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Study of Web Economy (Internet Economy) as Emerging Economy to Boost Electronic Commerce

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Abstract

Web emerged as an antidote to the rapidly increasing quantity of accumulated knowledge and become successful because it facilitates massive participation and communication with minimum costs. Today, its enormous impact, scale and dynamism in time and space make very difficult to measure and anticipate the effects in human society. In addition to that, we demand from the Web to be fast, secure, reliable, all-inclusive and trustworthy in any transaction. The scope of the present article is to review a part of the Web economy literature that will help us to identify its major participants and their functions. The goal is to understand how the Web economy differs from the traditional setting and what implications have these differences. Secondarily, we attempt to establish a minimal common understanding about the incentives and properties of the Web economy. In this direction the concept of Web Goods and a new classification of Web Users are introduced in this research paper.

Keywords: Web Economy, Modern Economy, New Trends in Economics, Internet Economy, Emerging Economy, E-Economy, Electronic Commerce.

Introduction

The Web emerged as an antidote to the rapidly increasing quantity of accumulated knowledge in the 20th century, which has been caused mainly by scientific progress and digitization technology. Human memory and processing power are extended through the storage and interconnection of online content. The Web shortened the time, which is necessary for an innovation to become mainstream technology. It took 38 years for telephone technology to reach the threshold of 50 million users, while television needed 13 years, Internet 4 years, iPod 3 years and Facebook just 2 years. The Web become the new "Promised Land" for quick fortunes and unlimited business growth in the late 1990s because of browsers and search engines that enabled user-friendly navigation. Greed and excessive enthusiasm drove economy in 2001 to a noisy burst of the 5 trillion dollars dot-com bubble. In mid-00s the Web enabled mass participation and reborn from the ashes of the dot-com bubble. After this hard lesson, the new business models were updated to include advertising revenue from Web navigation and provision of value added services. At this moment, the Web economy is bigger and more robust with new services ranging from search to social networking, virtual entertainment and giant multistoried. In the demand side, most of the population in the

western world is involved in the Web economy. While Silicon Valley is currently focused on the Initial Public Offerings of the leading social networks,
President Sarkozy introduces the e-G8 summit and includes the Web in the agenda of the traditional G8 summit The Web strengthens the development and democratization processes by empowering people in life critical functions and enabling participation and transparency. The Web transformed into the battlefield of a "winner-take-all" fight among titanic firms affecting business and consumer choice in the global economy spectrum. Public and personal info spheres and their interplay are re-invented under new privacy, trust and security laws, ethics and practices. In this new Web ecosystem, researchers and governments are called to create new policy mixtures that will balance market power with personal and social development.

Literature Review

The emergence of Internet and later the Web has had an important influence on the research agenda of Economics and Business literature. The massive participation of Users in a variety of social and economic functions created a new terrain of field experiments and analysis concerning consumer behavior, market structure and policy implications. New forms of economic data (e.g. co-purchase networks, real time linked data from Eurostat etc.) enabled researchers to conduct new or existing investigations with less cost. For instance, the estimation of demand for thousands different products is now feasible with only a few weeks of time-series data from Web mass merchants (Chevalier & Goolsbee, 2003). Yet the available data for research are just a tiny fraction of the collected data from Search Engines, mass merchants, social networks and others in the Web. Contrastingly to physical and life sciences, where massive amounts of open data revolutionized fields like biology and physics, this is not happening for economic and social research (Lazer et al., 2009). The exclusive exploitation of behavioral data in the Web is an issue of primer importance with scientific, economic and social aspects. First, it limits academic research inside the "walled gardens" of companies and government agencies, excluding open scientific research and dialogue. Second, companies that hold data and afford to analyze them have build comparative advantages against (potential) competitors or simply they are selling them for high profit. Finally, privacy and security risks (e.g. personal data leaks, almost-full profiling practices) create negative externalities in the personal and social level, which are not compensated (Vafopoulos, 2006). It is possible that the exclusive and limited data exploitation will become (if it has not already been) the major source of negative externalities in the online world, a form of "digital pollution" in the sense of environmental catastrophe from heavy industries in the traditional economy. The economic analysis of the Internet and the Web economy follows (with a small time lag) technological improvements and mass phenomena and includes the study of new products, services, business processes, market structures and macroeconomic issues like taxation theory, labor economics, regulatory economics, public goods and development. The first important issue was related to the optimal pricing of Internet traffic (MacKie-Mason & Hal Varian, 1995). The lack of agreement on access pricing was leading in inefficient allocation of limited resources at that time (i.e., bandwidth) (McKnight & Bailey, 1997). The Web as a universal platform for representing and communicating information in digital form initiated the micro-economic analysis of information, network and digital goods including pricing, bundling, sharing, versioning, switching costs, network externalities and standards, economies of scale and scope and antitrust regulations.

Emergence of Web Economy and aspects

In a few years time, the Web has been transformed to an enormous repository and distribution channel of data and information. Web technologies are making information tangible, editable, uniquely definable and compatible to almost any digital format. These functions changed the traditional production, exchange and consumption processes in an unpredictable manner. For the moment, we are walking in an uncharted ground of research. In my attempt to understand the basic functions of the Web economy, we start by analyzing the characteristics of online content. Online bits are considered to be the "cells", the fundamental particles of the Web ecosystem. The discussion initiates by providing working definitions about the classical triptych of Data-Information- Knowledge. Because of the fact that the general definitions do not provide useful insights about the specific characteristics of online content, we turn into analyzing the economic concepts of information, knowledge, digital and network goods. Information and knowledge are increasingly available in digital form and transferred over networks with almost-zero cost. Social networks and information flows through them are becoming partially observable (e.g. Facebook) creating new forms of production and consumption. The economic analysis of information goods is mainly based on the "informative" function, not the digital nature of information. Similarly, knowledge goods are better describing and facilitating analysis of human capital as an input in the production function. On other hand, the concept of digital goods is a more focused attempt to capture this new reality, because it refers to the information and knowledge that are relevant to the digital economy, but overlooks the transformative power of networks. Respectively, the notion of network goods includes all the goods (physical and digital) that exhibit network externalities, without taking into consideration the special characteristics of digital goods such as no rivalry, infinite expansibility, discreteness, a spatiality and recombination. Web technologies provide the technical platform for representing, interconnecting and exchanging addressable digital information in the Internet network. In this new world, in order to understand the novel life cycle of information that is relevant to the self-powered, collaborative and networked economy, we adopt the concept of "Web Goods". Web Goods are defined as sequences of binary digits, identified by an assigned URI and in hypertext format, that affect the utility of or the payoff to some individual in the economy. Their market value stems from the information they are composed from and a specific part of it, the hyperlinks, which facilitates navigation over a network of Web goods.

Data, information, knowledge

Last decade, digital and communication technologies, and especially the Web, facilitated the explosion in bits production and consumption. In 2010, Google processed 24 petabytes of data per day that have been created from more than 2 billions Users worldwide (G. Munday & O. Munday, 2010). Web Users have access to some trillion Web pages, spending 700 million minutes per month in Facebook, ordering, only in Amazon, 73 items per second and sending 1.3 exabytes from mobile Web devices (G. Munday & O. Munday, 2010). The Web has structurally changed the representation, communication and transformation of data to information and knowledge. A growing number of diverse disciplines are investigating the concepts of data, information and knowledge (e.g. Linked data (Bizer, Heath, & Berners-Lee, 2009), Information Society (Lyon, 1988), Knowledge-based economy (Harris, 2001) and development (Cooke, 2006), Knowledge Management (Alavi, 2001)). Much ink has been spilled in trying to clarify the elusive concept of "information". There are various definitions and debates about the so-called hierarchy of data, information, knowledge and wisdom (DIKW)1 (Rowley, 2007), but let us limit our analysis in the following conceptualizations. *Data* is a set of discrete, objective facts about events. In an organizational context, data is more usefully described as structured records of transactions (Davenport & Prusak, 2000). *Information* is inferred from data and is defined as data that are endowed with meaning and purpose

(Rowley, 2008). Definitions about *knowledge* refer to information having been processed, organized or structured in some way, or else as being applied or put into action. According to Drucker (Drucker, 1989) *"Knowledge is information that changes something or somebody - either by becoming grounds for actions, or by making an individual (or an institution) capable of different or more effective action."* Information could be better conceived as a flow and knowledge as a stock of accumulated information. The concepts of data, information and knowledge are tightly connected to the new economy (Rowley, 1998). The goal of this article is not to analyze how the DIKW hierarchy changes in the Web, but to understand the economic incentives and mechanisms of information production and consumption in the Web ecosystem.

Information goods

Information has been an important, and at the same time, a problematic concept for economic theory. It is important because is implicitly or explicitly involved in every economic action and problematic because it is difficult to define and quantify due to this ubiquitous and heterogeneous nature (Hirshleifer, 1973). In Economics, information is been considered both as a discrete entity (commodity or good) and as a state of awareness in primary modeling assumptions (Bates, 1985) and constitutes an active research area, usually under the titles "economics of information" and "information economy". In the classification of Economics (AEA, 2010), "information" appears in the Micro-economics and in the Industrial Organization fields. Information goods have of course always existed, but for most of their history they have been attached to the medium, usually a non-information physical good like stone, book and newspaper. Initially, an "information good" was generally defined as the good, which main market value emanates from the information it contains. The typical examples of information goods included stories printed in books and news in newspapers. First, telecommunication technologies (e.g. radio, TV) and later digitalization enabled the detachment of information goods from the medium of transfer. This change had tremendous effects in the production, exchange and consumption of information and knowledge that could not be fully captured by the traditional conceptualizations. In 1999, Shapiro and Varian (C. Shapiro & H. Varian, 1999) re-defined information goods to be anything that can be digitized (a book, a movie, a record, a telephone conversation). These "potentially digital" information goods may be copied, shared, resold, or rented in order to provide revenues. When such opportunities for sharing are present, the content producer will generally sell a smaller quantity at a higher price, which may increase or decrease profits. Three circumstances where profits increase may be identified:

- When the transactions cost of sharing is less than the marginal cost of production;
- When content is viewed only a few times and transactions costs of sharing are low; and
- When a sharing market provides a way to segment high-value and low value users.

The distinctive characteristics of information goods that have been identified, mainly in Economics and Information Science literature, can be summarized as follows:

- Typical information good has a *high fixed cost* of production but a *low marginal cost* of reproduction. This cost structure implies increasing returns to scale and therefore non-convexity (Levitan, 1982) (C. Shapiro & H. Varian, 1999), (Oberholzer-Gee & Strumpf, 2007)
- Information is an *experience* good. Consumers need to try it to see whether or not it is useful4.
- Information can be a public or a private good. Information goods are typically non-rival and sometimes non-excludable (C. Shapiro & H. Varian, 1999).

Information goods are transferable, durable and non-rival like public goods, but, like private goods, their production is costly. In most of cases, reproduction and distribution are inexpensive (i.e. marginal cost is low). The major issues concerning information goods refer to *versioning, bundling* and *pricing*. The case of monopolistic power in information goods market has been extensively studied in the economic

literature since the analysis is more intuitive than under the hypothesis of perfect competition. Bundling is selling two or more different goods in a package for a single price (e.g. Microsoft Office suite). Bundling could be a profitable pricing strategy for information goods since the marginal cost of adding an extra good to a bundle is negligible (Hal Varian & Farrell, 2004). For instance, Bakos and Brynjolfsson (Bakos & Brynjolfsson, 1999, 2000) demonstrate that when the marginal cost of bundling an additional good is low and the value of each good is identically distributed, selling unrelated information goods for a fixed price can be very profitable in the case of a multiproduct monopolist. In such cases, the monopolist can exactly ascertain consumers' willingness to pay for the bundle and thus, to maximize profits and minimize consumer surplus. Versioning is selling different versions of the same good in different prices (e.g. Microsoft Office for Students). Versioning is a second-degree price discrimination widely used in the information goods industry. The prominent advantage is that versioning allows markets to be served that would otherwise not be served, but comes together with the social cost of quality reduction that is necessary to satisfy the self-selection constraint (Schmalensee, 1981), (Hal Varian & Farrell, 2004). Research on discriminatory pricing for information goods includes discrimination on observable and unobservable characteristics, goldilocks pricing, quality adjustment and other methods of extracting consumer surplus (Hal Varian & Farrell, 2004).

Knowledge goods

Knowledge is mainly studied in Economics as technology and technological progress in the production process. First, Marx with his theories of exploitation and accumulation of capital (Marx, 1867) and later Schumpeter, with his theory about innovative entrepreneurship (Schumpeter, 1911), highlighted technological progress as a basic aspect of capitalism. The classical school of economic thought considered knowledge as an implicit way to increase productivity and to succeed economies of scale in production. In 1956, Solow (Solow, 1956) and Swan (Swan, 1956) initiated a new family of economic models that explicitly account for the connections of technological progress and economic growth. Their *exogenous economic growth model* was based on the assumption that technological progress is exogenous to economic activity and led to the paradoxical conclusion that the rate of growth of income per capita in a long-term balanced economy can be explained only by technological progress. The solution came by the *endogenous theories of economic growth* that incorporate knowledge as an endogenous aspect of production (P. Romer, 1986), (Lucas, 1988), (Rivera-Batiz & P. Romer, 1990). Nowadays, the prevailing view about the role of knowledge in economy is that economic growth could be a combined result of the contribution of productive factors and innovation in economic activity. Numerous epistemological approaches exist for the definition and study of the concept of "knowledge" (e.g. cognitive, social etc.). We limit our analysis to the economic aspects of knowledge creation as a dynamic human activity. This activity enters the production in four dimensions (Lundvall & Johnson, 1994):

1) Know- what (facts),
2) Know-why (scientific knowledge),
3) Know-how (skills) and
4) Know-who (networks).

Know-what refers to information about facts that can be easily represented by symbols. Know-why includes the scientific knowledge, such as the laws on how nature, the human mind and society develop. Contrastingly, to the first two types of knowledge, which are observable and can be accumulated through the access of data and information in paper and Web pages, know-how and know-who are tacit or implicit knowledge, usually called human capital, in the sense that is difficult to codify and transfer among humans and can be acquired mainly by education and experience. Know-how describes the capacity and

skills of participating in the economic activity. Know-who refers to the ability of procuring the knowledge that resides in social networks.

Future Scope

Economic analysis of information goods is mainly based on the "informative" function, not the digital nature of information. Similarly, knowledge goods are better describing and facilitating analysis of human capital as an input in the production function. For instance, in the economic analysis of information goods, non-rivalry and infinite expansibility have generally viewed interchangeably because each implies increasing returns and therefore non-convexity (Quah, 2003). In contrast to expansibility that represents a restriction on quantity available to society at zero marginal cost over a specific timespan, nonrivalry refers to a restriction on marginal utility. For digital information goods, infinite expansibility always implies non-rivalry (i.e. everyone can have her own copy), but nonrivalry is possible without infinite expansibility (e.g. a live concert is a once-only event that displays nonrivalry but cannot be reproduced in identical copies). Quah (Quah, 2003) explains that: *"This distinction has implications for Arrow-Debreu equilibrium. With infinite expansibility, the Arrow- Debreu price equals zero, the marginal cost of reproduction in the digital good. But if the first copy of the digital good uses up resources in its instantiation, then a zero price results in market failure: A socially worthwhile good is left unproduced in equilibrium. By contrast, with nonrivalry but only finite expansibility, Arrow-Debreu prices remain positive and, under appropriate conditions, can produce a socially efficient outcome"*. In addition, excludability is a main issue for the analysis of information goods (C. Shapiro & H. Varian, 1999) but it is not essential to digital information goods since it emerges from external enforcement mechanisms (legal or/and technological) not intrinsic to the good itself (Quah, 2003). Therefore, it is needed a new analytical framework that brings to light and synthesizes digital existence to informative nature of goods in the cyberspace. This framework is provided by the definition of *digital goods* as sequences of 0s and 1s that have economic value. Digital goods are distinguished from other goods by five characteristics, namely: nonrivalry, infinite expansibility, discreteness, aspatiality (or weightlessness or spacelessness), and recombination. Digital goods constitute a more focused and effectual concept because it refers to the information and knowledge that are relevant to the new economy. According to Quah (Quah, 2003) the framework of digital goods: *"…takes the economics of austere high science, technology, and R&D to apply with equal force to videogames, movies, and pop music, as to biotechnology and computer software. In this framework, some digital goods and some parts of the New Economy have a lot to do with knowledge, skills, and productivity; others, hardly at all."*

Conclusion

The Web is the largest human information construct in history. Web technologies have been proven to be an enormous stimulus for market innovation, economic growth, social discourse and the free flow of ideas. Searching, social networking, video broadcasting, photo sharing and blogging have become part of everyday life whilst the majority of software and business applications have migrated to the Web. At the same time, a growing number of researchers are investigating the incentives and consequences of Web functions. As this effort is coming from many diverse disciplines, there is not, yet a common set of definitions and methodologies about the fundamental aspects of the Web functions. Existing concepts in Economics are not fully fitted for the Web because they do not account for the important effects of the

Editors' function. Furthermore, they do not incorporate in the demand and supply of a network good the distinctive characteristics of digital goods. Furthermore, in existing models, the terms "Users", "Topics", "Queries" and "Web" are used with different meanings and connotations. Therefore, a set of definitions concerning the basic Web functions is needed in order to elaborate a more fruitful interdisciplinary dialogue about the Web. the concept of "Web Goods" is introduced and Web Users are divided to Navigators and Editors of the Web network. Editors are categorized to Amateur and Professional based on their production incentives. We include the economic aspect of User's functions into a more general framework of Web functions. This general framework is described as Web Economy. After the hard lesson of the dot-com bubble in early 2000's, the Web economy is now an important part of the real economy, bigger and more robust with new services ranging from search to social networking, virtual entertainment and giant multi-stores.

Economic behavior in the Web is motivated by a different mixture of incentives and patterns than in traditional economy. It is time to focus on them in order not to miss the new development opportunities arising from this extension of human functionalities.

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