

Turning Economic Inefficiencies Business Value: Lessons from the New Collaborative Technology

George Dikos*

Research Scientist

Amazon EU SarL, Luxembourg

gdikos@alum.mit.edu

ABSTRACT

Information has a decisive impact on economic equilibria, market prices, and individuals' transactions. It has indirect value as it can improve the position of a party in an exchange, transaction or negotiation; it can also reveal new options, possibilities, and opportunities. The mechanisms that channel information have been overlooked in economic theory and research, although they determine the infrastructure through which information is exchanged and processed. While the technological developments in the consumer technology and related collaborative technologies may be viewed as ‘candy’ applications it is impossible to overlook their impact on business. First – they re-engineer transactions mechanisms; two they create a new channel/pointer in the hyperconnected world; three they provide the technology for turning inefficiencies into business value. In this paper we review how economic theory and business practitioners can look into inefficiencies as a source of value creation.

JEL Classifications: D80, D86, L86, M14, M15, O33

Keywords: future studies; internet; industrial organization; organization theory; corporate governance; institutions; entrepreneurship; economic growth

*The views expressed in this paper reflect solely views of the Author. All usual disclaimers apply.

I. REDUCING INEFFICIENCIES: A PATH TO VALUE CREATION

The first industrial revolution began in Britain with the *mechanization* of the textile industry. Tasks previously done by hand were replaced by machines and automation – while several jobs were made redundant the factory was born, creating new employment types, boosting the productivity of labor. The second industrial revolution came in the early 20th century through mass production and corporate organization. Entrepreneurs could now efficiently mobilize labor, as well as capital resources at scales unimaginable before. Both revolutions made people richer, urban. Now a third revolution is under way where “everything that can will be digitalized” (Negroponte (1995)). Learning to extract value from information in the digitized world is a similar process like learning to cultivate soil in the agricultural era, utilizing machines for mass-production or mining for gold. The starting point for turning the shock of the new into sustainable economic benefits is to understand how information drives value creation for individuals and enterprisers.

According to IBM’s study (2011), inefficiencies in the global economy are estimated at nearly \$ 15 trillion, “or 28 % of worldwide GDP.” According to IBM “... much of this waste is found in our systems of commerce - in inventory backlogs, failed product launches, wasted materials and ineffective marketing campaigns...” Inefficiencies are also generated by wrong hiring decisions, poor utilization of assets and resources, failure to implement the right process or adopt the best technological solutions. Globally, from an economic viewpoint, the term “inefficiency” characterizes the allocation of resources to a sunk cost, the failure to utilize assets due to lack of coordination, the inability to execute a transaction that improves the position of all interrelated parties, due to lack of information or computational capabilities. Identifying these opportunities, technological solutions, processes, institutions for “turning waste into value” poses major opportunities for businesses, entrepreneurs, for the improvement of welfare; however lot of work still lies ahead in order to develop a coherent framework for recovering value from economic waste. Recurrent root-causes are related to the lack of or access to knowledge, information, and computational capacity; processing and coordination costs can be technically addressed by the evolutions in consumer, media, and collaborative technologies. Still, several barriers linked to market structure, institutions and vested interests are moderating the pace of change.

In most economic models of transaction a set of information is assumed as given for each party, while the available technologies for accessing and processing information are in most cases not taken into consideration. The new collaborative technologies provide the building materials for developing an infrastructure that revolutionizes the ways information is shared among individuals. Directly, they reduce inefficiencies in transactions by decreasing the cost to information, indirectly by

increasing the capacity of individuals to analyze and compile it. The penetration of the emerging physical and virtual network topologies for sharing, exchanging information throughout transaction phases is determined by the costs of: (1) transmitting, sharing data through the channels of each network and (2) building and maintaining the network. In this context consumer technologies provide the unifying framework for scaling-up the necessary services and solutions for leveraging digital urbanization: First, by reducing the complexity of customizing information, they can be utilized for addressing thrash that stems from its absence, from increased costs of acquiring knowledge, barriers between buyers and sellers (lack of marketplace structure, industrial organization), incompatibility of systems, resources or modes of communication (including language), costly, lengthy product launches and mainly poor capacity utilization of assets. Second, although similar mechanics govern wide spectra of “provider-user” or “buyer-seller” relationships, the transformative process has mainly reshaped the consumer-firm connection and the mechanisms commercial transactions are realized. In *consumerism*, “... today’s customers have no patience for this kind of waste [and] will not remain loyal ... while the cost of inefficiency is passed along to them ...” (IBM, 2011). While the market organization, structure, forces are different, the lessons from the consumer-technology revolution are becoming perfectly relevant to the enterpriser throughout industries and the spectra of economic activity. The emerging powers that have made commerce smarter, more user-centric are catholic, fundamental; they provide the doctrines towards a holistic understanding of how the new collaborative technologies can become instrumental far beyond the reduction of inefficiencies in commerce, throughout the pillars of the economy and spectra of relationships. Generalizing in the spirit of Simmel (1908), we follow the attached typology:

- *Transaction relations*: Agents exchange control over physical, monetary assets or symbolic media (such as gifts or donations);
- *Communication relations*: Linkages between agents are channels through which information content is transmitted;
- *Boundary penetration relations*: Ties consist in two or more social relations, for example corporation board of directors with overlapping members;
- *Instrumental relations*: Agents contact each other in an effort to secure critical information or access to valuable contracts, goods, jobs, political membership, insider information; generally acts of contact and conduct which are driven by financial or other power motives;
- *Sentiment relations*: Perhaps the most frequently investigated phenomenon from a network or relationship perspective, where agents express feelings of love, affection, friendship, admiration, deference, loathing or hostility;
- *Kinship relations*: They reflect mainly bonds of blood and relations among family roles.

Figure 1
Market is watching - taxonomy of relationships

Taxonomy of Relationships					
Drivers of Change	<i>Instrumental relations in Industrial organization - corporate management</i>	<i>Communication relations in Entrepreneurship</i>	<i>Transaction relations in Markets and Customers</i>	<i>Boundary penetration relations in Growth</i>	<i>Sentiment and Kinship relations in Social Structures</i>
<i>information processing efficiency</i>	transformation from physical to virtual, increase of variety and sophistication of virtual marketplaces	reduction of technical barriers to entry, informational-ization of global markets	reduction of search & transaction costs, reputation-based market norms, reduction of information asymmetries in commerce	Reduction of coordination failures	reduction of participation opportunity costs, network-based collaborative responses to political rule
<i>Reduction of inefficiencies</i>	transaction efficiency, improved customer experience	standardization, multi-channel access to customers, hyperconnected markets	reduction of transaction costs, productivity improvement frontiers for firms	productivity improvement	kinship is less important in politics
<i>knowledge diffusion</i>	knowledge-based relationships with customers and shareholders, emergence of the knowledge organization, end to knowledge monopolies	reduced start-up costs and barriers to access talent	increased computational efficiency	reduced barriers to education and talent development, borderless labor markets	emergence of the knowledge society, containment of group control policies

The workhorse of economic relationships is transaction and exchange; both are the focus of the paper. Information processing efficiency, reduction of inefficiencies and knowledge diffusion are transforming transactions, as well as the underlying communication infrastructure, evolving gradually into the main mechanism to directly drive the collaborative technology revolution in the interaction between markets, customers, firms.

In the next section the link between information and transaction is revisited. An essential tenet of this write-up is that the collaborative market-is-watching framework reduces the importance of instrumental relations, of market manipulations, lobbying, corruption by freeing-up the constructive forces of efficient economic markets. Sentiment and kinship connections are out of the scope of this work although

the new collaborative technologies have a critical impact on how sentiments are expressed, communicated, as well as the evolution of kinship relationships.

In order to develop a quantifiable approach to the aforementioned arguments and leverage the advancements in economic theory, we define as transactional inefficiency the value differential locked in by the provider of a service, or seller, due to information asymmetry between the requestor, buyer (i.e., a typical case is when the information set of the latter is a subset of the former) or value recovery - value loss avoidance under a different set of information. Globally, maximum value creation will occur under perfect information and infinite computational capabilities.

To understand how the new collaborative technologies are changing transactions we review the role of information from an economic perspective, discuss how they impact exchange, introduce the mind set for identifying inefficiencies across the value chain, as well as creating value by reducing their cost, and by enhancing the knowledge and computational capabilities of agents.

II. INFORMATION IN ECONOMICS

Economic theory has studied extensively how information exerts influence on economic decisions and the economy. Some of economics' most elegant results (Hayek's (1945) famous analysis of the links between performance, knowledge, economic organization, the efficient market hypothesis, no arbitrage pricing, rational expectations, general equilibrium) are built on the ground of specific assumptions regarding the transmission of information among transacting agents and the mechanisms through which information is reflected in prices. The capability of prices to reflect the scarcity of resources has been fundamental for modern neoclassical theories and the doctrine that management should aim at maximizing shareholder wealth (Tirole, 2006, p. 56). Following the seminal work of Akerlof (1970), economic actions have been studied with a focus on the structural location of agents in the exchange process and differences in the information they possess.

To some extent there has been a disconnection between advancements of economic theory and those in information management and technology (maybe due to the comparatively bigger lead times of academic publishing compared to those of new product launches and technical evolution). Thus, the effect of information technology on markets, production factors, firms and on the economy has always been a topic of controversy. In Bob Solow's words, "... You can see the computer age everywhere but in the productivity statistics." A substantial body of research has examined the relationship among Information and Communication Technologies (ICT) and productivity (Brynjolfsson, 1993; Hubbard, 2003; Jorgenson, 2008).

De facto, the new collaborative technologies have a massive influence on the ways information is processed in markets, between consumers, throughout transactions, exchanges. At a firm level, it is becoming undisputable that consumer technology is

creating new opportunities for optimizing processes and lowering inefficiencies. The re-engineering of the consumer-firm relationship shares the gains with customers and accelerates the quest for innovation in product development. Furthermore, it provides the means for development of new tools, mechanisms, paths for productivity improvement, with some of the interrelated gains ultimately transmitted mainly to consumers at this phase. To some extent this is reflected in the study by Jorgenson et al. (2008), where a well-documented reversal of the productivity paradox is expressed, while still not reflecting the recent evolutions in consumer technology and their impact on the enterprise.

Resolving the productivity paradox or the role of information in economics is left for professional economists. From the “markets’ watching” perspective, the new collaborative technologies provide the building materials for developing tools, operations and standards that (1) restrain inefficiencies at firm level by creating new productivity improvement frontiers; (2) expand the functions, role and multitude of marketplaces; (3) re-engineer the customer-firm relationship; and (4) ultimately influence how firms, organizations and countries are run. The specific dynamics of this change challenge the roles and mission of organizations, by making customers, users, economic agents more informed, exchanges more transparent. The effects on corporate organization are channeled mainly through the transformation of instrumental relations, whereas the impact on productivity is driven directly by the reduction of inefficiencies; indirectly by the transformation of transaction relationships, information asymmetries in commerce, evolution of reputation-based market norms, all which intensify competition in free markets.

Besides the structural effects of transforming communication, computation and exchange the new collaborative technologies influence the way agents share information and carry out individual decisions. Economic theory appears again disconnected; it has considered information as an input to the decision making process and the “root-cause” of different valuations resulting in contractual incompleteness. The opportunity to use information technology for creating value in management and business was introduced in the seminal paper of Porter and Millar (1985). But the potential unleashed by enabling people to tap the value of their networks, and the development of an infrastructure that makes the mapping of relationships possible, are only recently understood. Already in 1960, Granovetter found that many people acquired information that lead to employment through their network of connections; and most strikingly the personal contacts that made possible an interview were described as acquaintances rather than friends. This is one of the first studies that provides empirical evidence regarding the value potential of links as a mechanism of information transmission that can limit inefficiencies in search or information asymmetries in an exchange. The principle has been validated in the financial markets, as LinkedIn.com, the largest mapping of connections for more than two hundred million individuals, their career paths and skills is valued at more than ten billion USD. Still,

economic theory has neither fully incorporated the roles of the different transmission mechanisms on valuation, exchanges, nor the importance of networks of links as the underlying infrastructure for materializing exchanges and realizing value.

The opportunities that new collaborative technologies bring in creating value from information come together with substantial challenges. As access to information becomes easier, efficient and customized, relationships with customers, suppliers and all other external links of the firm are becoming more complicated, *demanding* organizations to manage and cope-up with. Virtual integration in the retail industry has created operational efficiencies throughout the value chain, requiring the development of tools and systems that synchronize information across departments, working out a large amount of data and supporting physical operations on the shop floor. Managing external relationships goes beyond internal presentations of marketing or strategy among executives; focus shifts to extract value by reducing waste, inefficiencies that bring no value to the customer, create “win-win” partnerships, respond to a rapidly changing world, where information sharing is instantly revealing the gap between strategy and image.

The new collaborative technologies empower customers with extended networks, transparency, abundance of information and extensive capabilities for consuming it as a new valuable choice input. On top of that, corporations develop complex structures internally, which are not always compatible with the outside world. The evolution of the customer-firm relationship coupled with the continuous re-engineering of the business evolution required intensifies the relationship between performance and adoption of the new collaborative technologies. Marchand and Hykes (2009) verify in their study a link between performance and information capabilities, *where companies with immature information capabilities require more resources and time to get things done*. In this framework the replacement of physical, hierarchical flows with collaborative ones is a first step for mastering *internally* information capabilities, for making a first step towards the change in culture, tools and organization required in the market is watching era.

Beyond aggregate productivity and individual decision-making, the rise of large-scale communication networks, standards through platforms, centralized virtual marketplaces, new bargaining mechanisms are effectively transforming the workhorse of economic relationships, namely the transaction, which due to its importance is the main focus in the next section. Information has a decisive impact on economic equilibria, market prices, and individuals' transactions. It has indirect value as it can improve the position of a party in an exchange or negotiation; it can also reveal new options, possibilities, and opportunities. The underlying physical infrastructure utilized to channel information has been overlooked in economic theory and research, although it determines the mechanisms through which information is exchanged and processed. The interrelated distribution channels induce and acquire value; participation in a network, becomes ultimately a source of potential gain for the user, whereas

consolidation of masses of information traffic can become a profitable strategy for the service provider. The new collaborative technologies are reshaping the transmission and sharing of information among individuals, as well as the interrelated costs for accessing and processing it. They provide the building materials for the emergence of new standards, networks and institutions; means open to all, giving a new voice to collaboration. By expanding the available information capacity sets and capabilities of individuals to process chunks of digital flows they have a decisive impact on the nature and mechanics of economic transactions.

III. TRANSACTIONS REVISITED

Understanding exchange, the process of a voluntary economic transaction between parties, has been a major area of research in modern economics and social sciences. Particularly the cases in which specific aspects of the transaction are not fully specified in a contract have been an active field of research and advancement in microeconomic theory, applied economics and industrial organization. Several key notions have emerged from this work: market norms, principal-agent relationships, behavior in markets, contract theory and asymmetric information are just some.

Most of these models (and approaches) provide valuable insights regarding how individuals entering into a transaction or exchange cope with the aspects of the transaction not specified in a contract. In line with the principles of neoclassical economics and efficient markets most of these models presuppose that a) large quantities of information interrelated to the transaction are available; b) individuals have the ability to transact and process the information in complicated ways. As discussed in Bowles (2006), "... it is obviously inconsistent to model the process of exchange under incomplete contracts as if individuals' information and cognitive capacities were virtually unlimited ..."; for these reasons, some of the models developed under these assumptions, have been viewed as of limited applicability or relevance to real transactions.

The new collaborative technologies have enabled the evolution of products, services and marketplaces that empower individuals by reducing the costs to accessing information and enhancing their capabilities to process it in customized (and optimized) ways; reduced barriers to information and increased capacities of individuals to mine information is widening the scope and applicability regarding the existing models of exchange with incomplete contracts. Logically, this implies that most key conclusions of exchange theory gain empirical relevance and validity particularly in the context of on-line markets, e-auctions, and the interrelated transactions, with the latter offering unique testing ground for most of the hypothesis and conclusions of exchange economics. In this section we use some of the most palatable results of this strand of microeconomics to understand how the new collaborative technologies are reshaping the aspects of transactions and exchange processes not fully determined by contracts.

IV. MARKET NORMS

One of the biggest revolutions in electronic marketplaces has been the successful exchange between agents that were perfectly unknown, unrelated to each other; had never met and had no information on each other's reputation, where in many cases potential buyers had no physical access to the product of interest while bidding or negotiating, being fully unrelated to each other. Through this process collective knowledge has emerged to key determinant of reputation; collaborative rating has become the predominant trust management mechanism.

The new collaborative technologies have facilitated repeated rounds of interactions between given exchange partners at very high frequency - unimaginable a couple of decades before - with millions of transactions between interconnected partners. High frequencies of repetition impact the strategy of parties engaged in the transaction by allowing more complicated strategies and make repetition stakes far more important when compared with spot or "one-off" transactions. They have also provided the infrastructure for *collaborative reputation systems* that facilitate the exchange process between arbitrary people that have never met before alleviating the risks interrelated to asymmetric information or lack of contractual framework. Despite the numerous challenges in developing credible reputation systems, reciprocity from individual users to the collaborative community - which to some extent goes against the neoclassical economic dogma of optimizing myopically individual behavior - has created positive network effects regarding the *post-transaction feedback* process, the workhorse of reputation systems.

Models of market norms that describe how different structures of social interactions may prompt individuals to take account of the network-side impact of their actions demonstrate how cooperative behaviors might become a norm, even when individual opportunities of material gain may be foregone. They are becoming highly relevant to collaborative rating behaviors, explaining the high propensity of sellers or buyers to abide by the agreement reached at the electronic marketplace, without asking later to renegotiate the price, or even refusing to commit the transaction.

With news spreading slightly slower than the speed of light, interconnected users can influence perception and ultimately adoption more decisively than the most powerful marketing campaigns; and reputation is more important than ever: internet retailers opt to reimburse millions to customers in order to safe guard their reputation and most organizations start taking their world wide web offprint very seriously. In line with the market norm literature any short-term gain that may have an adverse impact on reputation, status, eventually the *brand* and what it represents, has to be sacrificed for the long-term. Going against traditional economic intuition short-term profits or figure-pleasing economic actions are sacrificed for the intangibles that form reputation. Amazon.com will match the lowest price of a newly released title offered from a competitor even when the sale has concluded, Google's algorithms will not determine

the ranking of an ad on a page based on the higher bid ordered by the advertiser, but also on an estimate of the true click through rates that this ad will have in a given position, compared to other ones, and most importantly to the *user satisfaction* the add will bring by aligning the content offered with the users' desires. David Easley and Jon Kleinberg (2010) analyze how the ad quality in keyword-based advertising is managed in the search industry by foregoing potential high rates of price-per-click revenues offered by the higher bidding advertiser in order prevent low-quality user experiences, that will ultimately lead to low engagement or clicks on ads as much in general. Adverse overall effects on user behavior propagate exponentially through the new collaborative technologies; they impact adversely fame and have a disproportionately huge negative impact on revenue in the long run. In his seminal "48 Laws of Power" Robert Greene highlights: "So Much Depends on Reputation: Guard it with your Life." In the market-is-watching economy this becomes a tenet: collective reputation becomes the digital offprint of the brand.

V. PRINCIPAL AGENTS RELATIONSHIPS

The new collaborative technologies are reshaping most relationships that fall under what economists call a *principal agent relationship*. The problem potentially arises in almost any context where one party is being paid by another to do something, whether under formal, contracted scheme or a loosely negotiated transaction. In this particular relationship asymmetric information can result in departures from efficiency. As explained by Bowles it is the combined effect of incomplete contracts and conflicts of interest that determines the outcome on who exercises power in the contract (Bowles, 2006, p. 333); the new collaborative technologies are empowering the principal through collective information, reputation ratings on agents and enhanced computational capabilities.

From all examples of principal agent relationships listed, the goods or service that has been influenced most are goods purchased by consumers. By sharing information regarding their customer experience or feedback on quality users reveal valuable insights regarding the non-contractible aspect of product quality. Reciprocity to the community of users or consumers has a pay-back through positive network-effects as it accelerates the process of endogenous enforcement.

Without doubt the impact of the new collaborative technologies on the process of transactions has been paramount. Almost every component of the exchange has been influenced: search effort and costs, opportunities for sellers to match with buyers, the selection of marketplaces, interrelated liquidity in bid-ask spreads, access to resources, information on non-tangibles and the overall interrelated information costs. But most importantly the new technologies have further enabled "faceless" transaction, providing the framework for developing the tools, systems, markets and mechanisms that guarantee the transaction experience between principals, agents, buyers, sellers that will

never meet under the absence of contractually or legally binding agreements, creating new institutions for exchange in the market-is-watching economy.

In 1972 Kenneth Arrow wrote that "... in the absence of trust ... opportunities for mutually beneficial cooperation would have to be foregone ... norms of social behavior, including ethical and moral codes, (may be) ... *reactions to society to compensate for market failures*." The new collaborative technologies provide the underlying conditions for the emergence of new market norms and the tool-set for reducing the inefficiencies related to contractual incompleteness or bargaining failures; not by reducing the costs to address them *ex post* but by providing collective insights into the non-contractible aspects and reducing the exercise of power by one of the parties to the transaction, when an exogenous (third party) enforcement body of contractual claims is absent. The latter implies a shift of power from the political aspects of the exchange process to the pure economical when individuals voluntarily exchange on free, competitive markets.

The impact of the new collaborative technologies on goods and particularly consumer behavior, choice and exchange has been unquestionable. Multi-billion corporations emerged in less than a decade by providing new forms of transparency, insights into exchange and developing the mechanisms for sharing the gains from reducing inefficiencies throughout the value chain. Still this wave of change has not fully penetrated the structure of the most important organization governing exchanges and their non-contractible elements: the firm. Their managers combine *other peoples' money and labor* (Bowles, 2006, p. 266) being "... neither subject to complete contracting ...". Even following the mass-scale fall-outs of the 2008 crisis they continue to remain privileged with the rights to perform actions concerning other people's labor, money and fates without thorough regulation or transparency regarding their relationships with their principals, namely the shareholder. The fundamental forces unleashed by the consumer technologies that completely reshaped the purchase of goods and the interrelated transaction process from searching to buying will start challenging other major principal-agent relationships like the manager - shareholder relationship and the citizen - governmental official. The process is established, the tools are available at competitive costs - it is that the interest and stakes are bigger, more complex than those the early online-pioneers faced. But paraphrasing Keynes in his General Theory (1936), "it is not ideas but vested interests" that set the pace of change.

VI. CONSUMERISM

In the *capitalist economy*, the predominant form of economic organization is a firm, in which the owners of capital exercise through the appointed management control over their assets and other people's labor in return for wages, to produce goods or services for sales with the objective of making a profit. The emergence of the firm as the main institution in the capitalist economy that transmits the rapid increases in productivity to society, and through this process diffuses productivity gains into a raise of living

standards, provides a mechanism for individuals to: (1) take risks and bear the full costs of failure with expectations to making excess gains or minimize risks and offer labor in exchange for wage; and (2) amass substantial resources of labor and capital under one line of command. In the framework of the principal-agent relationship introduced in the previous section, the firm has empowered the exercise of power of the lender over the borrower and the employer over the employee; in the generic class of power relationships in the universe of voluntary competitive exchanges this has not been the case in the buyer-seller (consumer-firm) relationship, although from an economic viewpoint the buyer is the principal agent. The scalability of firms in the capitalist economy and their capacity to organize large and heterogeneous groups of providers of labor and capital under unified direction have led to increased bargaining and market power. The power of consumers has been limited by the lack of means, institutions and high interrelated costs for acting in a coordinated way.

The new collaborative technology is reducing the costs by facilitating coordinated action by consumers either through consumer solidarity, information sharing or large-scale price comparisons. Reciprocity, gains from cooperation are inducing highly scalable network effects for connected customers. The room left for firms to exercise market power towards consumers due to informational asymmetries, knowledge silos or transaction costs that limited the access of consumers to international and cross-border competition is reduced and is expected to lead to institutional change with consumers acting in coordinated ways and with increased power. *Consumerism* is expected to lead to the formation of new strong institutions that will challenge the role of the firm and accelerate competition for innovation. The new collaborative technologies will empower consumers to coordinate and influence the evolution of an institutional framework for entrepreneurs that embraces the allocation of resources and their transformation into products and services under one command, reinforcing the tenet: “start from the user/customer experience and work everything backwards.”

VII. FIRMS AND THEIR PURPOSE

According to Spulber (2009), firms are *transaction institutions* that address transaction costs through both markets and organizations, which is the main purpose of their existence. As the new collaborative technologies are transforming the mechanics of exchange, the boundaries of firms are pushed to new frontiers, where their scope shifts from the creation of organizational structures that protect their position in the economy towards innovating new products and technologies for reducing transactional inefficiencies for their customers and sharing the interrelated gains. Coase (1937) argued that the boundaries of firms reflect trade-offs between the internal competitive advantage of organizations versus market offer. The new frontiers for collaboration enabled by the new technology can provide the means for firms to scale-up their

coordination capabilities and collaborate with their networks of suppliers, customers, stakeholders, for the achievement of scalable efficiencies throughout their value chain. This process is transforming the dynamic interaction between the internal competitive advantage and market offer from competitive to collaborative and complementary.

VIII. BUILDING BUSINESS FROM WASTE: TURNING INEFFICIENCIES INTO VALUE

“Waste is like mud - you can either treat as dirt and try to clean-up or as soil to grow seeds.”

*“Every individual... neither intends to promote the public interest, nor knows how much he is promoting it... he intends only his own security; and by directing that industry in such a manner as its produce may be of the greatest value, he intends only his own gain, and he is in this, as in many other cases, led by an invisible hand to promote an end which was no part of his intention. ... By pursuing his own interest he frequently promotes that of the society more effectually than when he really intends to promote it. Adam Smith in *The Wealth Of Nations*, Book IV, Chapter II, p. 456, para. 9.”*

The new collaborative technologies are transforming exchange by reducing transaction inefficiencies - and the interrelated costs. Empowering search and computation mitigates the impact of information asymmetries, reciprocity in information sharing creates new market norms, collective experiences are determining reputation.

In a different framework, to deal with problems of coordination in a competitive market, macroeconomic theory has assumed a benevolent planner that has all the power to compute and impose an allocation of resources that maximizes norms of social welfare. One of the most fundamental and inspiring results of modern economic research is that this allocation - under a set of assumptions - is equivalent to one corresponding to a perfectly competitive equilibrium, that would be dictated by Adam Smith's invisible hand.

In theory, economic agents free to compete in markets, while pursuing their own interest, will urge economic forces to an optimal allocation distribution. In reality market, information, technological inefficiencies will imply divergence from the ideal state - much of these deviations are the root-causes for the inefficiencies in the global economy estimated at nearly \$ 15 trillion, “or 28 % of worldwide GDP.” (IBM, 2011) A similar reasoning applies to the new collaborative technologies: The issue is no longer whether the emerging forms of collaboration is beneficial, rather how to realize the benefits among individuals and firms who compete for their pursuit of their own economic interests. To visualize the ideal gains, in line with macroeconomic theory, we may assume a centralized decision maker who possesses all the available information, computation capabilities, throughout all components of the value chain, entrusted with

the goal to optimize industry or market-wide performance. The planner will find a global minimum that corresponds to a steady-state equilibrium of the system, minimizing waste, entropy, transaction costs. The value loss difference between the current state and the optimum target may be defined as an entitlement to informational inefficiency. The latter may be due to communication costs, costs of forming organizations, mismatching, and asymmetric information. There is no clear-cut methodology for defining the objective function of the centralized agent: in supply chains a function that minimizes distance is a good candidate, it corresponds to minimizing transit, delivery times, transportation costs, carbon emissions per unit transported. For a centralized banker the objective function may correspond to inflation targets or minimizing volatility, for a policy maker maximizing social gains.

In some cases information may be perfectly available (at some cost or free), but the computational capabilities of participants may be limited. In the event where information is perfectly available but the system is far from balance the value gap from the ideal state is defined as *coordination inefficiency*. They are due to costly computation, lack of standardization, incomplete contracts and networks, search costs, informational asymmetries, system failures, relational contracts. In systems usually comprised of different organizations that in many cases are independent economic entities, “a completely integrated solution may result in optimal system performance, while not always in the best interest of every individual member in the system” (Li and Wang, 2007).

Separate members and economic entities will act independently and opportunistically - in theory, at aggregate level this might eventually lead to optimality; in reality coordination schemes - or inefficiency reducing technological solutions - will be required in order to align the objectives of competing entities. While the reduction of inefficiencies may improve aggregate welfare, this may not be possible through a transition over Pareto equilibria, i.e. situations that do not deteriorate the position the economic agents involved and in many cases an equilibrium which is an improvement at system-wide level may imply ruin for a specific group. The new collaborative technologies accelerate the forces of creative destruction by the new needs, services, consumer technologies created, processes of managing information and computation, markets, forms of corporate management and most importantly the ability to scale-up at unprecedented speed, by aligning vast numbers of consumers, buyers, agents with common interests - economic, political or personal.

At the micro level, both informational and coordination inefficiencies can be internally driven - between departments in the same organization that compete for their individual objectives - or externally, by the competing components of the value chain. Transparency into the pricing mechanism and competition with less inefficiency will imply prices that reflect all available information and rational agents who learn from pricing signals. Empowered with information processing and advanced computational capabilities, frictionless and efficient transactions will urge economic systems to

eventually reach optimal allocations. As this is by default not possible when each entity of the value chain has its own state of information, strictly forming decisions that are used to optimize its own interests, two fundamental forces of change will determine the path of evolution:

Force 1: *Sub-optimizing the competing components of the value chain leads to system instability and inefficiencies.*

A core tenet of the collaborative economy is that profits from transaction inefficiencies are fundamentally instable and creative destruction enabled by the new collaborative technologies will enforce the system-wide welfare gain from the redistribution of value. Focusing on optimizing sub-modules of a value chain in competition with the other components is non-sustainable in the market-is-watching economy.

Force 2: *There is a Pareto optimal plan that reduces information and coordination inefficiencies. Entrepreneurs, consumers, market participants through new informational, computational frontiers, collaborative, collective knowledge will strive for the technologies, products, scale to push evolution towards optimality.*

The target state of the system is the outcome of the balance of power between the aforementioned forces. Businesses, organizations or individuals - even when optimizing for their economic interests - cannot sustain their competitive advantage, long-term performance and ultimately survivor-ship when fighting against the two equilibrium forces. At all levels of organizations, economic bodies, and private or public management, aligning performance improvement incentives with the reduction of informational and coordination inefficiencies provide a solid road-map for the build-up of a competitive advantage in the mid- and long-term. Sustainable performance improvement in the market-is-watching economy deals with turning inefficiencies into value. This requires the development of mechanisms that can align the objectives of independent members and reduce coordination inefficiencies or technological solutions that can mitigate losses at individual levels through compensation mechanisms.

Inefficiency decomposition introduces the notion of a centralized planner with perfect information across the value chain, in order to quantify efficiency losses at each component, due to informational imbalances or losses. Proposing scalable technological solutions for reducing those and mechanisms for allocating gains is the challenge when addressing value creation from a holistic perspective. A fundamental starting point is the sharing of a consistent set of information throughout the transaction and value chain focusing on reduced search costs, information asymmetries, and improved price transparency. Internally corporations can promote information transparency as a culture, aiming towards the development of “bottom-up” performance improvement processes aligned with the principle of the Digital Organization (Brynjolfsson and

McAfee, 2011). At market or industry levels policy-makers can consider mechanisms that facilitate information consistency, availability as fundamental infrastructure similar to civil works or schooling.

IX. BUILDING A BUSINESS ON REDUCING INEFFICIENCIES IN THE MARKET-IS-WATCHING ECONOMY

The impact of the new collaborative technologies goes far beyond the reduction of inefficiencies in institutions of exchange, commerce, trade, intermediation, market-making. Every transaction - physical, financial, social, mental - is carried out on the basis of the available information to the parties involved, their computational capabilities, resources, the availability, accessibility of channels, markets, institutions for facilitating the operational execution of the process. While agents may not need any more to meet or talk in order to trade, they still need mechanisms to find each other, firms to execute the non-core aspects of their transactions, institutions to safeguard the interrelated interests. The decision making process that leads to the materialization of any kind of transaction is critically determined by the available set of information and the computational abilities of the participating entities. Therefore, every component of transaction costs is directly challenged by the impact of new collaborative technologies on the pillars of economy and society.

The first wave of the collaborative transaction evolution has re-engineered communication and information processing costs in search, bargaining, matching through auction mechanics, communication networks and centralized marketplaces. Computation costs offer high potential for business models that aim to generate value through their reduction. Communication networks are providing the template for shedding light into the intangible components of exchange: moral hazard, free riding and contracting. Reputation systems through collaboration, reciprocity, reduce costs related to free riding or lack of transparency.

Apart from the pioneers in the early nineties, who are the contemporary industrial giants, controlling the platforms, influencing regulation, setting the standards in e-commerce through the advancement of frictionless digital marketplaces, it is of substantial difficulty to develop business models that will prove successful in e-marketplaces unless a local competitive advantage is leveraged or a niche market. Although several industries exist where the penetration of e-commerce remains low, specific industrial characteristics or other key constraints interrelated to credit, interpersonal relationships do not make the application of the consumer technology advancements always straightforward.

Globally, targeting towards the reduction of higher consumer or firm transaction costs through the development of new products and services based on the new collaborative technologies, offers enormous potential for innovation and business. While the barriers to the creation of virtual, match-making e-marketplaces have

increased there is a strong need for leveraging the lessons from consumer technologies, in order to create markets for contracts or services that reduce costly information exchange or computation, which result into transaction costs. Looking into inefficiencies throughout the value chain sets a new natural stage for the evolution of business models and the space for products, services that contribute to their reduction at industry level. The offer can span from providing information, enhancing computational capabilities or setting new standards for exchange. The choice depends on the market depth, the competitive advantage and other intangibles or tangibles that cannot be copied fast, in a costless way from competition, as well as the critical mass required for scaling-up.

In several cases the system-wide industry level gains from copying the successes of consumer technologies, e-marketplaces, or introducing new transaction standards are self-evident. However, the lack of coordination mechanisms for facilitating the efficient allocation of gains, adverse impact on the interests of groups whose profit is based on exploiting information asymmetries and market dysfunctionalities may imply substantial resistance to change and hinder the formation of the necessary critical mass, market depth required for achieving scalability. In this framework, business models should shift their focus from reducing information processing costs through facilitation of matching to inefficiency reduction. In line with the purpose of their existence, firms are challenged to go the extra-mile beyond producing, selling, gaining more market share to actually improve efficiency for the customer even at the short-term cost of selling less, moving into a new paradigm of helping people optimize and manage their transactions more efficiently. Industrial producers are aiming to re-engineer their end-to-end processes, shifting from production maximization to a life-cycle material approach that minimizes the environmental offprint, adding value to products through usability. Marketplaces are moving from matching to sharing - empty seats in a car, available apartments, and bikes. The move from expensive centralized main-frame computers, owned and controlled by a small group of industrial leaders, to affordable desktop computers, cell phones, has enabled the sharing of network powers allowing billions of people to connect in peer-to-peer networks, to have in common music, knowledge, news and sociability in scales unimaginable. In this framework any existing operation can leverage its infrastructure or competitive advantage to consider new business opportunities along the entire value chain, by serving users, customers within its' sphere of interests - and beyond - by complementing its' existing product offer. While this channel may marginalize core activities, prioritizing system-wide initiatives that bring down inefficiencies will incubate new exchanges and a fresh path to growth. The new collaborative technologies form new approaches to business models whose profitability is determined by the efficiency gains provided to end users. Incumbents are developing their business models on providing new paradigms of information processing - or new tools and insights into computation.

A number of emerging business models centered around the reduction of inefficiencies, like cutting-down idle time of cars by sharing or pooling, finding visitors for empty flats, reselling books on the marketplace, auctioning property or matching loads for trucks returning empty are collaborative initiatives that reinvent the way industries function. Beyond the unifying theme of extending the set, scale of possible exchanges, they all contribute to the reduction of *waste* - not only economic.

(Not) surprisingly the new ways of doing business in the market-is-watching economy go far beyond economics. *An economic inefficiency is value that cannot be recovered resembling the definition of entropy, which corresponds to spent energy which we cannot get back.* The labor, capital, energy spent on an empty air plane seat cannot be reclaimed once the plane has taken off - in this case the laws of physics and economics walk hand-in-hand. Surprisingly this has not been the case in human history for decades. The rise of industrial giants and mass-production lines have been based on the vast consumption of energy in favor of saturating capital costs over output, leading to a massive exploitation of physical resources and entropy rise. Increasing the fill rate of cars or trucks reduces the environmental offprint of commuting, cargo transportation; the short-term rental of flats reduces the need for urban capacity build-outs, e-readers substitute papers and the interrelated exploitation of forests for paper production. Digitalization replaces matter with bits, cutting-down drastically the needs for entropy consumption, resource exploitation; the transformation of matter into digits is an energy sparing process.

The development of the comparative advantage in the market-is-watching economy is linked to three organizational objectives: (1) improve the efficiency of decision-making throughout the organization by synchronizing information flows with operational processes; (2) integrate the core business processes of planning, budgeting with information management; and (3) achieve system-wide efficiencies, starting from the user and going backwards through global optimization. Maximizing performance for each component of the chain-to-customer individually does not usually imply total optimization. Applying holistic or total systems management approach to the entire flow of materials, services, energy and information in fulfilling customers' expectation is sometimes conflictive with managerial objectives that focus on operational achievement. Financial indicators do not guarantee system-wide performance and in many cases are conflictive. Arbitrations or trade-offs may be subject to personal views (biases), interorganizational politics or short-term gains, lacking an integrated framework. Building a business model or developing the capabilities for turning inefficiencies into value require to:

- Articulate the value proposition, that is, the value created for users by reducing *directly* transactional inefficiencies or *indirectly*, by addressing informational inefficiencies;

- Identify the market segment for which the technology will be used to reduce inefficiencies;
- Define the firms' *value chain* to develop and distribute the offering;
- Specify the inefficiency reduction gain sharing mechanism;

Other important questions are related to maturity-time of the offer and industry-wide impact. Does the value offer presuppose industry or network level adoption or users realize gains immediately? The case where adoption, interaction or compatibility with others is pre-required may be categorized as *network level inefficiency*. *Industry level inefficiencies* occur when the root cause is due to the lack of a standard, unifying technology or platform (for example: reservation systems in the Airline industry are a typical case of the gains from electronic intermediation); lack of computational capabilities lead to *computational inefficiencies*, whereas *informational inefficiencies* encompass a wide range of transaction cost-related causes. Understanding each type the business, product or service is targeting, coupled with the industrial organization of the market is critical for the value proposition and strategy. Network level inefficiencies are addressed by platforms, collection of related technical standards; informational ones by sharing, social networks, e-marketplaces, information processing applications, firms providing gathering, information bundling; computational by specialized firms providing matchmaking, market making, and ultimately distributed intelligence¹.

Scoping correctly each of the aforementioned types we are guided towards the necessary conditions for success: Is it the forces of creative destruction that have to be triggered? Or is it the critical mass that will provide the population for scaling-up? Although the proposed change may drive to Pareto-superior allocations at industry levels, it might not be beneficial for all players. In his seminal work Bakos (1999) analyzed the impact of electronic marketplaces on favoring buyers, while reducing monopoly selling power of sellers. Bakos suggested a new business model for sellers by reducing profits related to their market power, and sharing the gains from helping customers identifying the best match of their needs. From a business perspective offering computational capabilities or resources in exchange for the information that will ultimately generate the necessary depth for the roll-out of network level strategies is a scalable and adaptive strategy.

Value creation through inefficiency reduction requires a mindset away from the doctrine of neoclassical economics that through optimization of individual economic performance the invisible hand of the market leads to the best possible allocation: transaction costs may imply deviations from the equivalence between the fulfillment of private economic interests and social welfare. The re-engineering of exchange, information diffusion and sharing eliminates misalignments between economic performance, user experience and growth at the expense of inefficient energy or information allocations, closing the gaps between consumer, shareholders and society interests. In the market-is-watching economy, informed, connected users collaborate

and share information, resources, knowledge and assets, searching for efficient transaction schemes, enabled by new computational capabilities, services and products.

A consequence is the shift from competition to collaboration and sharing: throughout value chains, inefficiencies are reduced and user experience is improved when the components of the chain are synchronized rather than fighting each other. “Bottom-line” economics may encourage cost competition through the reallocation of resources based on price - even against the laws of physics; moving the printing units where labor is more competitive cannot compete in the long-run with the substitution of books from e-readers, reducing distribution costs of new music releases is even when accounting for the energy share consumed by servers, much more energy, cost consuming versus the instant, green alternative of digital media flowing through the collaborative channels. The abuse of any market power, structure, information asymmetry which competes with the interests of connected customers or a collaborative, digital alternative resembles the comparison of the best crafted horse coach with a car at the dawn of the 20th century. Value propositions that lead to the reduction of inefficiencies through *system-wide stability* will prevail other market size and power.

X. CONCLUSIONS

The new collaborative technologies make decentralized exchange feasible, bring core allocations closer to their respective Walrasian equilibrium and transform transactions, the workhorse of all economic processes by reducing search, matching, computation costs, limiting departures from efficiency due to asymmetric information, providing enhanced information processing, computational capabilities and a framework for virtual exchange with no borders of unprecedented scale. Collective, collaborative information processing capabilities, knowledge diffusion and inefficiency reduction are transforming the pillars of markets and offer a concise road-map for creating value in the market-is-watching world.

Businesses can firmly leverage the learning from consumer technologies to look for inefficiencies beyond their internal processes - at market and industry levels. Decomposing the interrelated informational and computational inefficiencies and mapping the necessary products for sharing the value from their reduction indicates “true north” in the quest for product and business development paths. Thinking beyond the boundaries of organization, markets and industrial structure, looking into the exchange chain end-to-end, mapping the inefficiencies and finding fixes corresponds to the high-level production process for turning waste into value. While the immediate focus has been on economic transactions, this approach can be extended without limits to intellectual, political and ultimately transform the nature of every type of exchange. The power of new collaborative technologies to increase the efficiency of all types of exchanges aggregated over several phases of economic and social life makes the

provision of services that reduce inefficiencies and more importantly develop structured, mechanisms, schemes, incentives for sharing the benefits of coordination in a non-disruptive way, an important market with potentially large rewards. As the underlying infrastructure increases its capabilities and becomes widely available, services will target informational waste giving rise to new forms of machine intelligence. This latest trend is reflected in the growing industry needs in building the computational resources and skills required for extracting value from data.

ENDNOTE

1. *Search* has been the first mass-scale success story of distributed intelligence based on collective knowledge.

REFERENCES

- Akerlof, G., 1970, "The Market for Lemons: Quality Uncertainty and the Market Mechanism," *The Quarterly Journal of Economics*, 84 (3), 488 - 500.
- Arrow, K.J., and L. Hurwicz, 1972, "Decision Making Under Ignorance," in C.F. Carter and J.L. Ford (eds.), *Uncertainty and Expectations in Economics: Essays in Honor of G.L.S. Shackle*. Oxford: Basil Blackwell.
- Bakos, J.Y., 1997, "Reducing Buyer Search Costs: Implications for Electronic Marketplaces," *Management Science*, 43 (12), 1 – 27.
- Bowles, S., 2006, *Microeconomics: Behavior, Institutions, and Evolution*, Roundtable Series in Behavioral Economics, Princeton University Press.
- Brynjolfsson, E., 1993, "The Productivity Paradox of Information Technology: Review and Assessment," *Communications of the ACM*.
- Brynjolfsson, E., and A. McAfee, 2011, *Race against the Machine: How the Digital Revolution is Accelerating Innovation, Driving Productivity, and Irreversibly Transforming Employment and the Economy*, Cambridge, MA: MIT Press.
- Coase, R.H., 1937, "The Nature of the Firm," *Economica*, 4, 386-405.
- Easley, D., and J. Kleinberg, 2010, *Networks, Crowds, and Markets: Reasoning about a Highly Connected World*, Cambridge University Press.
- Granovetter, M., 1973, "The Strength of Weak Ties," *American Journal of Sociology*, 78 (6), 1360-1380.
- Greene, R., 2000, *The 48 Laws of Power*, New York, NY.
- Hayek, F.A., 1945, "The Use of Knowledge in Society," *American Economic Review*, 35 (4), 519-530.
- Hubbard, T.N., 2003, "Information, Decisions, and Productivity: On-board Computers and Capacity Utilization in Trucking," *American Economic Review*, 93 (4), 1328-1353.
- Jorgenson, D., 2008, "Technology, Demography and the Long-run Prospects for US Economic Growth," Website Text.

- Jorgenson, D., W. Ho, S. Mun, and K.J. Stiroh, 2008, "A Retrospective Look at the U.S. Productivity Growth Resurgence," *Journal of Economic Perspectives*, 22 (1), 3-24.
- Keynes, J.M., 1936, *The General Theory of Employment, Interest and Money*, Clarendon Press.
- Marchand, D.A., and A. Hykes, 2009, *Using Information to Create Value Efficiently. Perspectives for Managers*, IMD.
- IBM, 2011, "Smarter Commerce".
- Li, X., and Q. Wang, 2007, "Coordination Mechanisms of Supply Chain Systems," *European Journal of Operational Research*, 179, 1-16.
- Negroponte, N., 1995, *Being Digital*, Vintage Publications, New York.
- Porter, M.E., and V. Miller, 1985, "How Information Gives You Competitive Advantage," *Harvard Business Review*, July-August 1985.
- Simmel, G., 1908, *Sociology: Investigations on the Form of Socialization*, Leipzig, Germany, Duncker und Humbolt.
- Solow, R., 1956, "A Contribution to the Theory of Economic Growth," *Quarterly Journal of Economics*, 70 (1), 6594.
- Spulber, D.F., 2009, *The Theory of the Firm: Microeconomics with Endogenous Entrepreneurs, Firms, Markets and Organizations*, Cambridge University Press.
- Tirole, J., 2006, *The Theory of Corporate Finance. Princeton*, Princeton University Press.