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**Productivity and Performance in the New Corporation:
The Need for a New Perspective**

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¹ In alphabetical order.

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1. Introduction

The large number of books published and conferences held on productivity in the last decade clearly indicates the importance of this field. Many academics and practitioners have discussed "the productivity problem" (Thurow, 1980, 1992), while some well-known reports have particularly emphasized the sharp decline in productivity growth in both the United States and Canada (Dertouzos et al., 1990, Porter, 1991). Recent negotiations about a possible free trade agreement between these two countries and Mexico (NAFTA - North American Free Trade Agreement) have also raised critical questions about how we, as a nation, need to increase our productivity in order to take up the challenge that the newly industrialized countries are confronting us with.

After so much effort dedicated to the study of productivity, one would think that a common ground might exist among the various disciplines that share an interest in the field. Yet there is still some confusion about many aspects of productivity, including its definition (Mohanty, 1992). Many examples can still be found in business magazines of productivity, performance and profitability being used interchangeably. The scientific literature also shows inconsistency in dealing with these terms. A common case is the substitution of productivity for efficiency (Campbell & Campbell, 1988, Lieberman et al., 1990). In the first issue of a well-known magazine dedicated to productivity, a group of experts who were asked to define the term responded by providing various meanings such as optimal quality, competitiveness, effectiveness and even "state of mind".

In fact, productivity is in a unique position where very different disciplines such as economics, engineering and psychology deal with similar issues. Only a few fields of study are of interest to such a variety of disciplines. Considering the multi-disciplinary dimension of productivity, some confusion is quite understandable. Even more confusion may arise as we consider the fact that the new rules of competition may indeed require different perspectives on productivity. It is therefore the purpose of this article to offer an overview of what appear to be different ways of looking at a common problem in light of the current competitive context. But before considering the impact of this new context, it is necessary to review how productivity is presently understood.

2. The concept of productivity: a multi-level/multi-disciplinary approach

Partial and Total Factor Productivity Indexes:

The debate about a better understanding and use of the concept of productivity is easily summarized by the following question: what do the productivity discussed by an economist and the productivity measured by a plant engineer have in common ? Many would argue that it is just a matter of definitions and in fact, they would be right. But such a trivial answer seems to represent the source of inconsistency when dealing with productivity. Beyond the generic definition with which most people agree (output/input ratio), it has been suggested by many authors (e.g. Sumanth, 1984; Sink, 1985) that the level of analysis (the system's boundaries) should always be specified when discussing productivity. Whatever system is the subject of analysis, there usually are two groups of indicators:

Partial Productivity Index: this index is the ratio of all outputs over ONE particular input such as labour or capital. *Although this definition makes the index easy to understand and evaluate, it also limits its use because of the restriction to only one input.*

Multifactor or Total Factor Productivity Index. this index takes into account all inputs rather than only one as for the previous index. *Even though this indicator provides a better indication of the contribution of all factors to output variation, it remains difficult to calculate.*

The distinction between the two kinds of indexes is very important as shown in the latest issue of the annual report on Canadian productivity (Statistics Canada, 1992). It is reported that the Canadian labour productivity index (partial indicator) has steadily increased since 1975 (total increase of 25% compared to the 1975 level) whereas, for the same period, the multifactor productivity index has remained almost the same. The following example helps one to understand how this could happen. In a case of a firm that invested substantial amounts of money on new equipment, more output per worker (or person-hour worked) would reasonably be expected. Thus, the labour index would show an increase especially if the level of input remains the same. On the other hand, this ratio will not indicate if the level of output has increased substantially as a function of the capital invested. The multifactor productivity index will.

Calculation of multifactor or total productivity indexes may become quite complex and a great deal of effort has been expended in the last few decades to develop different procedures. The measurement of productivity for manufacturing systems seems to be well developed. Some studies published in the last decade (Sumanth, 1984; Sink, 1985) have contributed to a better understanding of the various issues involved in this difficult but essential task. Recent research seems to emphasize the measurement of productivity in white-collar worker environments (Drucker, 1993), such as research, education and services. This has become important as the productivity of those jobs does not compare favourably with that of manufacturing sector, and thus contributes to lowering productivity growth at the national level (Thurow, 1992).

Based on what has been said so far, we now propose to summarize the different approaches to productivity in various disciplines and using different levels of analysis. Some authors admit more than six levels but we consider the following three to be representative of most approaches.

Productivity at the macro level:

Economists were the first researchers to be concerned with productivity and their main interest has always been at the **national** level. The macro-analysis of national productivity (generally expressed in Gross Domestic Product (GDP) per person-hour worked) usually aims at making comparisons with other countries (Parker, 1990). Although it is not the purpose of this article to go into detail with regard to methods of calculation (numerous articles have been written on this topic) it is worth mentioning various problems encountered when comparing data of this kind. Some authors have suggested that the above definition may be a biased basis of comparison as it does not account for many social, political and cultural differences between nations, especially the Third World countries versus Western countries (Sumanth, 1984). National productivity levels, if compared on the basis of a common currency, may also vary because of exchange rate fluctuations. Despite those difficulties, this measure remains the only one available for comparing national economies.

Productivity at the micro level:

The concept of productivity is also studied and used at a micro level, such as is normally understood in management science and industrial engineering, namely the firm or department level. This distinction needs to be made since most micro-economists, according to Carlsson (1989), tend to direct their analyses towards groups of firms (industries) rather than a single firm.

At the firm level, productivity has a very tangible meaning as it relates to what is being produced by the enterprise, whether services or products. Because such productivity data provides a good picture of the way resources are used, it provides **managers** with an essential tool for planning. It will also be utilized by industrial **engineers**, whose task is often oriented towards optimization of production. Comparisons of productivity levels between firms remains a difficult task especially if they are not part of the same industry. In this regard, correcting factors must often be used to account for differences such as worker and different wages due to factors not related to productivity (e.g. union, location, etc.). Ratios using capital as input can also distort the comparison depending on how expenses are accounted for. The main difficulty continues to be the lack of comprehension of what productivity really is. Sink (1985) found that very few measures identified by managers were real productivity relationships, which makes this author conclude that managers still do not distinguish between productivity and certain financial ratios such as ROI, cost per unit, profits per sales dollar, etc. In this context, inter-firm comparison remains a rather complex task.

Productivity at the individual level:

Using a narrower focus, productivity can also be studied at the **group** and the **individual** level. Although the "productivity problem" is more often addressed at the national level, part of the solution lies in each individual's attitude towards his/her job and that is of central interest to organizational or industrial **psychologists**. Many psychologically based programs such as goal setting, work redesign, financial incentives and work rescheduling have proved to be effective, to various extents, in increasing productivity (Campbell & Campbell, 1988). While recognizing that such practices do not eliminate the

need for other prescriptions at other levels, these authors believe that more attention should be paid to such solutions.

Implications of the multi-level/multi-disciplinary perspective:

Given the above discussion, it is obvious that a low level of productivity constitutes a complex problem. There do not seem to be any easy answers such as pointing at one of the three above-mentioned levels and identifying one party responsible ("the government", "the boss", "the employees") at only one level of involvement. When managers insist on increasing productivity, they generally mean that employees should produce more within the same time frame (and often for the same wages!); they are less likely to admit that such an increase might also be obtained by investing in new equipment. This typical example illustrates the intricacy of the situation and the importance of agreeing on terminology and understanding the various perspectives that people have of a common problem.

Besides misunderstandings between the disciplines interested in productivity, we should mention another misuse of terms in the public discourse on productivity. Most macroeconomic analyses that raise concerns about our productivity do not refer to the absolute level as such, but rather to its growth rate, which tends to be lower than that of the other Western countries² (Thurow, 1992). This situation is often explained by the fact that the United States has seen such an increase in the productivity level since World War II that it is quite normal to see other countries' economies catching up after so much transfer of technology and capital into those countries (Baumol, Blackman and Wolff, 1989). The fact that the overall American productivity level is the highest in the world (and still increasing) rarely appears on the front page of a newspaper. However, because increasing the productivity rate is an accepted way to raise the standard of living of a society, the growth rate must remain a national concern as other countries (Japan, Germany) approach our absolute level of productivity. In fact, Japan's absolute level of productivity has already exceeded that of the United States in the manufacturing sector (Thurow, 1990).

² During the last decade, American productivity grew at an average of 1.2% per year, which is lower than for Japan, France, West Germany and United Kingdom.

3. The importance of productivity at the firm level and its relationship with performance

Due to the lack of a standard definition, productivity has been given several meanings and this often results in debates concerning its role in evaluating a system. In his recent book on the competitive advantage of nations, Porter (1990) uses productivity as the best standard for international competitiveness. Conversely, the latest World Competitiveness Report (1992) chooses to include productivity among 36 other measures of management quality which, in turn, represents one measure out of a group of eight major indicators³. Although most macro-economists and micro-economists would agree on a definition at the national level and the industry level (GNP or GDP per worked hour), it is difficult to reach a consensus on the role of productivity as a prime indicator and its relations with other variables such as innovation and quality. Such analysis is better done at the firm level (Carlsson, 1989).

The choice of this perspective is justified by the fact that no country can raise its national productivity on the long term without doing so at the firm level. This is in fact part of Porter's message when he says that "Firms, not nations, compete in international markets" (Porter, 1990, p. 33). Furthermore, any national call for increased productivity will produce results only if concrete actions are proposed to entrepreneurs and firm managers. And after all, let us show a bit of chauvinism: the authors, being engineers and management scientists, strongly believe that one must go beyond the vague message often heard about increasing the productivity. We must indicate how it is to be accomplished within firms, as they are the prime creators of wealth.

Sink, Tuttle and De Vries (1984) provide a simple but comprehensive model that groups together seven criteria covering what they call the **performance** of the firm:

³ The eight indicators used in this report are: Domestic Economic Strength, Internationalization, Government, Finance, Infrastructure, Science and Technology, People and Management.

TABLE 1

Criterion	Definition
Effectiveness	Doing the right things on time, and in the right manner, in terms of goals, objectives, goods, etc.
Efficiency	Ratio of resources expected to be consumed on the right things to resources actually consumed.
Quality	Conformance to specifications, fitness for use.
Productivity	Ratio of quantities of output over a period of time to quantities of input resources consumed by that system for that period of time.
Profitability	A measure or set of measures that assess attributes of financial resource utilization.
Quality of Work Life	Human being's affective response to working and living in organizational system.
Innovation	The creative response of adaptation of product, service, process, structure, etc., in response to internal as well as external pressures, demands, changes, needs, etc.

Adapted from Sink, Tuttle and De Vries (1984), p. 267.

Although some of these factors cannot be easily quantified, this model is important since it provides a comprehensive view of a firm's performance. It also contributes towards a better understanding of productivity vis-à-vis the six other measures. Thus, based on what was proposed by Sink (1985), one could say that a firm is effective and efficient, and yet it would not necessarily be productive when compared to similar firms. Similarly, another firm could have a productive manufacturing system while having low profitability at the firm level. This would happen if, for any reason, the firm's products did not sell as much as expected. Since the firm's output represents the products sold and delivered, the ratio output/input would remain low even if the manufacturing system produced the expected output. In real life, viewing those seven factors as a whole makes them easier to use by a

firm's managers. In fact, it is their responsibility to rate the factors according to the type of activities carried out by the organization. Although effectiveness remains important (after all, no organization can expect good results unless it does the *right* thing!), the other factors may be weighted differently, depending on the age of the organization, its environment or its activities. For example, productivity will not have the same weight when analyzing the performance of a school as compared to a firm that manufactures goods. This rating is an very important step as it precedes the no less important activities of measurement, evaluation, control and improvement.

Besides Sink's proposals for defining performance, The MIT Commission on Industrial Productivity (Dertouzos et al., 1990) has suggested a few other factors grouped around the term **productive performance**, such as timeliness of service, flexibility and command of strategic technologies. One can argue over whether **performance** should be defined by six, eight or ten factors but the fact remains that productivity, however important it may be, should never be considered as the only measure of a firm's performance. Although the causal relationship between all the factors remains to be proved, one can say that there is obviously a certain interrelationship among them. An innovative firm that promotes a good quality of work life is certainly more inclined to have high productivity compared to one that disregards that factor.

4. The renewed rules of competition and firm performance

The above discussion brings us to the importance of the overall rules of competition and the competitive context to the definition of performance as presented earlier. How do they ultimately affect our perception of the weight that should be attributed to the various different dimensions previously identified, including productivity?

Knowledge and Information

According to Davidow and Malone (1992), tomorrow's corporation will be evaluated on its capacity to produce "virtual" products, high in added-value and available when the customer requires them. To be able to provide such products or services, a firm will rely not only on new organizational forms which foster flexibility and adaptability and thus imposing a rethinking of business processes but also on a new kind of worker, the knowledge worker

(Drucker, 1993), who will be both product and client knowledgeable.

Recognition of the client's desires as the driver of all firm's actions towards improved performance lays the foundation of what Quinn (1992) calls Customer Driven Productivity. Although Quinn's work pertains to managing productivity in service firms, and despite the fact that his distinction between performance and productivity does not exactly reflect that of the present authors, the "intelligent enterprise" represents a useful framework for rethinking the performance of all firms. The author argues that traditional measures of productivity are restrictive because they are too oriented towards the firm's own structure and processes. Customers' expectations should indicate which productivity measures are to be developed and how they are to be weighted, hence the strategic importance of getting as much information as one can about customers (Davidow and Malone, 1992). From our perspective, we would add that the same approach should be used to evaluate each of the seven dimensions of performance indicated in Table 1.

Time and the New Corporation

The new rules of competition change the way buying, making, selling and delivering products and services are done. In this context, the basic assumption of organizing based on the specialization of labour may not be adequate any longer. Hammer and Champy (1993) argue in favour of new techniques which they refer to as business reengineering, where, essentially, businesses are asked to do "discontinuous thinking" with regard to the traditional ways of doing things and rely on individualism, self-reliance and willingness to accept risks and develop the capacity for change. This is very much in line with Tom Peters' Liberation Management (1992), in which he reflects on how corporations will need to rethink structures and processes to deal with the "nanosecond nineties".

All of the above factors point to a redefined competitive environment in which the notion of time takes on a whole new meaning. One can argue that time has forever represented a source of advantage for those who produced faster than their competitors. Making a widget more rapidly and delivering it sooner than other firms has always been advantageous, no matter what the product, the industry or the period considered. And yet some authors consider time as today's most powerful source of advantage (Stalk, 1988). This powerful characteristic may be due to the remarkable improvement in information technologies

during the last few decades and to their widespread diffusion. As reported by Davidow and Malone (1992, p.79): "in forty years computing has experienced a combined improvement in five dimensions of thirty orders of magnitude. Such a level of change is almost beyond human compass". With such a rate of improvement in technology, speeding the process from design to delivery can bring out any firm a long way ahead of its competitors in the race for more customers, as the Japanese and Germans have shown (Davidow & Malone, 1992). In this context, we believe that time-based productivity measuring and managing approaches should also be considered essential for helping firms in the new competitive battle.

TABLE 2

Level	Critical Attributes
Individual/Group	<ul style="list-style-type: none"> . The educated person (Drucker, 1993) * . The "empowered" worker (Davidow & Malone, 1992: 190) . Educated workers (Davidow & Malone, 1992) ** . Multi-dimensional jobs as a result of integrated processes (Hammer & Champy, 1993: 81)
Firm	<ul style="list-style-type: none"> . Productivity of knowledge workers and services workers (Drucker, 1993) . Playing "as" a team vs playing "on" a team (Drucker, 1993) . Reengineering to answer fundamental questions such as what a company must do, and how to do it (Hammer & Champy, 1993) . Flexibility and capacity to change and adapt . Tapping the power of information - business as information (Davidow & Malone, 1992)
National	<ul style="list-style-type: none"> . Making choices based on competencies . Developing knowledge in a few value-added sectors

* "the educated person is the social 'archetype' - to use the sociologist's term. He or she defines society's performance capacity, but he or she also embodies society's values, beliefs, commitments (...) The educated person will represent society in the post capitalist society in which knowledge has become the central resource (Drucker, 1993: 210-211).

** "People who can understand and use the new forms of information, who can adapt to change, and who can work efficiently with others. This requires the ability not only to read, write and perform simple arithmetic but to analyse and engineer" (Davidow & Malone, 1992: 8).

In summary, it is asserted that in the virtual corporation of the nanosecond nineties where knowledge becomes crucial and information a basic competitive tool, performance needs to be redefined. More specifically, we need to ask which dimensions of performance (including productivity) will become crucial for firm survival and what combination of these dimensions will best promote success. Taking a bottom-up approach, that is, going from the individual to the national level, which we feel may be the most appropriate way to rethink the seven dimensions, we propose that the critical attributes as presented in Table 2 may be essential in the years to come to the triad "time - information - knowledge".

5. Concluding Remarks

In spite of the relatively abundant research conducted in the last few years, we believe that the concept of productivity still appears confusing due to the great variety of approaches and definitions. Depending on which discipline is dealing with the concept, the level of analysis will also vary, from an individual perspective to a national one. A comprehensive integration is clearly required among the various concepts being used by economists, managers, engineers, psychologists and anyone else interested in the study of productivity.

In this article, we also support the idea that the concept of productivity is better understood when studied in the more global context of firm performance. From a rather simple indicator at the macroeconomic level, productivity then becomes a measure to be used in conjunction with six other factors (see Table 1) that contribute to the overall success of the firm. Although some of these factors, such as innovation and quality have particularly captured the attention of academics and practitioners during the last few years, little emphasis has been placed on presenting them in the larger context of a firm's performance. We believe that the multi-dimensional nature of firm performance must be reinforced in order to better appreciate the factors that contribute to the success of a national economy.

Moreover, as today's reality is characterized by time-based, knowledge-intensive and customer-driven competition, a new look at the various dimensions of firm performance (including productivity) may be required. In this regard, it appears that a bottom-up perspective and increasing preoccupation with the time dimension may pave the way for a better idea of how to respond to those new challenges.

Clearly though, more research is needed. We believe that a forum like the International Conference on Productivity and Quality Research should serve as a platform for proposing renewed approaches to firm performance and to productivity in particular.

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