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Digitization and the Internet: Catalysts of Modern Economic Transformation and General-Purpose Technologie

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Abstract: This paper examines the transformative impact of digitization and the Internet, positing these developments as modern general-purpose technologies (GPTs) akin to those of the past, such as the Corliss steam engine and electrification. The transition from physical to digital information handling has revolutionized communication, enhancing the efficiency and speed of information collection, packaging, and distribution. Historical GPTs like the automobile, commercial aviation, and television catalyzed significant changes in economic activities and daily life. Similarly, digitization and the Internet are reshaping service industries—healthcare, government, and financial services—which now constitute over 75% of GDP. This paper explores the broader economic impacts of these technological advancements, emphasizing their role in fostering new combinations of ideas and actors and generating new economic activities. Despite measurable improvements in productivity and efficiency, the most profound long-term effects of these technologies remain beyond quantification..

Key words: General-Purpose Technologies (GPTs), Digitization, Internet, Economic Transformation, Communication Technology, Productivity Enhancement, Service Industries, Information Handling, Economic Activity

INTRODUCTION

Numerous indicators suggest significant changes in the United States economy over the past decade. The notable increase in labor and total factor productivity growth rates during the latter half of the 1990s was often interpreted as evidence of a 'New Economy.' However, whether this represents a transient phenomenon or the beginning of a sustained trend remains uncertain. Other indicators, less cyclical by nature, seem more likely to endure. For instance, evidence points to a wave of innovation: Census Bureau data reveal that the number of US patents issued to US corporations more than doubled between 1990 and 2001, and industry R&D expenditures have exceeded government R&D expenditures since 1980, more than doubling since 1990. Additionally, Tobin's Q more than doubled during the 1990s, indicating a substantial increase in intangible capital (including knowledge capital) relative to tangible capital. The production of IT has surged, competition has intensified in a deregulated economy facing strong international competition, and there has been a notable rise in R&D conducted by small companies, technology alliances and acquisitions, and new forms of financing (Baily and Lawrence, 2001). The inventory-to-shipments ratio in the durable goods industries has declined by approximately 40% since the early 1980s, suggesting more flexible manufacturing processes and just-in-time deliveries have reduced inventory needs.

Whether one views these data as compelling evidence of a New Economy or merely indicators of new patterns, the key question remains: What accounts for the different behavior of the US macro economy in the late 1990s compared to earlier periods? What is driving these observed changes?

This paper argues that these changes are consistent with the notion that digitization of information, combined with the Internet, constitutes a form of general-purpose technology, which we may refer to as the New Economy. The level of

connectivity between actors and ideas is increasing dramatically, and we have only begun to see its impact, with only a portion of it being measurable.

Interpreted in this manner, the New or Digital Economy is characterized by dynamics rather than static efficiency, focusing more on new activities and products than on higher productivity. While economic growth can be described at the macro level, it cannot be fully explained at that level. Economic growth arises when various actors create and utilize new technology, which itself results from new combinations of ideas. Increased connectivity leads to an increase in possible new combinations.

The paper is structured as follows: the next section presents the theoretical background, followed by a brief review of historical examples of general-purpose technologies and their economic impact. Subsequently, the effects of digitization and the Internet are examined, including productivity enhancements in traditional industries, the restructuring of economic activity within industries, market efficiency effects, and the potential for entirely new products and industries. The paper concludes with a summary.

In discussing the New (Digital) Economy, it is essential to distinguish between information and knowledge. Information can be defined as a collection of data, while knowledge can be understood as a structure (theory or hypothesis) that enables the organization and interpretation of information.

In the traditional economy, the flow of information was primarily physical: it involved cash, checks, invoices, bills of lading, reports, face-to-face meetings, analogue telephone calls, radio and television transmissions, blueprints, maps, photographs, musical scores, and direct mail advertisements.

In contrast, the new digital economy transforms information into digital form—converted to bits stored in computers and transmitted at the speed of light across networks. The new realm of possibilities created by this transformation is as revolutionary as the invention of language itself, the foundational paradigm for all physically based interactions (Tapscott, 1995, p. 6).

Certainly, information itself is not new; what has changed is the form in which it is collected, manipulated, stored, and transferred. Knowledge is also not new. In "Post-Capitalist Society" (1993), Peter Drucker contends that knowledge has been central to economic activity since the industrial revolution. The period from 1700 to 1850 saw the conversion of practical experience into systematic, codified knowledge. Drucker further argues that the period from 1850 to 1950, known as the "Productivity Revolution," involved the application of knowledge to work, as exemplified by Taylorism. From 1950 onwards, he describes the "Management Revolution," characterized by the application of knowledge to knowledge itself. He concludes that:

"Knowledge is the only meaningful resource today. The traditional 'factors of production'—land (i.e., natural resources), labor, and capital—have not disappeared. But they have become secondary. They can be obtained, and obtained easily, provided there is knowledge. And knowledge in this new meaning is knowledge as a utility, knowledge as the means to obtain social and economic results." (Drucker, 1993, republished in Neef, 1998, pp. 29–30)

Therefore, knowledge work—activities involving complex problem identification, problem-solving, or high-technology design that result in innovative new products or services or create new ways of exploiting markets—has rapidly become the focal point for economic growth and individual and organizational prosperity (Neef, 1998, p. 3).

In the long run, knowledge-intensive industries such as financial services, entertainment, health care, education, and government are expected to be most transformed and to benefit the most from digitization and the Internet. In the medium term, the most visible effects are likely to be seen in retailing, manufacturing, and travel.

To examine the effects of digitization and the Internet, we can consider examples of new combinations in the following four categories of economic activity: (1) productivity enhancement in traditional industries, (2) restructuring at the industry level, (3) the creation of more efficient markets, and (4) the emergence of new products and industries. The main objective of this analysis is to demonstrate the pervasive and transformative nature of the Digital Economy.

The Banking Industry

A significant recent development in the banking sector is the proliferation of vendors offering web-based self-service technologies. This shift changes the nature of interactions between banks and their customers, moving away from bank customer-facing staff, particularly call center agents, toward automated Internet-based channels. This transition is designed to maintain a high level of customer service while offering potential cost savings and efficiencies. It allows bank staff to focus on higher-value and more customer-specific inquiries (Datamonitor, 2001).

Online banking customers reduce costs for banks because the majority of their transactions are self-service. However, while the Internet is likely to continue profoundly affecting how banks conduct business, it remains uncertain whether it will ultimately create or destroy value for banks and what its overall impact on banking revenues will be. As online banking

becomes more widespread, it is expected to provide less of a strategic (competitive) advantage to individual banks, with customers likely to be the primary beneficiaries.

The Mortgage Industry

The mortgage industry exemplifies the restructuring of financial services due to the Internet. This industry is evolving as new Internet-based entrants identify niches and provide specialized services, adding new value to customers while outdated traditional business models disappear. Several reasons contribute to this transformation:

1. Cost Reconfiguration: The Internet facilitates cost control and process reconfiguration through work elimination, work shifting, work avoidance, and work sharing. Web-centric mortgage systems reduce employee training costs, are easier to navigate, and provide easier access to databases than conventional systems.

2. Facilitating Self-Service: Ubiquitous Internet access, combined with real-time technologies, allows consumers to access and update information anytime, from anywhere. This reduces the demand for customer service departments. Consumers can also perform more complex interactions, such as calculating loan payoffs and determining the additional payment required to qualify for mortgage insurance cancellation.

3. Enhancing Revenue: The Internet enables service providers to cross-sell, refinance, and pursue other revenue-generating opportunities, thereby increasing revenue.

4. Improving Asset/Risk Management: Internet connectivity enhances asset and risk management by allowing information to be communicated, viewed, and shared on an immediate, real-time basis (Thinakal, 2001).

The level and form of connectivity among multiple heterogeneous ideas and actors give rise to a vast range of new combinations. I have argued that the combination of digitization and the Internet can be viewed as a general-purpose technology (GPT) with characteristics similar to those of past GPTs. Technological advancements in transportation and communication during the 19th century created a large national market, enabling businesses to capitalize on scale and scope in the production and distribution of certain capital-intensive goods. The Internet, unlike transportation, primarily influences communication and thus impacts the handling of information more than the production and distribution of physical goods. It allows for the efficient and rapid collection, packaging, and distribution of information

The Corliss steam engine eliminated location constraints for heavy industrial activities, enabling these industries to situate themselves in favorable market conditions, thereby fueling urbanization and agglomeration and leading to further economies of scale and scope. Similarly, electrification and single-unit drive innovations in manufacturing technology improved existing products and generated new industrial products.

A more comprehensive review of historical GPTs, focusing on their broader economic impacts beyond mere productivity enhancements, would provide insights into the types of new economic activities generated in the past. Examples of such transformative technologies include electrification, the automobile, commercial aviation, and television, all of which have significantly altered how we live and organize our daily activities. The thought of life without these technologies is almost unimaginable.

Digitization, in combination with the Internet, appears to have even broader applicability than previous GPTs, owing to its pervasive nature. It profoundly impacts service industries—such as healthcare, government, and financial services—more than goods-producing industries, and these service sectors constitute over 75% of GDP. Additionally, the direct impact on consumers through the creation of new products may never be fully measurable. While some measurable effects on productivity and efficiency exist, the more significant long-term effects are likely beyond quantification.

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