.4 Public Policy Environment 15

 7.5 Customer Value and Outcomes 16

 7.6 National Innovation Outputs and Outcomes 17

8. NEXT STEPS: DEVELOPING INNOVATION METRICS 18

NOTE: This report addresses the first objective of the project on “*Measuring Innovation for National Prosperity*” The three objectives are:

1. Formulate a conceptual end-to-end innovation framework (demand pull through technology push).
2. Using the innovation framework as a guide, detect and define a pool of performance metrics that are useful in assessing the effectiveness of innovation strategies at the enterprise, industry, regional and national level.
3. Map the innovation framework, attributes and metrics, prospectively, to an emerging innovation area and uncover implications and insights for national innovation strategy.

EXECUTIVE SUMMARY

For the US to maintain high levels of economic growth and job creation, it must be a global leader in the development and commercialization of “new-to-the-world” technologies. Incremental improvements, imitation and adaptation will not be a sufficient foundation for long-term competitive advantage and economic growth.

This report introduces a framework for describing the “national innovation ecology” and for guiding the development of a national system of innovation metrics, with the aim of reinforcing the foundation for competitive advantage and growth.

The framework recognizes the importance of:

- both technology push (inputs) and demand pull (outputs) as factors influencing the rate of innovation.
- attributes of the *public policy environment* and linkages to the *innovation infrastructure* as important determinants of national innovation potential.
- changes in innovation management practices, types of innovation, innovation in the service sector and customer value.

Innovation is a process by which value is created for customers through public and private organizations that transform new knowledge and technologies into profitable products and services for national and global markets. A high rate of innovation in turn contributes to more intellectual capital, market creation, economic growth, job creation, wealth and a higher standard of living.

A dramatic change in the approach to innovation is now required if we wish to sustain our competitive advantage. This requires a transition to a globally integrated economy capable of developing and commercializing “new-to-the-world” technologies.

The framework takes into account the fact that this new growth curve cannot be reached with traditional methods like increasing R&D inputs. It has to be expanded to include customer value as a main driver, as well as the public policy environment and the national innovation infrastructure as major influences shaping the national innovation system. In addition, the framework integrates the fundamental change in innovation practices from the previous closed, static, linear and individualistic perspective into a multidimensional and dynamic approach well in line with the demands of a global economy.

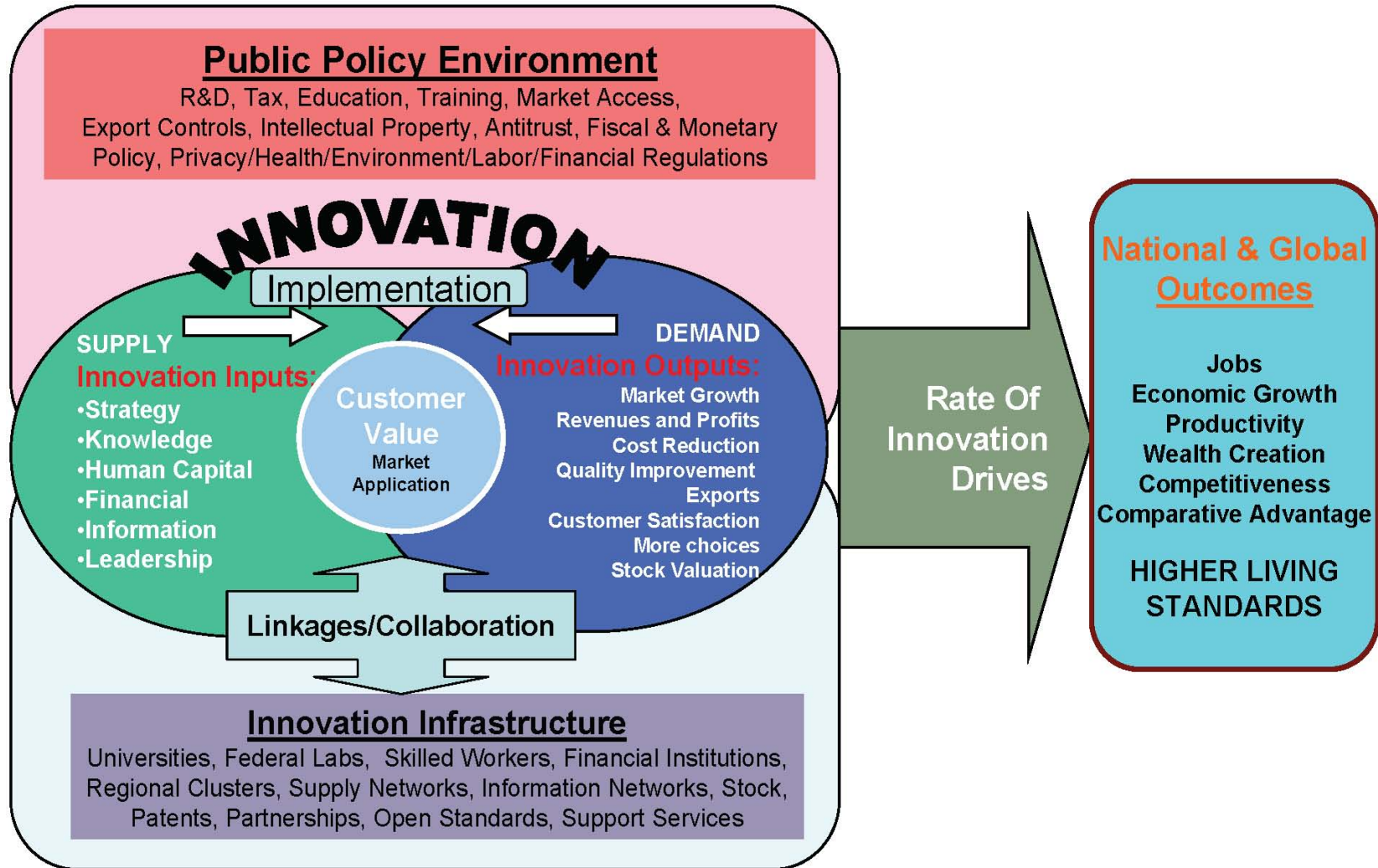
The report also stresses that current measurement methods do not clearly describe the dynamics of innovation today. Consequently, the push to the next growth curve will require: new measurement methods to better understand the more subtle elements of innovation; greater recognition of service sector innovations; and, how customer value creates demand for innovation.

The framework clusters the most important innovation factors into six dimensions:

1. ***Innovation input factors*** such as enterprise strategy, knowledge, capital and human resources, both domestically and globally.
2. ***Innovation implementation factors*** such as design, production, organizational culture and barriers to commercialization.
3. ***Public policy environment*** such as R&D policy, taxes, intellectual property, standards and market access.
4. ***Innovation infrastructure*** conditions such as quality of research in universities and federal labs, and availability of skilled human resources.
5. ***Consumer value and outputs*** such as market growth, cost reduction, profits, revenues and convenience.
6. ***National outcomes*** such as employment, economic growth, competitiveness and trade balance.

These dimensions, individually and as an ecological system, make up the context in which the nation's enterprises innovate. See the graphical representation on next page.

Innovation Framework / Ecosystem



1. INTRODUCTION

Innovation is a key contributor towards achieving our national goals—economic growth, competitiveness, comparative advantage, national security and higher standard of living. This paper introduces a framework for describing the “national innovation ecology.” The framework identifies the important attributes that drive innovation and serves as a roadmap for guiding development of a national system of innovation metrics—a fundamental prerequisite for improving innovation policy and business strategies.

The framework goes beyond knowledge creation (invention) and emphasizes the factors that drive the transformation of knowledge into useful products and services. The framework is balanced and recognizes the importance of both technology push (input factors) and demand pull (output factors).

While innovating enterprises are the prime agents of knowledge transformation and commercialization, innovation is increasingly a global and interactive activity among many stakeholders, including customers, government, academia, the financial sector, research centers and partnerships. The framework gives major consideration to the attributes of the *public policy environment* and the *innovation infrastructure* as important determinants of national innovation performance.

It should be noted that the framework will always be a work in progress. Innovation is inherently dynamic and constantly evolving. No framework can be definitive and final.

2. THE IMPORTANCE OF INNOVATION

According to leading economists, nearly half of US total factor productivity growth is accounted for by technological progress and the skills and experience of the workforce (Solow, Kendrick, Denison, and Romer). Cross-country comparisons of economic performance indicate that the intensity of national innovative activity is correlated with higher rates of productivity growth and standards of living (Porter, Furman, and Stern).

Successful innovation results in new products and services, gives rise to new markets, generates growth for enterprises, and creates customer value. Innovation improves existing products and processes, thereby contributing to higher productivity, lower costs, increased profits and employment. Firms that innovate have higher global market share, higher growth rates, higher profitability and higher market valuations. Innovation also generates spillover and cascading effects as competing firms absorb new innovations. Customers of innovative products and services gain benefits in terms of more choices, better services, lower prices and improved productivity. As innovations are adopted and diffused, the “knowledge stock” of the nation accumulates, providing the foundation for market growth, long-term wealth creation and higher living standards.

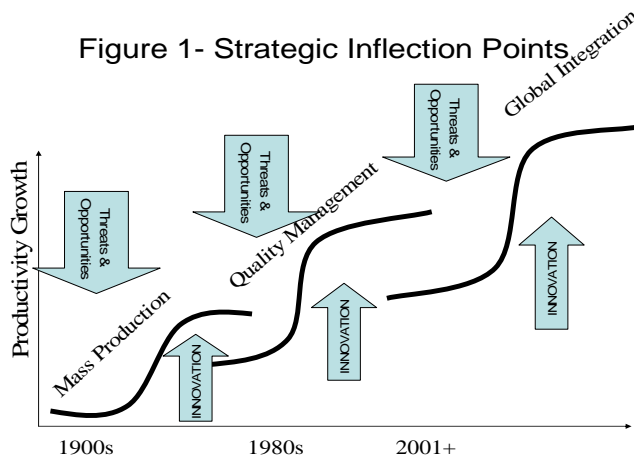
3. THE NEXT INNOVATION WAVE

For the US to maintain high levels of economic growth and job creation, it must be a global leader in the development and commercialization of “new-to-the-world” technologies. Incremental improvements, imitation and adaptation will not be a sufficient foundation for long-term competitive advantage and economic growth. The nation must now develop a true innovation capability and generate exponential rather than linear improvements.

During the 1980s the US faced a competitiveness challenge primarily from Japan. To meet this challenge, policy attention was focused on cost reduction, operational efficiency and quality improvement. The economy successfully transitioned from a mass-production to a quality-management culture, where ideas such as lean, six sigma, TQM, do it right the first time and supply chain optimization created the productivity marvel of the world. Today the forces of globalization and advances in technology are creating a different and more complex challenge. Sustaining competitive advantage requires moving beyond efficiency and quality toward creating new markets, increasing value to customers and innovating continuously on a global basis.

Figure 1 suggests we have reached a historically significant strategic inflection point where a new wave of innovation is necessary to drive US economic growth and global integration. US enterprises that rely on older scientific knowledge, technologies, and national markets approach limits in terms of future gains in efficiency, growth and profitability. They are riding the upper portions of “S” curves that are decelerating. Other nations are investing aggressively in new technologies, human capital and infrastructure and increasing their competitiveness in world markets. They are catching up.

The US must create the conditions that will stimulate enterprises to innovate and take the lead in the next generation of technologies and launch the economy onto new “S” growth curves. The transition to a globally integrated economy portends to be more disruptive in its reach, scope and scale than prior waves of innovation such as the shift from mass production to quality management. But it is a challenge we must meet.



4. FROM INVENTION TO INNOVATION

The most common conception of innovation is as a linear progression from research to invention, and from invention to commercialization. If that were all we needed to know, it would suggest that public policy and corporate strategy should focus on increasing R&D inputs (technology push) and we would be done with it. Innovation, however, is much more complex than a sum of knowledge inputs.

4.1 The Fundamental Role of Customer Value

As illustrated in Figure 2, our perspective needs to be expanded to not only to include innovation’s “demand pull” factors for innovation, but also to understand the changing nature of innovation practices. More companies have moved beyond the dichotomy of technology push and market pull and are embracing both sides of the equation by collaborating more with customers, engaging with external sources of innovation and going global.

Furthermore, the “national innovation system” is being shaped by external factors, primarily the *public policy environment* and linkages to the *common national innovation infrastructure*. Ultimately the demand for innovation is formed by applications that create *customer value*. It is customer value and “receptivity to innovation” that determine the rate of diffusion in the economy.

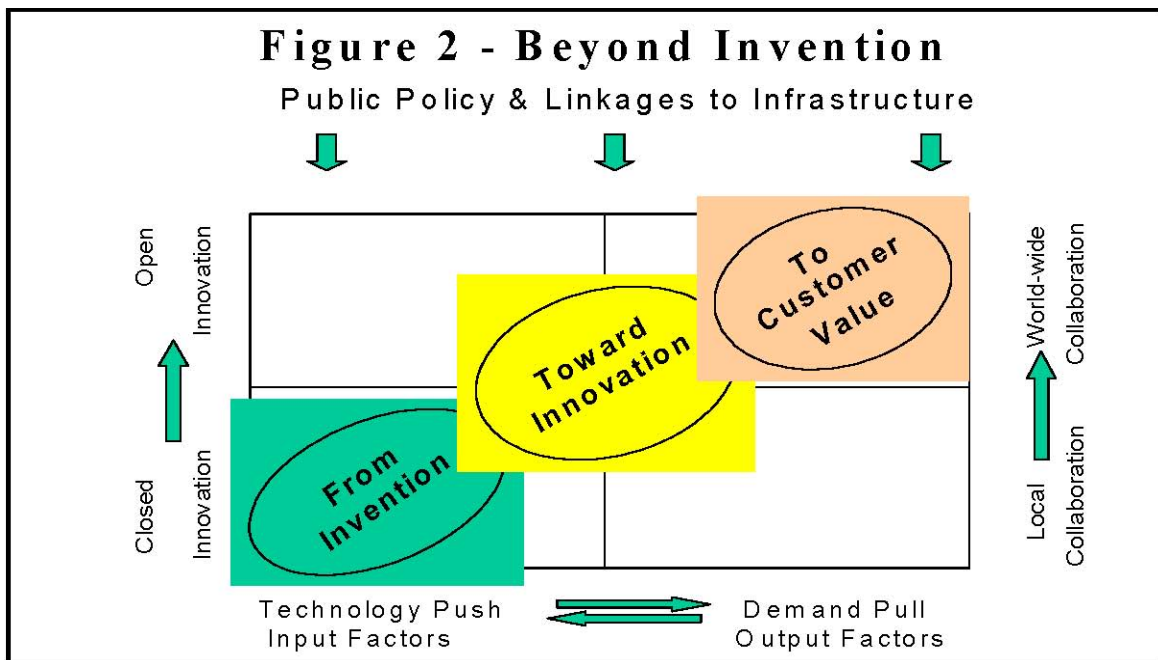


Figure 2 illustrates how innovation is a highly complex and interactive activity that goes far downstream beyond knowledge production (invention) and that needs to be fused with customer value, demand and output factors. The figure also illustrates how innovation practices are changing in relationship to the “openness” of the innovation process and the extension of R&D collaboration to a worldwide scale (Chesbrough: Open Innovation). The public policy environment and its linkages with the common innovation infrastructure also influence the rate of innovation.

4.2 Innovation Practices are Changing

Additional perspectives on the changing nature of innovation are presented in Table 1.

Table 1- Innovation Management Practices*

FROM	→	TO
Invention		Innovation
Linear innovation model		Dynamic innovation model
Standard products		Customized products integrated with service
Build to forecasted demand		“Sense and respond” to demand
Sequential Technology Transfer		Simultaneous co-creating
Engineering and incrementalism		Creativity and disruptive innovation
Managing production workers		Coaching/Motivating Knowledge Workers
Closed Innovation—do it yourself		Open Innovation—multiple innovation sources
Independent		Interdependent
Hierarchical organizations		Distributed, networked, adaptive and virtualized
Optimizing vertical processes		Optimizing horizontal processes/ outsourcing
Input driven performance metrics		Outcome driven performance metrics
Quantitative innovation metrics		Qualitative innovation metrics
Single discipline		Multiple Discipline
Basic research orientation		Application orientation
Centralized and product centric		Closer to customer
Product functions		Value to customer
Local R&D teams		Globalized 24X7 and linked into regionally specialized clusters
Market valuation based on historical performance and tangible assets		Market valuation based on knowledge assets and expected future performance

**Compiled by Milbergs from various sources of management and innovation literature.*

5. MEASURING INNOVATION

Research on innovation, for the most part, does not encompass a comprehensive and end-to-end view. Most innovation policy attention is focused on the *capacity to innovate* and on *input factors* such as R&D investment, scientific institutions, human resources and capital. Such inputs frequently serve as proxies for innovativeness and are correlated with intermediate outputs such as patent counts and outcomes such as GDP per capita.

“Some of the most useful information is not the most reliable. Some of the most reliable information is not the most useful.” Steve Wallman, former SEC Commissioner

While this kind of analysis is generally indicative of innovative behavior, it is less useful at the enterprise level in terms of discriminating causality and what drives successful strategy or public policy interventions. The explanation for this input view is partly explained by the inadequate data that is available to policymakers and analysts.

For example, we underestimate the role of different types of innovation, the degree of innovation in the service sector, and the extent to which customer value shapes the demand for innovation.

5.1 Types of Innovation

A key challenge is to better understand how differences in the type of innovation impact the economy. *Incremental innovation* improves the performance attribute of an existing product or service in the marketplace. But some innovation is *disruptive* and *new to the market*, and may involve integration of complementary innovations in service support and subsystems. *Process innovations* are less visible in the marketplace but can have a substantial beneficial effect on costs, prices, and productivity performance. Improved measures are needed to contrast and define the differences between incremental innovation and radical innovation.

5.2 Importance of Service Sector Innovation

Innovation measurement has historically concentrated on the manufacturing sector and shaped our mental perspective of innovation as primarily for “products.” Yet services are the predominant feature of today’s economy. The non-goods-producing sector accounted for 78% of economic growth between 1992 and 2000, an 86% share of GDP in 2002, and 88% of the workforce in 2002. And services are running a \$47.3 billion trade surplus, as compared to manufacturers, who are running a \$470.3 billion deficit in 2002.

Nearly all of the post 1995 productivity growth jump can be explained by the performance of just six economic sectors: retail, wholesale, securities, telecom, semiconductors, and computer manufacturing—four of which are classified as services (Solow, McKinsey Global Institute 2001).

Innovation Measurement Challenges (Adapted form Vantrappen and Metz)

- Taking into account variables beyond R&D input and complementary service assets necessary for innovation success.
- Capturing information for each stage in the innovation chain and recursive processes between sources of innovation and resources.
- Measuring the processes involved with the production, dissemination and utilization of intellectual capital and their value.
- Supplementing lagging indicators, such as market share with indicators of future uncertainties, risks and outcomes.
- Finding the balance and spectrum of indicators between aggregated indexes that are not of much strategic value and measures too narrowly focused on individual functions, such as engineering, to measure the performance of the innovation process as a whole.
- Integrating episodic surveys, limited sample size case studies and anecdotal information into a general innovation framework and measurement system.

The structural transition to the service economy has been going on for years, yet our understanding of innovation in this sector and how it supports and interacts with

manufacturing has lagged. Service sector innovation also tends to be of an organizational rather than a technological nature and is more difficult to define and measure.

5.3 Demand for Innovation

Reasonably good estimates can be acquired for the outputs of innovating enterprises, such as product performance characteristics or the contribution of new innovations to revenue growth and profits. However, we have a sparse inventory of systematic data collected on the value that innovation generates for customers.

This area is full of difficult measurement and analytic issues. This ambiguity, for example, fueled much of the debate in the 1990s over the impact of information technology investment on economic performance (e.g., “We see computers everywhere except in the productivity statistics”).

Innovation adoption decisions by customers are influenced by financial considerations, as well as more intangible factors such as ease of use, business adjustment costs, observability, quality, convenience, testing, training and technical support. Integrating the factors that influence customer receptivity to innovation would improve our understanding of the demand for innovation, and not just its supply.

6. WHAT IS INNOVATION SUCCESS?

Innovation success is the degree to which value is created for customers through enterprises that transform new knowledge and technologies into profitable products and services for national and global markets. A high rate of innovation in turn contributes to more market creation, economic growth, job creation, wealth and a higher standard of living.

As discussed above, this definition updates our perspective on innovation by incorporating more than ideas, R&D, technology development and transfer. The nation must not only generate fresh ideas and intellectual property, but must also apply them and make them commercially successful. This definition also states that innovation is primarily an enterprise-level activity. In this sense, innovation can be demand-induced as well as supply-induced by technological advances.

Innovation is “the commercial or industrial application of something new—a new product, process or method of production; a new market or sources of supply; a new form of commercial business or financial organization.” (Schumpeter, Theory of Economic

This definition also introduces innovation cycle time (rate of innovation) as an important determinant of market growth, customer value, shareholder value, international competitiveness and contribution to national economic welfare.

7. DESIGNING THE INNOVATION FRAMEWORK

An innovation framework can be constructed at a number of levels of abstraction and detail—from an individual technology project, to the enterprise, to the industry sector, to the national and even global level.

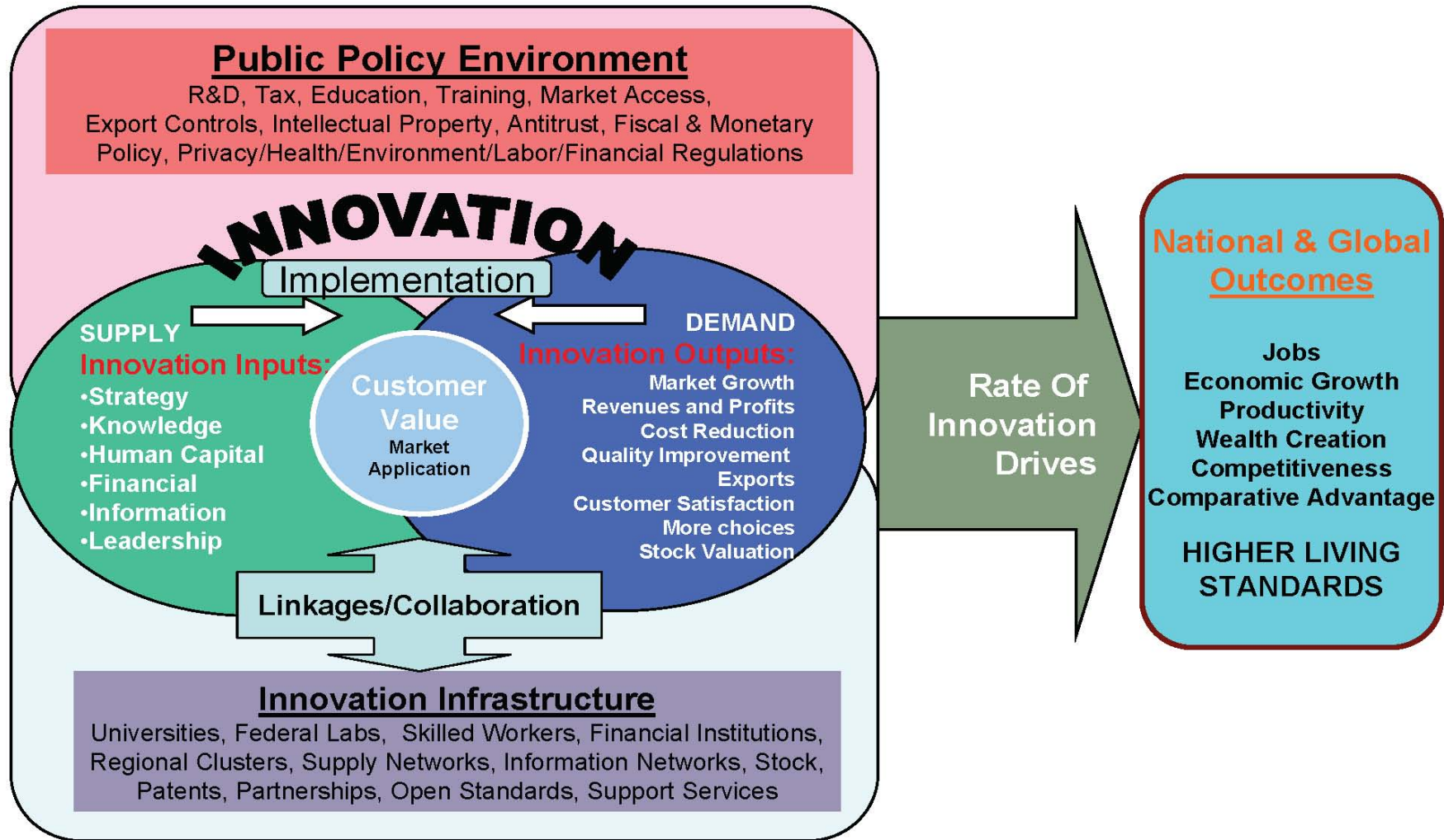
The “function of a framework is to help guide data collection and analysis of the fundamental determinants of innovation and performance” (Mowry 1997). Innovation frameworks establish the important relationships between innovation inputs, strategy, process and intermediate and final outputs (Klomp 2001).

The following framework extends the traditional linear chain model to the innovation process and enlarges it to incorporate all aspects of society, thus creating a comprehensive “national innovation ecology”. Despite a national outlook, it retains its focus on the enterprise level and clusters the most important innovation factors into the following six dimensions.

1. ***Innovation input factors*** such as enterprise strategy, knowledge, capital and human resources, both domestically and globally.
2. ***Innovation implementation factors*** such as design, production, organizational culture and barriers to commercialization.
3. ***Public policy environment factors*** such as R&D policy, taxes, intellectual property, standards and market access.
4. ***Innovation infrastructure*** conditions such as quality of research in universities, federal labs, and skilled human resources.
5. ***Consumer value/outputs*** such as cost reduction, profits, revenues and convenience.
6. ***National outcomes*** such as growth, employment, competitiveness and trade

These dimensions, individually and as an ecological system, make up the context in which the nation’s enterprises innovate. Figure 3 on the next page is a graphical representation and a more detailed discussion follows.

Figure 3 – Innovation Framework / Ecosystem



7.1 Innovation Inputs: Strategy and Resources

Firms, explicitly or implicitly, have innovation strategies. The range, scope and effectiveness of innovation strategies will depend on the *type, quantity and quality* of key innovation resources (inputs), the most important of which are:

- Human capital
- Scientific and technology resources
- Capital resources
- Information and communication resources
- Leadership and management

Innovation strategy can focus on various types of innovation—incremental, disruptive, system integration and platform technologies. Strategy can focus on driving down costs through process innovation such as new production methods, outsourcing, or introducing new products and services. Innovation can be of a non-technological nature involving business process reengineering, training, cultural change, reorganized information systems and redeployment of assets.

7.2 Innovation Implementation

This dimension focuses on the organizational factors and barriers in technology development and commercialization. Innovation implementation is the capability to fuse customer requirements (presently and in the future) with the innovation resources it can access, develop and exploit.

The general implementation process consists of market definition, design, engineering, production, marketing, distribution and support phases. These activities can be viewed as linear steps, but the reality in most cases is much more complex. For each phase of the process there are numerous sub-processes, both internal and external to the enterprise, involving feedback loops and the coupling of each activity to downstream and upstream phases. Technical and economic problems that are uncovered in the development process often generate demand for additional research in engineering and even fundamental science (OECD).

For the more radical innovations the process may involve numerous recursive activities; managing linkages with customers, partners, suppliers and knowledge providers; and integrating complementary innovations in services, public policy, distribution models and customer relationship management.

Poor project execution and unanticipated technical problems can slow down implementation (driving up costs, uncertainty and time to market) and pose a significant barrier to revenues, profits and success in the marketplace. These barriers can also be of a non-technical nature—examples include organizational resistance, changes in market conditions, competitor response, and regulatory and legal barriers. Identification of these

barriers and methods for overcoming them is a rich area for speeding up innovation cycle times and reducing the risks of innovation.

7.3 Innovation Infrastructure

The nation's innovation infrastructure helps supply inputs to private enterprises. This infrastructure includes:

- ***Scientific and research institutions*** that serve as a major source of knowledge and include research universities, federal laboratories, non-profit research centers, R&D consortia, technology transfer centers and technological centers of excellence. Industry is utilizing a wide variety of coupling mechanisms to increase its access (e.g., personnel exchange, patent disclosure and licensing, university-industry partnerships).
- ***Capital providers and markets*** that finance innovation and the acquisition of new products and services. Venture capital and government research programs have played a particularly important role in supporting technology-based entrepreneurs, start-ups and small business firms. Equity markets provide an important incentive for innovation, reward innovators and determine the value of enterprises.
- ***Education institutions*** comprising grade schools and high schools, community colleges, universities and colleges, along with private sector training organizations, provide the pool of leading-edge scientists, engineers, managers and the technical workforce. The skills, mobility and flexibility of the workforce are an important innovation input to both producers and customers of innovation.
- ***Information infrastructure*** provides enterprises with many of the important tools and communication platforms necessary for innovation. Global collaboration and open innovation systems rely on advances in computing, software applications and information networks.
- ***Regional innovation clusters*** are geographic groupings of similar tech-based enterprises and related support industries and services that share a common knowledge base, labor pools, markets or distribution channels (e.g., Silicon Valley—microelectronics, Detroit—automobiles, Maryland—270 Corridor-biotechnology). Participation in such clusters can enhance enterprise access to innovation inputs and speed up implementation.

7.4 Public Policy Environment

The public sector is linked to the innovation process in powerful and deep ways. R&D funding from the public sector accounts for a substantial portion of national R&D investment. The choices of government in supporting a field of science (e.g., life science, nanotechnology, advanced computing) are an influence on the direction of innovative activity. However, R&D is only one area of public policy that bears on innovation.

INNOVATION FRAMEWORK REPORT

Table 2 below illustrates the extensive range of public policies impacting innovation and the diverse ways these policies can stimulate or inhibit innovation.

Table 2 - Public Policy Impact on Innovation

Public Policy	Examples of Innovation Impact
R&D Funding	Impacts scientific direction (e.g., life sciences, nanotechnology, advanced computing) and production of scientists and engineers. Supports innovation infrastructure of universities, research centers, federal labs, industry research. Specialized programs like ATP support pre-competitive collaboration. MEP supports small manufacturers and SBIR technology-based start-ups. Public R&D goals and administrative procedures can conflict and misalign with private sector goals, expectations and management requirements.
Macro Fiscal and Monetary Policy	Cost of capital for innovation, and rate of national economic growth influence investment decisions, available earnings, stock market valuation of innovative enterprises, etc. Currency policy, foreign and domestic, impacts international competitiveness.
Technology Transfer Policy	Bayh-Dole Act and Federal Tech Transfer Act impact the incentive for industry-university-lab collaboration and rate of knowledge flow to innovators
Human Resource Policy	Federal education and training programs, education subsidies and research funds to support universities are a determinant of the supply of qualified workers needed for scientific research, development, and commercialization of innovation.
Tax Policy	Provides R&D incentive. Rate of depreciation affects transfer of knowledge embedded in new capital. Provides level of incentives for consumers to adopt innovation.
Standards	Facilitates platform technologies, such as Internet, computing systems, software. Standards can also function as a barrier to technical change and can restrict markets.
Procurement	Government can stimulate market and standards development through large-scale aggregation. Design specifications can restrict introduction of new technologies.
Antitrust	Can encourage industry innovation collaboration. Encourages new market entrants. Delays innovation introduction.
Intellectual Property	Acts as incentive for innovators. Can restrict entry of competitors. IP protection can be weak globally, reducing return to innovation.
Market Access	Choice and access to foreign markets, export conditions and foreign direct investment influence market potential, risk and growth. Export controls can inhibit competitiveness.
Economic Regulation	Impacts innovation investment through pricing control, rates of return, market share restrictions and entry of competitive alternatives.
Social and Environmental Regulation	Can act as stimulus to innovation and also impact performance parameters of innovation. Type of regulation also impacts industry costs, relationship to suppliers and employment conditions.
Health Care Policy	Major driver of business cost of operations. Demographics and growing demand for health care creates opportunity for new products, services and productivity-enhancing technology
Privacy	Public concern creates additional demand for protecting information flows and assets.
Homeland Security	Creates government market for innovation, and creates additional economic requirements for managing risks and vulnerabilities of most economic sectors, including information industry, financial industry, water, energy, transportation, manufacturing supply chains, etc.
Employment & Manufacturing Initiatives	Current political pressures add to protectionist risks, constraints on global investment, "buy America" provisions, employment transition costs, and higher skill standards.

7.5 Customer Value and Outcomes

The adoption of new products and services by customers (business and consumers) is the centerpiece of innovation policy and strategy—where the supply of innovation meets the demand for innovation. The rate of customer adoption (diffusion) is what ultimately determines the impact of innovation on the national economy. Customers adopt innovation not because of the inherent characteristics of a product or service innovation, but rather by

the value customers expect when innovations are acquired and utilized. People do not buy products; they buy expectations of future benefits (Leavitt 1969).

Major factors important to customer value (outputs) include:

- Cost reduction
- Quality improvement
- Revenue growth
- Market share
- Exports
- Convenience
- Satisfaction
- Training support

The intersection of “innovation producers” with “innovating customers” is an important driver of economic growth and productivity. In this relationship the innovation output of one enterprise becomes part of the innovation input to another enterprise, creating a virtuous cycle with a powerful multiplier effect. An example of this powerful dynamic is the high rate of innovation in semiconductors (Moore’s Law), which in turn helped drive the innovativeness of the PC business, which in turn became an important driver of the software business, which fed back as a driver of the PC business and so on.

Gauging the value of innovation to customers, including “intangible variables (e.g., convenience, service support, training, testing, and observability as well as product performance) is an important consideration for accelerating the rate of innovation diffusion, creating market growth and generating downstream (spillover) economic benefits.

7.6 National Innovation Outputs and Outcomes

This dimension of the framework addresses the final outcomes of innovative activity. This domain also surfaces some of the more complicated issues.

- ***Enterprise performance outputs.*** The contribution to financial performance can be measured by sales and profits contributed by new products/services, change in market share and intellectual property licensing revenues. Intangible outputs, such as an increase in a firm’s knowledge stock and acquired competencies in managing innovation, organizational learning and adaptiveness is more subjective and difficult to quantify. Yet these subjective factors are strategically significant to long-term competitive performance.
- ***Customer value outputs.*** These outcomes could be product, service or process impacts. Product impacts relate to the functionality, range and performance of the innovation in terms of improving customer utility and performance. Product impact could deal with the range of goods or service, creation of new markets and revenues and improvements in quality. Process impact relates to reduced costs,

improved production flexibility, and increased productivity and capacity. Service factors relate to more intangible factors such as timing and scheduling of delivery, convenience, technical support, training, brand image, safety, environmental impacts and compliance with regulations.

- **National Outcomes.** Growth in real GDP and GDP per capita are the conventional measure for the overall contribution and outcome of innovation. Some other measures that are useful include labor and total factor productivity, income per capita, sectoral trade balances, corporate earnings associated with innovation, stock market valuations, market share and penetration of markets.

8. NEXT STEPS: DEVELOPING INNOVATION METRICS

The next step is to use the framework to develop meaningful innovation metrics and to identify the critical measurement gaps. This will be done by “data mining” the available innovation research, innovation surveys and government data from the angle of the dimensions and dynamics discussed above. These metrics include trends and comparisons in R&D investment, patenting activity, production of scientists and engineers, major sources and types of innovation, capital investment in technology, productivity performance, changes in living standards, employment trends, trade in advanced technology, rate of return to innovation and others.

As the metrics are developed, they will define the competitive challenges we face and be useful in the following ways:

- **Awareness**—providing information to policymakers, public and media for more accurately perceiving the performance of the national innovation system
- **Performance**—measuring progress and results against business strategy and public policy objectives
- **Signaling and Monitoring**—calling attention to significant innovation trends and growth opportunities
- **Accountability and Evaluation**—supporting R&D budgets and innovation policies, and complying with GPRA
- **Consensus Building**—legitimizing and making the case for more effective innovation policies and strategies