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THE IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGIES ON SOCIETY*

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INTRODUCTORY REMARKS

INFORMATION TECHNOLOGY AND THE NEW MEDIA: A FORCE WHICH IS CHANGING THE STRUCTURE OF THE ECONOMY, GOVERNANCE AND SOCIETY

Over the past few decades, the world has been experiencing a phenomenon which has seen the proliferation of information at exponential rates. Thus, this era has been appropriately termed the 'Information Age' and has been likened in its significance to the Industrial Revolution in terms of its impact on the entire modus operandi of the global system.

Advanced economies have become progressively specialised in the production, distribution and use of information. This specialisation is the source of substantial welfare gains. First, reliable information is essential if competitive markets are to work as a mechanism for efficient resource allocation. The concepts of individual choice and invisible co-ordination are essential to market economies. When information on the key variables such as price, quality and technology is widely available, markets are much more likely to generate rational production and consumption choices, and provide powerful signals that contribute to co-ordinate economic activity. By contrast, information gaps and asymmetries create unemployment, misallocation of credit, economic rents, non-competitive technological choices and policy mistakes. Second, information is the basic factor input for scientific and technological progress, and is therefore central to sustaining productivity growth throughout an economy. Information-based economies are therefore well-positioned to compete in research and development, in knowledge creation and serve as economic laboratories for business and government innovation. Finally, economies that invest heavily in information may enjoy higher long-run growth potential. Information cannot be perfectly copyrighted, patented or kept secret. Therefore, the creation of information by one firm (or by the government) inevitably benefits the production of other nearby firms. On the other hand, given cross-border barriers to knowledge diffusion (eg. language), this information externality may be an important cause of the productivity gap between high and low income economies.

Alongside the growth of the demand for information, the structure and occupational profile of advanced economies is undergoing significant change. First, the information sector itself—media, communications, consulting services, and the production of information technology—has grown very fast, and has also become increasingly specialised. Information sectors in advanced economies generate a high volume of internal trade in a manner highly analogous to sophisticated financial

markets. The global market for information goods, services and technology is now estimated at over \$1.2 trillion. Second (and more pervasively), all sectors of the economy have become more information-intensive, resulting in a gradual re-engineering of business and government functions. Information has substituted for other inputs (eg. labour, energy, inventory expenses), and information technology (IT) has become a vital intermediate input in the economy's aggregate production function. As a result, there is a high income elasticity of demand for this technological input; and improvements in its price/performance ratio are a significant source of economic growth. Third, the nature of work has changed. In many OECD economies, employees whose primary task is to collect, process or transmit information now account for over 50 per cent of the workforce.¹

Information technology is evolving toward a "strategic" role with the potential not only to support chosen business strategies, but also to shape new business strategies.² The large investments in computers and telecommunications indicate the definitive economic importance of information. The evidence is clear that those who utilise statistical information benefit substantially because this reduces the uncertainty that players face and therefore their risk is reduced. Banks, insurance companies and other financial institutions which adopted computers in their management processes early on are the best examples of such beneficiaries. In other words, the technical and institutional matrices influence the evolution of competitive decision making, and the technical and institutional alternatives facing decision makers are what determine outcomes.

Industrial restructuring, which is constantly occurring, along with innovation, relies heavily on information technology. During the 1970s and 1980s, the US, Japan and most of the OECD countries developed national level IT programmes. Since the mid-1980s, IT applications have become commercially feasible and governments have increasingly recognised that IT development is a crucial factor in maintaining industrial competitiveness. Also, the increased number of IT programmes has encouraged collaboration between industry and research institutions.

The limitations faced by developing countries in creating effective information infrastructures are the major impediments to their further advancement. In this context, it is worth pointing out that one of the most effective contributions the world community could make to developing countries and sustainable globalization would be to ensure their access to the information super highways being constructed by the most advanced countries.

INFORMATION THEORY, INFORMATION SYSTEMS AND THEIR BENEFICIARIES

The significance of information systems extends far beyond the economic sphere; they are necessary at almost all levels of society. All organisations need a sufficient flow of information in order for decision makers to make many decisions that face them each day. Indeed, the entire decision-making structure depends on the free flow of information. The information system, in order to be useful to the decision makers, must be in a form so as to promote the dissemination of information in a useable form and in a timely fashion. In the context of the present information age, an information system will be considered successful or not according to its ability to condense the most significant information quickly to its users. Additionally, since decision making is usually an interdisciplinary process, the information used must suit the nature of this process and be, therefore, of use in this regard.

The relationship between the information structure and the decision-making structure must develop in such a way as to lead to continuous improvements in both structures. That is, information

structures should provide the decision-making structure with the necessary information, whereas the decision-making structure should convey its demands on the information structure in a clear manner. Through this relationship, both structures should be able to focus on and sort out the information that is crucial for decision makers from the numerous information sets seemingly relevant for policy making.

Where and how else does information make its contribution? If a cost-benefit analysis is performed, it is clear that we can quantify some of the benefits but others are less tangible and difficult to quantify.

Even if we could quantify all of the benefits associated with improvements in information systems infrastructure, international comparisons would not be easy. Enhanced information systems and statistical infrastructure make their greatest contributions at all levels (international, country wide and institutional) indirectly. A partial list of these indirect benefits includes the following:

- Open information on prices and markets
- Access to new ideas and new theoretical and scientific models
- Promotion and assurance of scientific integrity and independence
- Government accountability to the world as well as to domestic public opinion
- An informed public and/or electorate
- Promotion of international harmony through a ‘common language’ or base of information that all nations share
- Balancing of competing domestic interests and forces
- A very low marginal cost of distribution—the value of information increases the more widely it is disseminated; and
- Competition among ideas that refines and improves their effectiveness and applicability to new situations.

Any discussion of indirect benefits must consider how such benefits can be observed. We can only deal with observable reality, but what is dominant in an independent world is what we might call a ‘targeted biased-reality’ that finds its sources within the ‘balance-of-power structure’. As long as we are able to eliminate this ‘targeted biased-reality’ and replace it with observable reality with a minimum margin of error, transparency and problem solving will be less costly and not a priori in a world which gives priority to human, economic, social and cultural development.

When we say that there is a very high positive correlation between information infrastructure and democracy, the functioning of a market system, the solution of social problems, and the structure of culture and civilisation, we are referring chiefly to indirect benefits such as those cited above. Further, it is important to consider these benefits not in the short-term but in the medium- to long-term. The criterion of benefit must be what they bring to human development in terms of security, economic and social development, and efficiency in public and private management.

Optimisation of world, national or institutional development would necessitate the endogenisation of the following vectors:

- population and human development
- economics
- geo-strategic considerations
- science, technology, education, history, culture, civilisation; and
- information systems and statistical infrastructure (the reliable flow of internationally comparable information).

Methods of arranging and re-arranging information have been the area of computer scientists and information scientists. Algorithms that formally describe how to operate on information, and how to construct better, faster, more efficient, more reliable algorithms, have been the subject of extensive academic and professional work.

A user of the information infrastructure, especially a decision maker, faces an infinite amount of information. Obviously, not all of the available information is relevant to any given decision. There is also a degree of relevance associated with this information. In order to deal effectively with this information, the decision maker must abstract a finite (and manageable) subset of data from this potentially infinite collection. Such an abstraction (or filtering) is accomplished by the application of a model.

Clearly a model is a simplified view of reality. It imposes an order or pattern or even a structure on a disordered mass of information. Available information does not have only one possible interpretation. Different models imposed on the same information may result in different interpretations.

Wisdom, Knowledge Systems, Information Systems and

Social and Economic Phenomena

When examining knowledge and information systems in the context of understanding social and economic phenomena, it is necessary to point out the uniqueness of social and economic phenomena at a particular point in history, geography and society. This makes it difficult to undertake controlled experiments as in the natural sciences. Although recent literature has propounded a new approach where order and pattern replace what was formerly considered random,³ there still exist many gaps in our knowledge base. The issue is further complicated because of the close relationship between human behaviour and the existing social and economic phenomena.

Individuals, or decision makers, are affected by the existing social and economic phenomena when making decisions. Once decisions are made and acted upon, the social and economic phenomena that form the basis of future decisions are changed. Alleviating these problems requires the analysis and quantification of any social and economic phenomena within the context of understanding the global structure. Understanding the global structure necessitates the use of the quantification methodology of the social sciences which are intimately tied to behaviour patterns.

Because the social sciences are primarily linked to behavioural patterns, the strong bond between behaviour patterns and information flows will be a main determinant in the evolution of the social sciences and the decision-making structure. As mentioned above, the volume of the available disaggregated information necessitates quantification for simplification purposes; and the underlying tool for this within the context of the behavioural patterns in human society is systems analysis, operations research, econometrics, and various quantitative methodologies and techniques.⁴ Thus, in the late 1990s and the decades that follow, we will be witnessing a phase where an interdisciplinary and quantitative approach, both theoretically and empirically, will become a necessary precondition. With this, the endogenisation of information flows, and thus information systems, will also become a necessary precondition. These trends are already having a strong impact on the decision-making systems, and this has shown the need for a reconsideration for the existing theories and research being undertaken from this perspective.

Other extremely important factors in creating optimal decision-making structures by extracting the maximum value possible from information flows are the freedom of opinion and the freedom of expression. These allow the creation of information and its transmission in the broadest possible terms, which positively impact the decision-making structure and the decision makers have a wider scope from which to view their alternatives. This is the basis on which policy makers rely in making economic, social and political decisions. Clearly then, a link and interdependency can be seen between the scientific process of collecting, quantifying, and disseminating information on the one hand, and decision making on the other. In this regard, the independence of science is most essential to the decision-making process, and the means for transforming the information flows generated by scientists into digestible form, namely quantification and diagnostic theories, methodologies and techniques, is the bridge between scientists and decision makers.

Information flows are the core ingredients in the functioning of open market economies in democratic societies. The markets would be unable to function properly without transparency and unrestricted access to the most current information. While information systems are at the centre of the world's economic structure, it is also widely appreciated that the transparency that results from free information flows, and appropriate statistical infrastructures to present this information in a usable format, is vital to achieving the highest possible level of democracy in any given society.

The Changing Role of the State, Governance and Ethics in the Public Service

The inherent link between information and democracy makes the evolution of public management and the power structure, more specifically, the changing role and functions of the state, a subject of intense interest. While one line of argument associates progress with reducing the role of the state to the provision of a handful of non-economic services such as law and order, and defence, there are also calls for the preservation of the essential parts of the role and functions assumed by the state during the post-war era. However, it is clear that either a nineteenth century type of liberalism or post-war Keynesianism is not warranted and that the dominant trend of opinion and actual development emphasises the transformation of the role of the state from one of provider of factors of development to one of an effective creator of its conditions. The more relevant part of the argument is about the instruments with which the adequate conditions for further progress can be created and the ways in which these instruments can be articulated and used. The assertion of the collective interest alongside and, in some instances, beyond sectional interests, constitutes a further fundamental factor in the transformation of the role of the state.

National economies and the world economy have become much more complex processes particularly because of the breathtaking pace of technological progress and internationalisation. Globalisation is not complete but intensifying continuously. The functioning of the market mechanism and the forms of competition associated with it have acquired new characteristics. Under these circumstances governance in general and the management of the economy in particular have also become more complex matters. Good governance, whose importance and relevance is becoming increasingly felt, extends to a domain which is clearly broader than the economy. What is at stake now is obviously more elaborate than remedying instances of market failure or merely providing a level playing field for the existing actors of the economy, though both of these are highly relevant factors. For example, ensuring the existence of such factors as self-regulation, a highly developed technological infrastructure or a fair mechanism concerning the adoption of new technology standards in industry is becoming increasingly significant. The way in which the state is to fulfil its role concerning areas such as education, health and income distribution is still subject to some controversy. While the responsibility of the state in these areas is seldom denied, the best ways of combining efficiency with equity are debated. One area in which this combination is most relevant is education since providing continuous adequate education to the largest possible section of the population ensures a more effective form of equity while it also meets the increasingly elaborate need for skilled labour.

It is more productive to configure the changing role of the state in the context of the creation of the adequate 'framework conditions'. The objective of the creation of such 'framework conditions' is to establish a non-distortionary policy environment, including macro-economic stability but also predictability. The existence of a flexible but healthy, fair and effective set of legal rules is a most critical element of this framework, notably in the area of privatisation. The taxation system is relevant from the viewpoint of both domestic and international investments. The sufficiently uninhibited but properly regulated and equitable functioning of competition is at the core of the set of framework conditions. This is relevant for the functioning of the national as well as the international dimensions of the economy. The existence of effective public sector institutions and adequate competition among these is another prerequisite, as is transparency, democracy and sufficient and realistic degrees of decentralisation and participation. All these targets have acquired a new dimension at a time where new information technologies and processes are creating enormous new opportunities and also posing new problems in terms of safeguarding freedoms and creativity. At an even more general level, it is worth pointing out at this stage that it would be a pity and misleading to perceive the emerging context as the sum total of new technologies and technical policy instruments, however sophisticated these may be. In fact no system pertaining to society has ever been and can ever be successful if the human dimension, the dimension of the human spirit and the ethical base are absent. Thus, the state's changing role cannot be conceived as the management of a set of static inert entities through a set of conveniently determined rules and instruments. A multi-dimensional, considerably more complex phenomenon is involved.

Consequently there is no simple recipe for defining the changing role of the state and that is what makes the task of streamlining the state's emerging new functions so challenging.

The historical background of a traditionally strong role played by the state creates both a drawback and an advantage. The drawback is that the transformation is confronted with strong resistance concerning the effectiveness and superiority of the new mechanisms. The advantage is that, to the extent this very state is genuinely ready to transform itself and give up some of its roles like those in the direct provision of goods and services and direct economic controls associated with a command mechanism in favour of functions related to the creation of the adequate framework conditions, it

will have considerable strength to carry out these changes.

From the full magnitude of the adjustment challenge and the market-oriented reforms, particularly with reference to those in developing countries, we deduce that the benefits of reform can be realised at a lesser cost if these benefits are explained effectively to the various segments of society. In other words, reforms can be accomplished more easily when they are based on a consensus between the state and its citizens. This would depend not only on dialogue between the state and its citizens, but also on the level and scope of transparency that the former will adopt in the implementation of its activities. Consensus will have been reached and maintained only if there is open communication and dialogue.

Today, most countries are concerned about declining confidence in government. The environment in which public management operates is continuously changing and public servants are facing increased demands from citizens; changing private/public sector interface and changing accountability arrangements. The potential tensions between traditional notions and new forms of public management are starting to emerge mostly in the area of ethics. The goals of the three 'E's'—economy, efficiency and effectiveness—still continue to be important, but countries are clearly giving greater priority to a fourth 'E'—ethics. Proper conduct is a prerequisite for good governance and thus the success of public management reforms and the overall confidence in the government will depend on it. In this context, increasing transparency involving the public as a watchdog and increased accountability by the authorities are of particular significance.⁵

Information and Communication Technologies, Media, Governance and Democracy

Revolutionary advancement in information and communication technologies have brought peoples and countries closer during the last decades and the mobility of goods, capital, people and thoughts have gained an accelerated pace. The accumulation of knowledge is increasing faster than ever in this information era, and the media is an indispensable contributor to the formation of a universal community. The role of the media as a distinctive civic channel for political participation is of utmost importance. The media has the means of forming civic responses to national as well as transnational challenges. In performing this civic duty, the media needs a democratic and open society. Today, the media in general, television and radio in particular, are the extended "town hall" for public debate, where all problems can be discussed and addressed in a participatory manner. Pluralistic and participatory democracy has gained a new dimension through the breathtaking progress in communication technology and the media is now an indispensable part of civic and public life.

The media is essential for the democratic process as it provides the information necessary for people to exercise their rights as citizens. Through the media they may take part in the discussions and the interpretations of events, attitudes and actions affecting the development of society and the political choices taken.⁶ In democracies, the role of the media, as a representative of the public, is to act as a watchdog, to put forth constructive criticism and to protect rights, especially the right to truth. The media has an incomparable authority within society to form and influence public opinion and its role becomes considerable in the process of adapting to change and adjusting to uncertainty and complexity.

The media also represents a balancing power in democracies that can play an intermediary role between the state and society, keeping open the channels of communication between the government

and the people. Although the media, especially television, have acquired considerable power over the last two decades, they have not yet reached the maturity and responsibility which the exercise of such power would require.⁷ Freedom of information, the free access of all to information, pluralism in opinions, interpretations and arguments, are the prerequisites which must be fulfilled for the media to function in a truly democratic way. This implies that as wide a variety of forms and opinions as possible must have access to the communicative systems.

Concluding Remarks

The world is entering an era of globalisation, where local and national economies are becoming increasingly interdependent, and economic, technological, and social trends are quickly transcending regional and national boundaries.

Globalisation is occurring very rapidly, primarily because a new element in the global system has been introduced, namely disaggregated information flows at unprecedented levels.⁸ There is also an entirely new system of explanatory variables because of this. This implies that there will continue to be rapid change in both economic theory and quantification techniques which will thereby lead to a transformation in these areas. With respect to social sciences, the impact will, through an interdisciplinary approach, make it possible to explain the interaction between the global system and the subset systems structure as well as the interaction with other social sciences.

This makes it imperative for each country to harmonise its interests with others to have updated information on the latest developments and advances.

Many of the current processes are concerned with reporting the status quo as opposed to evaluating technical change. So in order to compare indicators of any type, it is necessary to first create solid structural networks with similar correspondences in the classification systems. What we are aiming at then is an integrated system of evaluating indicators. A correlated system of information collection and processing will then lead to our ultimate goal of comprehensive evaluation.

It is certainly true that the convergence of several streams of technological developments have dramatically increased the ability to record, store, analyse, and transmit information in ways that permit flexibility, accuracy, immediacy, geographical independence and complexity and volume. However, the challenge for social scientists is to restructure the formulation of the specification methodology so that it is formed in relation to the data collection process according to the needs of these scientists as opposed to only the needs of businesses and governments.

In light of the abundance of the free flow of disaggregated information, the current economic theory and quantification methods can be reformulated so as to better understand the global structure with the available tools, and perhaps with the creation of newer and more efficient tools. It is inevitable that there will be changes in the theoretical and quantificational methodologies of the social sciences since the world, the global structure and therefore the basis of our theory and techniques are changing.

The era of information will mark a higher level in the progression of mankind because an inseparable link has been formed between statistical infrastructures and democracy.⁹ Freedom of opinion and expression lie at the centre of establishing scientific and transparent information flows. These freedoms allow the creation of information and its subsequent transmission to occur in an optimal manner. This benefits decision making and the decision-making structure at the highest level

because it broadens the scope for the realm of data in methodology specifications.

Furthermore, in market economies, where decentralised decision making is inherent to the system, the existence of reliable and timely information reduces market uncertainties to viable levels. By reducing the imperfections in the market structure through optimising the use of information flows, the market structure functions more efficiently and this results in an improved allocation of resources. Increases in the volume of information flows also mean that problem solving will occur at increasingly disaggregated levels, and by using the appropriate quantitative techniques, there will be a revision of economic theory and of quantification techniques that will best suit the needs of democracies and free market economies as they attempt to address the challenges of human development and optimal global change.

In conclusion, the relevance of a modern informational infrastructure to the economic and social well-being of a society cannot be underestimated. Optimal choices, be they economic, social, or cultural, must be based on the best available information. The quality of the information determines the effectiveness of any given choice. In the public sphere, access to credible information is a prerequisite to pluralistic and participative democracy, human development, economic and social transparency, and the evolution of culture and civilisation. Wisdom, knowledge and information infrastructures promote dialogue between those holding various ideas. It is only in an atmosphere where reliable facts and figures are available that citizens can form opinions, express preferences, hold government officials accountable for their actions, and that democracy can thrive and reach a consensus on the policy options towards desired objectives.

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