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The Dynamics of Organizational Productivity

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Abstract

"Productivity" is an oft-discussed and vitally important concept; however, there exists a dearth of models concerning productivity and the factors which influence it. A fundamental model of "organizational productivity" depicting the dynamics of the system is presented to provide a pragmatic and pedagogical structure for analyzing productivity.

Introduction

"Productivity" often evokes an emotional, polarized, and perhaps irrational reaction from labor, management, stockholders, and consumers. News stories and advertisements point out the importance of productivity and the great need for increasing the level of output in order to maintain, if not increase, the standard of living and the quality of working life. Yet, it is apparent that much more is said about productivity than is known on the basis of sound research and theory.

A major factor in this problem is the lack of simple, yet systemic, models of productivity. Those models that do exist either concentrate on only one segment of the prob lem (3) or they fail to indicate relationships among the factors that eventually impact productivity (6). What is urgently needed is a variety of models of productivity, some simple and some complex, that will clarify the relationship between inputs and outputs that is called "productivity."

The purpose of this article is to present a relatively simple, yet comprehensive, model of productivity. The primary value of the model is to provide a common framework

for systems dynamics models of productivity and to prevent the meaningless dialogue that often results when various parties use differing connotations of the term "productivity." This new model reflects both an evaluation of the literature and a recognition of pragmatic relationships discovered during interviews with managers and workers from many business firms and governmental organizations.

An Input-Output Model of Productivity

The purpose of this elementary model of the firm (Figure 1) is to emphasize that productivity, at the firm level, is a function of all of the various inputs to the production function; and that, in turn, the firm's productivity is a major determinant of those inputs by providing the product or service to generate revenues that pay or reward the input factors. Viewed in this way, productivity is the pivotal point around which the firm, as a system, revolves.

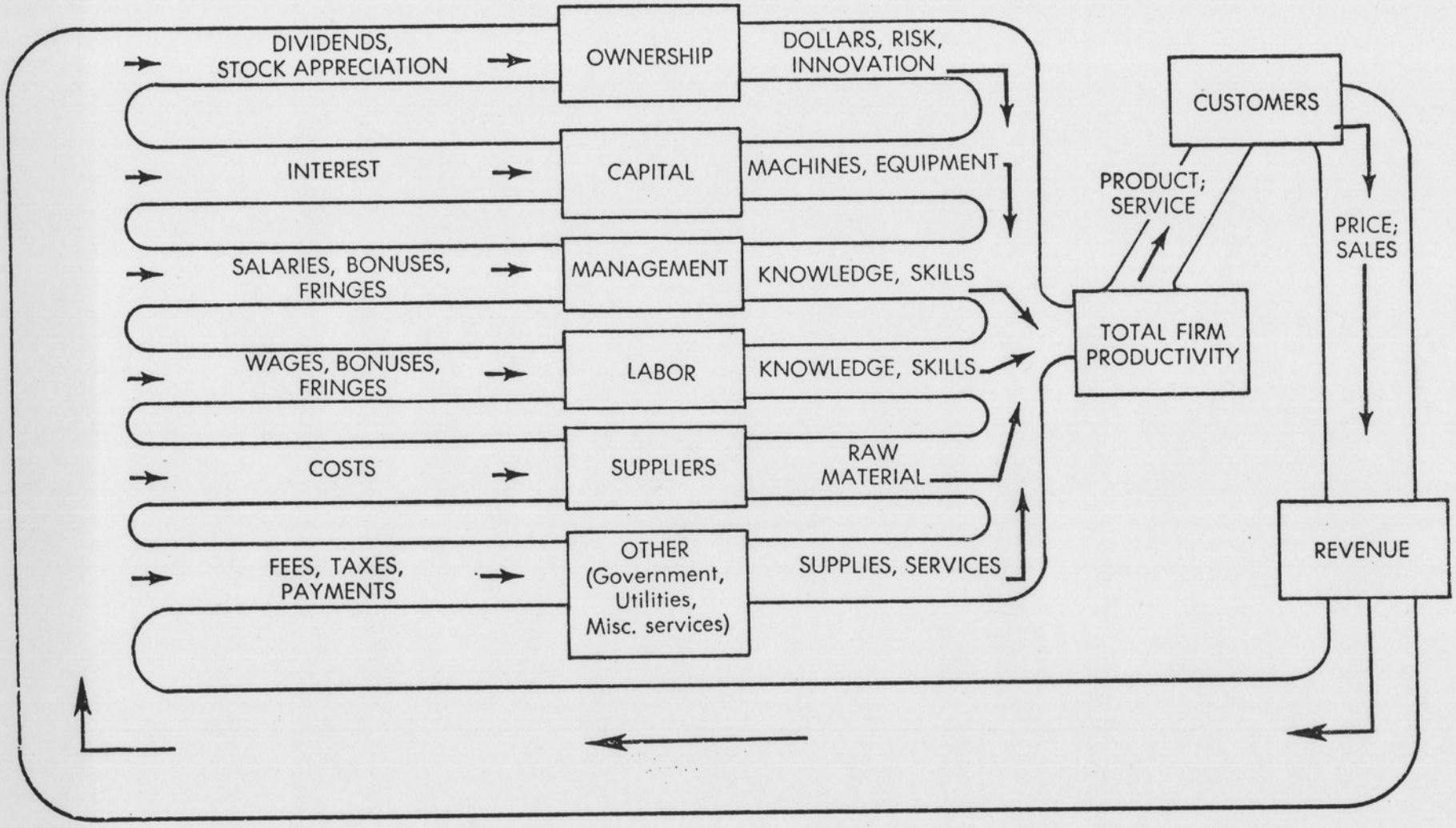
This model focuses on productivity and enlarges it relative to the other factors in this system. It is a distorted view of the importance of productivity only if one accepts the narrow definition of productivity as referring to the output of direct operative labor. The broader definition of productivity at the firm level -- the rate of conversion of inputs into all outputs -- is adequately represented and properly emphasized in the model of the firm.

Peter Drucker (2) recently said, "to be concerned exclusively with the productivity of the production worker is to look at only one factor." This leads to suboptimization -- raising the productivity of the worker at the cost of (less productivity of) capital, land, and physical resources. What is needed is a systems approach to include all factors. This model is designed to focus attention on all of the inputs to the firm's productivity and thereby instigate the development of a systems way of thinking about productivity.

Six sources of inputs to the firm are identified and the general nature of the input from each is shown. These factors of production are combined in some way within the "black box" labeled "Total Firm Productivity." No attempt is made in this model to indicate how those inputs are converted into goods and services. The purpose is to emphasize that output is a function of all these factors and that productivity is a function

FIGURE 1

AN INPUT-OUTPUT MODEL OF PRODUCTIVITY



of both the level of the inputs and the way in which they are combined.

The output of the firm flows to the customer where it is converted to dollars of revenue for the firm as determined by price and demand. The revenue then becomes a payment for each of the inputs to the firm, and the process recycles.

Dynamic Implications of the Model

The homeostasis of the system may be disturbed in any of several ways: (1) an exogenous change in the absolute level of one or more of the inputs, (2) a change in the relative levels of two or more of the inputs, (3) a change in the way in which a given level of inputs are combined (i.e. a change in the productivity), (4) a change in price, or (5) a change in demand. Furthermore, each of these changes may be instigated by the firm; or, in some cases, the change may be initiated by factors in the environment outside of the control of the firm. In any event, some reactive process is necessary to return the system to equilibrium.

The firm may change the absolute or the relative level of the input factors, thereby changing the level of output even though the efficiency of combining those inputs has not changed. For example, a new piece of capital equipment may be installed (perhaps combined with a reduction in labor) to cause an increase in output. If demand permits, this will result in an increase in revenue sufficient to at least cover the cost of the additional capital. Hopefully, the change generates enough revenue to also increase the flow of funds to the owners of the firm. If labor is reduced as a part of the change, payment to this factor is correspondingly reduced.

Sometimes changes occur that are outside the control of the firm. For example, an increase in the interest rates on capital will make capital more expensive relative to labor. The result should be a change toward a more labor intensive process in an effort to return the system to equilibrium. Exactly the opposite would occur if the initial change were an increase in wages or some other payment to labor. Similar statements can be made for any of the inputs; an exogenous change in one will require some change in the network to return the system to equilibrium. It should be noted, however, that the ownership factor is often the residual in the sense that it seldom has the

power to demand higher payments for its inputs; it must accept what remains after the other inputs are covered.

Changing the absolute or relative level of the inputs is only one way to return the system to equilibrium. A second way is by adjusting the price of the output. If demand will permit, an increase in the cost of some input, say in the cost of raw materials, can be passed along to the customer through an increase in price. Thus, if the model is viewed as a hydraulic network, price can be interpreted as an adjustment valve to balance the flow of output and dollars just as each of the inputs has an adjusting valve to control the flow of that input into the system.

Another major adjusting valve -- one that is often overlooked -- is productivity. If the cost of an input increases and demand in the marketplace does not permit adjustment of the price valve, the firm may have to "work smarter" if it is to avoid a decrease in the payments to the ownership of the firm. Working smarter means a better, more efficient way of combining the inputs to create more output with the same, or even less, inputs. In other words, the firm can attempt to increase its productivity.

If productivity is increased in direct response to cost pressures from some input, the additional funds generated may be directed exclusively to that input. However, the real world is seldom that simple. Many changes are taking place simultaneously, and the system is generally in a state of dynamic disequilibrium making adjustments in an effort to achieve a better balance. Thus, when a productivity gain is achieved, it is sometimes difficult to isolate the direct cause of the change and to recompense one input factor. Of the input groups, ownership and labor are likely to claim credit for the productivity gain and feel that they deserve the benefits from it (4).

This issue -- the equitable division of the benefits of productivity gains among owners, management, and labor -- is at the heart of many labor disputes and has formed the basis for many profit-sharing plans now in existence (5). This model will not solve that dispute, but it may serve to clarify the nature of the dispute by diagramming the part that each factor plays in the productivity of the firm and by establishing that each has a legitimate claim to the returns from productivity gains.

Measurement Implications

Other issues may also be discussed within the framework provided by this model. For example, measurement of productivity at the firm level continues to evade even the brightest of scholars. Whereas this model indicates that productivity is a function of many inputs, it leaves to the user the thorny problem of measuring those inputs (and outputs) in some comparable unit (1).

If the temptation to measure everything in dollars is overwhelming, consider the following questions as just a sample of the many problems that would then arise:

1. Should "labor productivity" refer to the output of one dollar of labor regardless of how much time that one dollar covers (or, alternatively, the output of labor per hour regardless of wage rates)?

2. If taxes are a payment to a factor of production (an input to productivity) then does an increase in taxes lower productivity? Alternatively, if a new road is built between a factory and a warehouse (but taxes remain the same), who reaps the benefits of the additional output that is then possible?

3. If a firm adds a second shift and its output increases by 75 percent, has its productivity changed?

4. Is output measured in dollars of cost or dollars of sales? If the former, then a firm can be highly "productivity" while items are rotting in inventory. If the latter, then a change in consumer taste alone can drastically change the productivity of a firm.

The purpose of this model is not to solve these issues -- the purpose is to create a framework so simple and understandable that these issues can be intelligently discussed by those who endeavor to solve them. If semantic incongruencies and conceptual misunderstandings can be reduced, perhaps progress toward a better understanding of productivity can be enhanced.

Conclusions

In view of the overwhelming emphasis that is being placed on productivity by virtually

all sectors of society, it is imperative that a better understanding of the phenomena surrounding productivity be gained before advancements in the productivity of organizations can proceed in other than a haphazard manner. If management is compared to medicine, we are at the "snake oil" stage with respect to curing the productivity problem. Many methods have been proposed and each shows some promise; yet, there is still a serious lack of fundamental conceptual models which would provide the framework for evaluating existing productivity improvement plans and developing new ones.

The purpose of this article has been to present a foundation model. The Input-Output Model of Productivity takes a systems approach by emphasizing that total firm productivity is a function of all of the inputs to the firm, their absolute and their relative levels and the way in which they are combined to yield saleable outputs. Thus, the following general definition of productivity is suggested:

> Productivity is a systemic concept concerning the conversion of inputs to outputs by the system under consideration.

There are a few important aspects of this definition. First, it attempts to establish productivity as a systemic concept as distinguished from most of the partial definitions currently used. Second, it creates a dual aspect of the term; input and output are both included. Third, it establishes productivity as a process of conversion or transformation.

Evidently, the complexity of productivity as a systems concept has hindered the development of models of productivity heretofore. Pedagogically and pragmatically, the lack of models of productivity, of measurement of productivity, and of organizational changes to improve productivity can no longer be afforded. In terms of model building, the basic components of the model and the variables to be included in behavioral relationships have been identified at an aggregate level. Units of measurement and form of behavioral relationships remain to be defined for systems dynamic models of organizational productivity.

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