# Improved port productivity through a partnership between human beings and technology

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## Abstract

For the last few decades the focus of the port society has been on technological advances that make productivity less dependent on human effort, knowledge and skills. But this approach can go only so far. At some point attention must also turn to productivity improvements through people. Ports should be seen as "Socio-technical" systems because, in practice, operations in port terminals are carried out by a partnership between human beings and technology. This partnership, however, can only be successful if the appropriate emphasis is given to Human Resource Management (HRM), an often over-looked area which can have a significant impact on port productivity. This paper presents real life evidence which clearly demonstrates that port organisations which have acknowledged the importance of HRM and have correctly practised it, have achieved not only an impressive, but more importantly, a continuous growth in productivity.

## 1 Introduction

Real life experience has shown that any profit margins which, as a result of current levels of productivity, are enjoyed by port operators at a given time, will eventually disappear due to a number of changes that always take place in the world and have a direct or an indirect impact on the global transportation system and consequently on ports. The current trend of port privatisation and avoidance of public subsidisation renders the generation of profits as the only realistic means to support the survival and growth of ports.

Hence, port operators are not only interested in just measuring, reporting and comparing productivity, which no doubt, are the crucial steps in any effort towards raising productivity, but in actually achieving a continuous increase in productivity.

The following three key factors contribute to port productivity improvement at organisational level: (1) the quality and appropriateness of the technology; (2) the management skills in developing relevant strategies and integrating human and other resources and (3) the amount and focus of the effort expended by people. Therefore, when studying port productivity increase as a system, this system has three subsystems, namely, technology, managerial skills and human resources.

## 2 The relationship between performance, efficiency, productivity and human resource management

Productivity in any system is the output per unit input. The term usually defines output of goods or services per hour of labour. However, it is recognised that many other factors may be involved besides worker efficiency. Basically, productivity is a measure of efficiency in the utilisation of resources, or, as otherwise stated, productivity is the efficiency of the transformation process of converting inputs in to outputs, at the societal, organisational, group or individual level.

In turn, efficiency is one of the three basic output dimensions of organisational performance as shown in the following relationship.

Performance = effectiveness, efficiency and participant satisfaction.

Effectiveness is concerned with the accomplishment of explicit or implicit goals, whereas efficiency refers to the ratio of output to input, or benefit to cost. It is possible to be effective but inefficient, thus squandering human and material resources. Conversely, it is possible to be efficient and ineffective. Organisations sometimes emphasise doing things right at the expense of doing the right things.

Today's society, requires organisations, not only to accomplish their goals and to be efficient in using resources (productive) but also to provide a climate that enhances the well-being and satisfaction of the human participants. Participant satisfaction is an equally important ingredient of organisational performance.

The basic factors that lead to performance are, ability effort and opportunity, i.e. performance is a function of these three variables [i.e. Performance = f (ability, effort, opportunity)]

The above three factors are inputs that, taken together, determine the results of individual and group endeavours. Organisational performance, can therefore, be viewed as a system which has three interrelated and inseparable parts. No ability or no effort or no opportunity can negate the other two factors. It is a multiplicative relationship.

Ability is a function of human knowledge and skill and technological capabilities. It provides an indication of the range of possible performance. Effort is a function of needs, goals expectations and rewards. How much latent human capability is released depends on the degree to which individuals and/or groups are motivated to expend mental and physical effort. But nothing happens unless managers provide an opportunity for individual ability and effort to be used in meaningful ways. Organisational performance is, thus, dependent on the success of individuals and groups in achieving relevant goals. The above argumentation leads to the conclusion that the control and influence of most of the factors of productivity, efficiency and organisational performance, fall within the regime of Human Resource Management (HRM). Therefore, it is very important to clearly define the relationship between productivity and HRM.

As it has been stated in the introduction of this paper, when studying port productivity increase as a system, this system has three subsystems as shown in Figure 1. below:

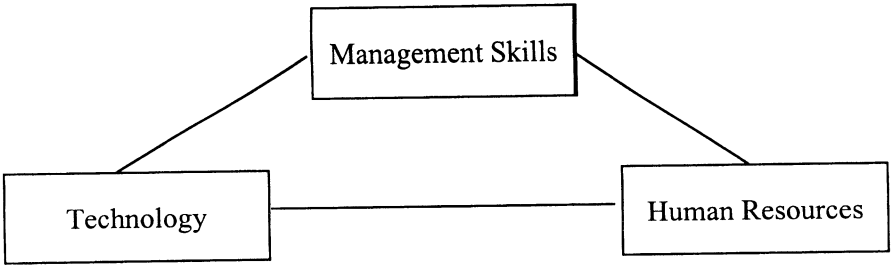



Figure 1: The three key factors of productivity increase.

A breakdown in any one of these subsystems has adverse effects on productivity. In the past, ports and particularly container terminals, focused on improving productivity through better technology i.e. yard inventory systems and automatic positioning, close circuit monitoring systems, computers and information systems, innovative container handling systems such as driverless cranes and other applications of automation are some examples of this approach. Unfortunately because

of past successes with technology, terminal operators tend to neglect the other two factors and particularly human resources.

The amount and focus of effort expended by people is vitally important to productivity. The appropriate tool to achieve productivity through people is Human Resource Management.

The term Human Resource Management (HRM) was first used in the 1980's and has to a large extent, replaced the term Personnel Management. This change of terminology, has signalled the new way of undertaking the personnel management role; HRM is a term which stresses the development of people as assets rather than their control as costs, and places people management at the strategic heart. At the heart of all HRM activities is the human resource plan or strategy. This is the centerpiece, where manpower objectives are set out. Such objectives would include the motivation and development of the work force and the creation and maintenance of a harmonious working climate in order to promote productive relationships and maximum commitment and effort from work force. In simple terms, it can be stated that one of the main objectives of HRM is to improve productivity through people.

# 3 Port Productivity through people

The issue of productivity through people is how to increase output with existing, or even decreasing, resources. Increasing productivity through people, however, is not a matter of having them work harder. Many people throughout the world, particularly in the developing countries, work extremely hard but have little output. The key is not working harder but working smarter. Sometimes, it is not possible to drive a good port labour force to work say 30% harder but it is possible that can work 30% or even 50% smarter. "Working Smarter" in a Port terminal would mean for example, eliminating unnecessary tasks, developing a strong sense of teamwork, providing continuous staff training or giving employees more say about how to do their jobs and in problem solving. The psychosocial system has been neglected as a source of productivity improvement.

Experience from some ports, and particularly from PSA (Port of Singapore Authority) suggests that greater employee participation and involvement are vital factors in improving productivity. At organisational level, it is important for port management to recognise that many strategic and operating decisions affect the psychological system and are directly related to productivity. This is particularly true of decisions that have a direct impact on the people involved. A successful

management response to the productivity challenge requires the basic recognition that decision which affect people, such as promotions, rewards, placements, development etc. are critical in the motivation of a port's work force.

Productivity is influenced significantly by the motivation and effort of people. People who have a strong commitment to the relevant organisational goals generally show a high performance level.

Implementation of some form of employee gain-sharing system can also be motivating and effective. Most people respond positively when they have a financial benefit in improvements of productivity. Strong evidence suggests that becoming more people-oriented have significant payoffs in terms of productivity. Nonmanagers can contribute a great deal to improving port productivity. In the past, they were asked to bring their bodies to work but leave their minds at home since management would do the thinking. Improving terminal productivity through people means creating an organisational climate of collaboration and commitment. Promoting the idea of "every employee a manager" and developing self-managed work teams or problem solving groups, such as quality circles (QC), have proved to be very effective in those few ports that have adopted this HRM style. Reward systems for high performance and appraisal systems that provide continuous feedback are also important in productivity-oriented HRM.

Over the past several decades the capability of port labour has increased substantially. As people become better educated and trained, ports no longer need to rely on technologies and managerial approaches geared to unskilled workers. Instead, the level of skills available sometimes influence the selection of the appropriate technologies and managerial approaches. This could be carried one step further and suggest that the issue of human performance and satisfaction may eventually become an important determinant of the type of technology to be used. The port industry may be entering an age in which people are no longer forced to adjust to technology, but rather technology will be adapted to people. This may be the most important characteristic of future "Socio-technical" port systems.

The above discussion on terminal productivity through people can not be considered exhaustive. However, since the majority of the ingredients of "productivity through people" are outlined, it is believed that the point is adequately made. The key ingredients which are stressed above are motivation, strong commitment and collaboration, strong sense or team work, work smarter, more employee participation

and involvement, employee satisfaction, reward systems, employee sharing systems, and training which is further discussed herebelow.

# 4 Staff Training in Ports

Investments in new technology can have important payoffs for improved productivity. But so can investments in improving human performance. Human Resource Development (HRD) is an inseparable component of correct HRM.

The term HRD was first used by Professor Leonard Neddler of George Washington University. He introduced the term at the conference of the American Society for Training and Development (ASTD) held in Miami some 30 years ago. Professor Nedler's definition of HRD is the following: "The provision of organised learning experiences in a specified period of time, for the possibility of improving performance or the general growth of individual.

In addition to port efficiency/productivity improvement there are a few more reasons which make it vital for ports to train their personnel. One of them is the enhancement of the status of port personnel. Systematic training of port personnel will help to raise their professionalism and social status. Training will enhance their motivation and career advancement prospects. Another reason, which is of paramount importance, is to keep pace with technological change. Specialisation in shipping has resulted in new cargo handling technologies. These have profoundly changed operational practices and procedures needed for the safe and efficient handling of cargoes.

To keep pace with changes in shipping and port technology, training and re-training of all levels of port personnel is vitally necessary. Port personnel need to be equipped with higher skills to operate sophisticated equipment and to manage computerised systems. Particular emphasis needs to be placed on the training of such key personnel as equipment operators, technical staff and managers.

Equipment operators must be trained to operate a wide range of cargo handling equipment to maximise their productivity through interchangeability. They must be trained in basic equipment maintenance skills as well as operational safety. Their educational level must be raised to enable them to comprehend and respond effectively to operational instructions. They should also be trained to use computers installed in container handling equipment.

The skills of technical staff must be upgraded to keep pace with changes in equipment technology. Ports must endeavour to cross-train

technicians in various disciplines to enable them to repair and maintain complex equipment which incorporate mechanical, electrical and electronic systems. Technicians should also be trained in fault diagnosis, planned maintenance, cost control techniques and workshop safety.

Managers and supervisory personnel need to possess a broad knowledge and understanding of port management and operations. They must be trained in participative management techniques to better supervise and motivate an increasingly educated workforce. They should be trained in problem solving skills and to use information technology for operational planning and decision making. With the demand by port users for higher levels of service, managers and supervisors should be imbued with a sense of commitment to productivity and quality of service.

# 5 The position of ILO and ITF on the issue of worker - technology relationship in Ports

The fifty-eighth session of the General Conference of the International Labour Organisation (ILO) held in 1973 noted the considerable repercussions of technological change on the conditions of work and life of dock workers and emphasised that dock workers should share in the benefits secured by the introduction of new method of cargo handling. ILO produced six articles as requirements to meet this end, which are included in what is called the ILO Convention No. 137.

This Convention assigns great importance on the worker-technology relationship in ports and particularly on the issues of efficiency and training. More specifically, Article 5 states that cooperation should be encouraged between employees and their organisations, on the one hand, and workers' organisations, on the other, with a view to improving the efficiency of port work. Moreover, Article 6 requires that appropriate vocational training provisions should apply to dock workers.

As well as convention No. 137, the fifty-eighth Session of the General Conference of ILO adopted Recommendation No. 145. This Recommendation, among other, calls for training and retraining to enable dock workers to carry out several tasks as the nature of work changes.

The International Transport Workers' Federation (ITF) in 1994 assigned Peter Turnbull of the School of Business and Economic Studies of the University of Leeds and Victoria Wass of the Trade Union Research Unit of the University of Wales College of Cardiff in U.K. to undertake a study titled "Reform and Structural Adjustment in the World's Ports". In the report of this study which was published by ITF in

1995, it is stated that Convention No. 137 and Recommendation No. 145 are still applicable in broad terms for the future and that they continue to provide a set of standards for ports which can encompass the latest developments in cargo handling, automation, mechanisation and computerisation.

ITF has also produced, in 1993, a Model Technology Agreement (MTA) in which 14 points are recommended to be included in any agreement on the introduction of new technology. The following points of the above MTA are of relevance to the "Socio-technical" character of Ports:

- Measures must be agreed to provide for retraining and redevelopment of existing workers whose jobs are eliminated or substantially altered by the introduction of new systems.
- Measures must be agreed to ensure that the introduction of technological change is carried out in a way which enhances the quality of jobs, raises the level of skills required and produces a safe and healthy working environment.
- Training programmes must be designed and agreed to ensure that all port workers using new systems are fully equipped with the necessary skills.
- Measures must be agreed to ensure that any economic benefits to the employer resulting from the introduction of new technology are equitably shared with the workforce as well as, if necessary, used to compensate workers whose employment is affected by technological change.
- The employer will fully respect the provisions of ILO Convention 137 and Recommendation 145 on the social repercussion of new methods of cargo handling in docks. The employer will respect these instruments at all times, and in particular, in connection with the introduction of new technology.

# 6 A real life example of a successful "Socio-technical" port system

The Port of Singapore's productivity growth in terms of value-added per employee grew by 9.7% in 1996 while value-added per employee dollar grew by 1.8%. However, 1996 was not a year of exceptions for the Port of Singapore Authority (PSA) with regard to productivity achievements. In fact, PSA has been constantly experiencing such growth rates in productivity for more than fifteen years. 1996, though, marked the 15th year of PSA's Quality Circles (QC) movement. The novel concept of QC

together with other staff oriented productivity programmes such as the Productivity Suggestion Scheme (PSS), productivity reward schemes etc, and the excellent HRD programmes which have been introduced over the years, clearly demonstrate the people-centred management approach of PSA. On the other hand, the emphasis on productivity through use of modern technology and efficient management of resources which has always been assigned by PSA, highlights the technology-centred management approach of PSA. The above management style clearly demonstrates the "Socio-technical" character of Singapore's port system.

This message is also clearly conveyed through PSA's Mission Statement which, among other, states the following two corporate commitments:

To our employees

Recognising them as our most important resource, we will provide a rewarding and challenging environment, with teamwork and good union-management relations, to help them realise their potential.

To technological excellence

We will use the latest port and information technologies to gain competitive advantage.

PSA, through the practice of correct management has achieved a rational balance between HRM and technology. In this way PSA has constantly maintained its position as one of the world's leading ports.

PSA's most recent performance statistics constitute the best evidence for the effectiveness of PSA's balanced investment in infrastructure, technology and people. PSA has achieved a 9.3% growth in container traffic in 1996 which was the world's highest growth rate, thus increasing the total container traffic from 11.85 million TEU's in 1995 to 12.95 million TEU's in 1996, just 250.000 TEU's short from the 13.2 million container traffic of Hong Kong, the busiest port in 1996. Singapore was not only the second busiest port in the world in 1996, but was also the only port to achieve a throughput increase of more than one million TEU's i.e. 1.1 million.

The above registered container traffic figures in 1996 would not have been considered as evidence of success if they were not accompanied by positive productivity growth figures.

PSA's achievements would not have been possible without a team of well trained, motivated, dedicated and committed staff. The following facts and key statistics clearly demonstrate how PSA's HRM has succeeded in maintaining a people-focused culture leading to a workforce with all the above characteristics, thus proving, without any

doubt, that "productivity through people" is not just another theoretical terminology but an achievable task:

PSA invests a significant amount in training its nearly 8.000 staff.

The training budget has increased from 9.8 million Singapore dollars for 1995 to 16 million for 1997. The 1995 training budget represented a 3.1% of the total wage bill, while the one in 1997 represents a 4% of the payroll. The average man-days of training per employee per year is of the order of 8 days (approximately 56 hours). In addition to developing a learning organisation to get staff personally involved in improving themselves, PSA launched in 1996 a corporate-wide team-building programme. This programme emphasises communication and team-building among participants.

A voluntary organisation-wide employee opinion survey was also conducted in 1995 by an independent external consultant to provide management with a better understanding of the needs, concerns and aspirations of the staff.

# 7 Concluding remark

Human resource management is an often over-looked area which can have significant impact on Port productivity. Human factor is not, however, the central point, neither technology nor management skills. A rational balance is what is the recipe.

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