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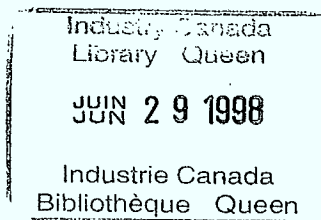
Canadian Workplace
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2^T OFFICE AUTOMATION
AND PRODUCTIVITY MEASUREMENTS:
SOME THOUGHTS!

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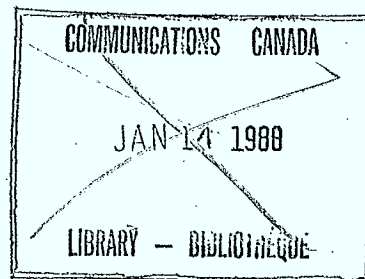
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Dr. George Wybouw

and

Richard Kanaan, MBA, MPA

Professor
Faculty of Management
Université de Moncton
and
Visiting Scientist
Canadian Workplace
Automation Research Centre
Government of Canada

Researcher
Canadian Workplace
Automation Research Centre



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INTRODUCTION

A recent U.S. Department of Labor study is predicting that employment in the manufacturing sector will decrease from the present 25% to only 5% of available labour at the end of this century. It is also predicted that employment in the agricultural sector will account for between 1 and 2% of the labour force and that employment in the other primary sectors will not exceed 3%. If we assume that unemployment will not be higher than 10%, it means that 80% of total employment will be found in the service sector or in services related activities in the primary and secondary sectors of the economy.

The Diebold Group (1982) forecasted that more than 50% of workers will be found in offices--workers involved with information and transactions--before 1990. And even in 1986, 75% of salaries go to white collars.

In Canada we lack these forecasts, but we can figure that we will not be too far behind the U.S.'s evolution! Some studies already indicate that more than 50% of Canadian labour force is involved with information processing activities (used in its wide meaning).

In order to assure continuous economic growth, we have to improve productivity. Increased productivity in the primary and secondary sectors succeeded remarkably well in this last century. Although productivity in these two sectors was counterbalanced by an increase in tertiary expenses, the industrial countries sustained a continuous economic growth. In the next two decades, in order to improve overall productivity, it will be compulsory to devote much of our efforts to the tertiary sector of the economy, the service sector. In the last ten years, the increase in productivity in this sector was only 2%, compared with more than 20% for the other sectors. "Business has spent billions, but white-collar productivity hasn't budged" can be read on front page of Fortune Magazine (May 26, 1986).

This low increase in productivity is often explained by a lower rate of investment in the workers of the tertiary sector (Katambwe 1986). Companies invest one dollar for an office worker, when they invest between \$15 and \$20 for a blue collar worker (Zisman 1979; Ader 1985).

The main objective of office automation is clearly to increase the productivity of office employees. However, probably for the first time since the concept of productivity was used (1766), there seems to be no clear and universal definition of the concept of productivity when applied to the office environment. Difficulties associated with the development of the model of productivity measurement in the office are methodological as well as conceptual. One thing is sure: we need to measure in order to manage.

The object of this presentation is to describe briefly how we see office work, to review the different approaches to productivity measurement and finally to discuss some of the problems we encounter in the development of productivity measurement models related to office automation.

OFFICE WORK

The office is still defined by many as the physical location where people (white collar workers) work. For researchers in the field, an office is an organized work group whose activities are related to a service. An office is a complex system, composed of persons, tasks and information which interact efficiently in order to reach common goals. Information becomes the most important part of the office. This evolution in definition came only with the emergence of the new information technologies.

White collar workers don't represent a homogenous group of workers. Clerical workers, professionals and managers have a diversified range of tasks, responsibilities and authority. Ruch (1982) distinguishes two principal dimensions in their classification: the level of autonomy and the level of tangibility of the office products. Grusec (1985) gives a similar classification by distinguishing between procedural type work and non-procedural type work. According to Sassone and Schwartz (1986), all office workers are involved with work of a procedural nature. Managers spend 23% of their time at clerical and support tasks and professionals spend 26% of their time at the same tasks. But even non-procedural work of managers and professionals involves lower-value activities.

One can say that white collar workers are a diverse group involved, at different levels, in procedural and non-procedural activities, which include high-value and low-value activities.

WHAT IS PRODUCTIVITY?

Productivity is the ratio of volume of outputs to inputs, inputs which include labour, capital, intermediate products and time. Being the ratio of the obtained production to the factors used in production, the numerator represents the results obtained and the denominator the sum of efforts and expenses produced in order to obtain these results.

Because of the difficulties in measuring all these variables, people have a tendency to use partial productivity instead of total productivity. Partial productivity is the total output on only one input instead of the sum of inputs. Productivity of capital and productivity of labour are just two examples of partial productivity measurement. These measures of partial productivity present important biases because the other explanatory variables are not controlled in most cases.

Finally, it should be noted that the meaning of productivity varies considerably when it is seen from the perspective of an economist, an accountant, an engineer, a manager or a psychologist (Tuttle 1983).

There is no management theory of white collar productivity (Diebold 1982), but there are different approaches or models to measure office productivity. We distinguished three major approaches: one based on office activities and tasks, one following the economic models and finally one based on normative approach (Sink et al. 1984).

Approach based on office activities

Booz, Allen (1980) and IBM (Diebold 1982; Ruch 1982) give interesting examples of this method. Booz, Allen examines time devoted to different office tasks, and concludes that managers and professionals spend up to 25% of their time at low-level activities. He expected, in 1980, that the basic elements of office automation could save 15% of the knowledge worker's time over five years. IBM defines 140 different tasks and 60 performance indicators. By creating a large data base and by comparing similar offices in different organizations, IBM measures differences in productivity (similar to added-value) and is able to make recommendations.

The main difficulties with these approaches is that they don't measure productivity at the organizational level and don't examine the level of contribution of office activities to the missions of the organization.

Economic measures

The model of the American Productivity Center is a good example of the economic approach to productivity measurement. Basically, it analyses two dimensions: productivity (input/output ratio) and cost accounting. In many cases, the APC uses partial productivity measures instead of the global model.

The major difficulty of using this approach consists in the identification of the outputs related to office work.

Normative approach

This approach attempts to identify productivity measures appropriate to each work group, taking into account the missions and the objectives of this work group. The evaluation is done by judgement concerning achievement of objectives or achievement of a certain level of performance.

Since the approach is group oriented, it is almost impossible to compare departments with each other or to analyse the contribution of each group to the global productivity of the organization.

DIFFICULTIES ENCOUNTERED

Difficulties encountered in developing productivity measurement models in an office environment are conceptual and methodological.

Conceptual difficulties

The lack of universal definition of the concept of productivity is considered to be a major difficulty (Kendrick 1977). Managers include in productivity efficiency, effectiveness, quality, working direction, sabotage, absenteeism, etc. (Katzell et al. 1975). Research being done presently at ten large Canadian organizations confirms that managers have a broad definition of productivity (Bernier & Kishchuk 1986, in progress).

Industrial-organizational psychology has no clearer definition of productivity. It seems the lack of consensus on the definition of productivity stems from a confusion between organizational productivity and performance. The term productivity should be restricted to the ratio discussed earlier; efficiency should be used as a measure of utilization of resources to produce outputs; effectiveness as a qualitative measure of mission and objective achievement. Performance should include the above plus some measurement particular to the organization.

Definition and implementation

As noted by Kishchuk (1986), in many organizations there is a slippage between definition and implementation. Even if productivity is well defined, it is evaluated by what can easily be measured. These measures often fail to capture the most important feature of the organization's mission. Word processing personnel may be measured by the number of key strokes or lines or pages typed; although these might be useful measures of some aspects of how well the organization is producing, they are by no means complete, and indeed fail to measure the organization's most meaningful outputs. In some cases, it was reported that the introduction of word processing in the organization created an unmanageable flow of documents at the manager's desk. Most reported productivity improvements due to office automation show increases in productivity of up to 300% after automation is introduced! These increases are to be found in measures of typing speed, graphic production and similar activities. But it is only when the main mission of the organization is to produce printed material or graphics that these measures are valid!

Individuals, groups and organization

As just pointed out, organizational productivity is not measured by the total of the individual productivities. Neither is it measured by evaluating the productivity of particular groups in the organization. Productivity has to be measured on the organizational level. Productivity gains might be very apparent at the group or individual levels but these gains are not automatically transportable to the organizational level.

Inputs

Input includes all production factors, capital, labor, materials and energy costs. In most cases the tendency is to pay attention to labor only and in particular to individual performance. Increases in productivity are therefore essentially related to a reduction in employment. This approach ignores the other production factors such as the considerable costs in equipment and training. Recent studies suggest that the rule of thumb for successful implementation of office technology is to spend as much on training as on the technology (Bikson et Gutek 1985).

Outputs

Outputs must also be measured. This is where things become more difficult. In the manufacturing context, there is a minimum level of quality of work in order to come out with the product. In office work quality control can vary from laxity to perfectionism. It means, in other words, that we have to measure both quality and quantity of outputs. Output quantities could include things like sales, customer service, reports produced, contracts signed. But it is the quality of these things that is central to organizational mission (Adam 1981). When quality of work is measured, it is often evaluated subjectively. In the process of designing a measurement model, we don't find that additive models (quantity + quality) are valid. We favor the multiplicative model.

Another difficulty is the definition of output. IBM centres on task and activity measurement. (Booz, Allen 1980) assumes that the outputs will remain constant and he works mainly on the evaluation of inputs.

It is also often advertised that giving managers access to more information through a decision support system will improve their decisions. As yet, this is not proven and one of the most important problems managers face today is the incredible amount of information they receive thanks to improved office technologies (electronic mail, more papers, more magazines, videoconferencing, sophisticated telephone systems, etc.).

FACTORS OF INCREASED PRODUCTIVITY

Productivity can be seen as the dependent variable and office automation as the independent variable in the model we want to study. But is office automation the only explanatory variable of productivity in the office? Of course not! Because other things happen when new technology is introduced than the mere arrival of new equipment, it is difficult to attribute effects to the automation only (Kishchuk 1986; Guzzo & Bondy 1983). Paul Strassmann (1985, 1986), in his study of 40 major companies with 200 measurements, supplemented by information on more than 100 variables describing the business, has concluded that there is no correlation between productivity and information technology. He even found, in some cases, a negative relation. In the same context, Strassmann (1986) has pointed out that information technology is not even included in the first 10 more important variables considered critical to productivity. Very

often, when office technology is introduced in the office, the technology itself suggests new ways to do things, many jobs are redesigned, there might be changes in the social climate, a new policy of information sharing is introduced, and the organization's culture might be changed. Quality circle-type user groups are formally or informally created, which might also increase productivity, as can changes in staff composition. As can be seen, there are many more explanatory variables to improved productivity than new information technology. "Getting results usually entails changing the way work is done" (Bowen 1986).

We believe that, even if the real effects or productivity are due to variables other than technology (the other explanatory variables), technology works just like a catalyst in a chemical experience: by helping the other variables to react on organizational productivity as a whole. Of course, it might be to the organization's advantage to see if similar benefits could be reached at lower cost. For this reason, it could be interesting to analyse the direct effects of office automation, by controlling the other dependent variables; but it might be rather difficult.

CONCLUSION

Difficulties encountered in the development of a rigorous evaluation model of the effects of office automation on productivity are various. There is still a lot of confusion about the concept of productivity itself. Inputs and outputs are not well defined. Should the model be multiplicative or additive? How can we measure productivity at the organizational level? Is office technology the real factor of increased productivity? Very few research labs in the world are tackling this very important question. Only when more efforts are made will we know the real impact of technology in the office. To users as well as the manufacturers, this question is a crucial one.

REFERENCES

- ADAM, E., HERSHAUER, J. & RUCH, W. (1981). **Productivity and quality: Measurement as a basis for improvement.** Englewood Cliffs: Prentice-Hall.
- ADER, M. (1984). **Le choc informatique.** Paris: Éditions Denoël.
- BIKSON, T. & GUTEK, B. (1983). **Training in automated offices: An empirical study of design and methods.** IFAC Training for Tomorrow. Leiden: IFAC.
- BOOZ, ALLEN (1980). **Multi-client study of managerial & professional productivity.** Booz, Allen & Hamilton Inc.
- BOWEN, W. (May 26, 1986). **The Puny Payoff from Office Computers.** Fortune Magazine.
- DIEBOLD AUTOMATED OFFICE PROGRAM (1982). **Productivity casebook: Measuring organization performance** (Document Number 210M), Diebold Group Inc.
- GRUSEC, T. (1985). **Office automation and productivity in government offices.** Ottawa: Department of Communications.
- GUZZO, R.A. & BONDY, J.S. (1983). **A guide to worker productivity experiments in the United States 1976-81.** Toronto: Pergamon Press.
- IBM (1980). **IBM Measures Indirect Performance Through CSS Technique.** National Productivity Report 29.
- KATAMBWE, J. (1986). **Office Automation as a productivity improvement program.** (Unpublished paper) Laval: Canadian Workplace Automation Research Centre.
- KATZELL, R.A., YANKELOVICH, D.F., FEIN, M., ORNATI, D.A. & NASH, A. (1975). **Work, productivity and job satisfaction. The Psychological Corporation,** New York.
- KENDRICK, J.W. (1977). **Understanding productivity.** Baltimore, Md.: John Hopkins Press.
- KISHCHUK, N., ARDOUIN, P., BERNIER, M., GUAY, M. & WYBOUW, G. (April 1986). **Evaluating the productivity impacts of office automation. Paper presented at the annual conference of the Canadian Evaluation Society,** Banff.
- KISHCHUK, N. & BERNIER, M. (1986). **The Management of Productivity and Office Automation in large organizations: a fact-finding mission.** (in preparation) Laval: Canadian Workplace Automation Research Centre.

- PANKO, R.R. (1984). Officework. *Office: Technology and People*, (2), 205-238.
- RUCH, W.A. (Fall 1982). The measurement of white collar productivity. *National Productivity Review*, 416-426.
- SASSONE, P.G. & SCHATZ, P.A. (February 1986). Cost-justifying office automation. *Datamation*, 83-88.
- SINK, D.S. (1984). Using the nominal group technique effectively. *National Productivity Review*, 2(2), 173-184.
- SINK, D.S., TUTTLE, T.C. & DEVRIES, S.J. (Summer 1984). Productivity measurement and evaluation: What is available ? *National Productivity Review*, 265-287.
- STRASSMANN, P. (February 11, 1985). Information Payoff. *Computerworld*, ID 15-32.
- STRASSMANN, P. (May 14, 1986). The Transformation of Work in the Electronic Age. Conference given at the Montreal Office Automation Group.
- TUTTLE, J.C. (1983). Organizational productivity. *American Psychologist*, 38 (4), 479-486.
- ZISMAN, M. (Spring 1978). Office automation: Revolution or evolution ? *Sloan management review*.



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veuillez communiquer avec :

*Le Centre canadien de recherche
sur l'informatisation du travail*
1575, boulevard Chomedey
Laval (Québec)
H7V 2X2
(514) 682-3400

For more information,
please contact:

*Canadian Workplace
Automation Research Centre*
1575 Chomedey Blvd.
Laval, Quebec
H7V 2X2
(514) 682-3400

