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REFLECTIVE PRACTICE

Developing the organization's productivity strategy in various sectors of industry

P.R.A. Oeij
School of Management, Open University of The Netherlands, Heerlen, The Netherlands and TNO, Netherlands Organisation for Applied Scientific Research, Hoofddorp, The Netherlands, and

M.P. De Looze, K. Ten Have, J.W. Van Rhijn and L.F.M. Kuijt-Evers
TNO, Netherlands Organisation for Applied Scientific Research, Hoofddorp, The Netherlands

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Abstract

Purpose – The paper aims to present an approach to improve the organisation's productivity which is applicable in every industrial sector. The nucleus of the approach is to develop an optimal productivity strategy in an organization by the application of a uniform static model of productivity (Q4-model), covering quantity and quality aspects and applicable to various sectors of industry, and a dynamic control cycle.

Design/methodology/approach – The study discusses the steps of the approach and presents three case studies from different industrial sectors where the approach has been applied.

Findings – The approach has proven to be uniformly applicable in all three cases from these different sectors, namely consultancy, health care and manufacturing. Across these applications highly different productivity-related challenges, productivity strategies, and specific interventions are described in the perspective of the Q4-model.

Research limitations/implications – The approach is not made for measuring the quantity and quality input and output factors of productivity.

Practical implications – The approach succeeds in developing a productivity strategy which combines quantity and quality input and output factors and supports the transformation of a strategy analysis into a practical intervention.

Originality/value – The approach is unique in its uniform applicability to every industrial sector and is helpful to entrepreneurs, managers and innovators.

Keywords Productivity, Quality, Knowledge work, Service industry, Manufacturing, Q4-model of productivity, Productivity rate, Manufacturing systems

Paper type Research paper

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1. Introduction

Europe today faces major socio-economic challenges, such as the financial crisis, the worldwide competitiveness, the climate change and the ageing population. Economic growth is considered to be crucial in order to overcome these challenges and to compete successfully with the emerging economies of China and India. A key variable in relation to economic growth is productivity. On the (trans-) national level, productivity is usually measured in terms of the volume of labour used in relation to the output produced in terms of the gross domestic product (EANPC, 2005). The national productivity is partly derivable from the productivity levels achieved in individual organisations or enterprises within the nation.

At the level of an enterprise, a high level of productivity is one of the crucial variables to perform well, to compete successfully and to survive. At this level, productivity is basically described as the ratio between outputs and inputs, where the inputs comprise all factors utilized to produce the output demand. The input factors include labour (man hours or fulltime equivalents) as well as capital and resources. The outputs of the enterprise may be defined in terms of physical volumes (e.g. tons produced) or financial indicators (revenues or profits or added value) (Eilon, 1985). This way of thinking of productivity finds its origin in the traditional manufacturing industry (e.g. Sink, 1983), where the inputs and the outputs are often tangible and quantifiable. In these cases, the monitoring and managing of productivity is relatively straightforward and is often associated with increasing efficiency.

It is contentious however, whether this traditional concept of productivity also holds for the large variety of private and public organizations in our modern society. Specifically, it can be questioned how this concept relates to the performance or competitive strength of contemporary organizations. Many of these organizations are characterized by a certain amount of knowledge work, rather than routine manual work only, and the deliverance of services, rather than discrete numbers or volumes of tangible products. It can be argued that in such organisations not only quantities of inputs and outputs, but also aspects of quality are of relevance from the perspective of organizational performance (Grönroos and Ojasalo, 2004). At the input side for instance, the creativity, the motivation and the commitment of workers might be an equally or even more important determinant of productivity than the number of workers. Similarly at the output side, the appreciation of services by customers might add more value for a company compared to the exact volumes of services. Therefore, a meaningful concept of productivity for organizations that (at least) partly rely on knowledge work, should incorporate quantity as well as quality aspects, both at the input and the output side. This idea has been presented as a specific requirement of the service industry (Vuorinen *et al.*, 1998). It is suggested that this way of thinking can be of relevance in all sectors of industry, which is explored in this paper.

The incorporation of quality aspects complicates the management of productivity in an organization. One of the difficulties concerns the measurement of productivity and, even more, its mathematical calculation. These problems and the practical methods and approaches to deal with this complexity have been recently described and illustrated by a case study in municipal administration (Jääskeläinen and Lönnqvist, 2009). Another difficulty concerns the development of the most effective productivity strategy. With the increasing relevance of quality aspects, the number of options to influence the productivity of an organisation rapidly increases.

Based on a study by Janssen (2010) it seems clear that at least three interconnected problems that are discussed in the literature need to be dealt with: the integral character of productivity, the confusion of concepts and the topic of measurement. Although the basic definition of productivity is simply the ratio between inputs and outputs, many researchers agree that this simplification violates reality. However, more realistic definitions, which are suggested over time have resulted in a proliferation of combinations of variables. The concept of productivity has become as broad as a "garbage can" definition or "umbrella term" (Johnston and Jones, 2004; Tangen, 2005). Janssen (2010) shows that many researchers have tried to create holistic concepts, but that it has also resulted into considerable confusion, differences of opinion and conflicting definitions. Productivity as a concept is, for example, related to efficiency and effectiveness (Rutkauskas and Paulavičienę, 2005), to tangible and intangible assets (Vrat *et al.*, 1998), and it was being put on a par with performance (Sink, 1983) and profitability (Tangen, 2005). Other aspects that were associated with productivity further broadened the concepts, such as the time factor (e.g. lead time) (Johnston and Jones), quality (Drucker, 1999; Grönroos and Ojasalo, 2004), the role of clients or customers (Martin *et al.*, 2001), value creation (Rutkauskas and Paulavičienę, 2005) and capacity planning (McLaughlin and Coffey, 1990; Jääskeläinen and Lönnqvist, 2009). Broadening the scope of productivity, therefore, indeed enhanced the insight into relevant variables, but it was not elucidating the concepts (Tangen, 2005). Especially with reference to knowledge work and services it only lead to more confusion. There was a need to make productivity applicable outside traditional sectors, which made it necessary to not only define productivity itself, but also the characteristics of knowledge work and services. Instead of limiting the field a further expansion was the result. Obviously, knowledge work and services are slippery concepts themselves, and are according to Janssen (2010) to a large extent intangible, perishable, reflecting the production and consumption simultaneity, heterogeneous in customisation, intransparant and identifiable to persons (Armistead *et al.*, 1988; Brignall and Ballantine, 1996; Drucker, 1999; Gummesson, 1998; Jääskeläinen and Lönnqvist, 2009). Just as with the term productivity the several connecting variables are explaining why the scope of knowledge and service work was broadened, namely the role of clients, the characteristics of this type of work and its workers, namely professionals (Janssen, 2010). Characteristics of professional and knowledge work are its limited task specifications, significant amount of mental tasks, long cyclical tasks and limited specifications of targets, and a process in which brainwork leads to new knowledge (Drucker, 1999; Ray and Sahu, 1989; Ramirez and Nembhard, 2004; Jääskeläinen and Lönnqvist, 2010). Its intangibility seems paramount. Janssen (2010) points out that such processes are hard to get a hold on, because their variables are connected in a non-linear way, which gives ground to the argument that it is important to study the process of knowledge and service work in an integral way, from a systems thinking perspective. Otherwise, one is missing too many relevant variables. This integral process, however, goes beyond boundaries of the organisation and connects employees and clients / customers in many ways. The non-linearity of that process leads to the third issue, namely that of measuring productivity of knowledge work. In a complex process with many agents it is difficult to determine what to measure when one speaks of productivity, let alone how to measure it, since straightforward causality is almost absent (Janssen, 2010; Ghalayani and Noble, 1996; Vrat *et al.*, 1998; Sherman

and Zhu, 2006). This article avoids these three interconnected problems, because it focuses on a method to improve productivity strategies for organisations. The complexity of the situation to get a grip on productivity is regarded as given. How can entrepreneurs nevertheless be facilitated by a practical approach?

The main question to be answered in this paper, of practical and continuous relevance for many organisations, is: "how to develop the strategy to improve the productivity in a private or public organisation". To answer this question an approach is proposed based on a model of productivity that includes both qualitative and quantitative aspects of inputs and outputs, and a mechanism to exert control over the dynamics. The central question can be subdivided into some sub- questions: what is the productivity challenge of the organisation; which quality and quantity aspects are the underlying elements with regard to this productivity challenge; how can this productivity challenge best be translated into a productivity strategy; and finally, how can this productivity strategy be made operational through interventions in the work process? In exploring this strategic approach the following steps are taken:

(1) Two elements of the approach are described. The first element is a static model constituting the productivity defining quality and quantity aspects, as deduced from the service productivity concept of Vuorinen *et al.* (1998). The second element describes the dynamic connection between inputs and outputs and the options to intervene from the perspective of the "control cycle".

(2) This approach is applied to three organisations from three highly different sectors of industry, namely health care, consultancy and manufacturing, respectively. By these examples it is aimed to show the applicability and relevance of the approach in various sectors of industry.

(3) Based on these three case studies, a final purpose is to define the generally applicable handles that companies could use in finding their optimal productivity strategy.

2. The Q4-model of productivity

In the service productivity concept of Vuorinen *et al.* (1998) quantity and quality aspects on the input and output side, are considered together to provide a joint impact on the total productivity of the service firm. An exact definition of productivity is not applied in this paper. Instead, productivity is understood as a broad concept, which may overlap with such notions as performance. The reason for this is that entrepreneurs and managers will have different understandings of productivity strategies. Besides, it is an arduous task to measure the productivity of such diverging work from service workers, manufacturing workers and knowledge workers in a standardized, uniform way. The approach being proposed should be applicable to a wide range of practical circumstances. In the light of the views expressed in the service literature (Grönroos and Ojasalo, 2004; Van Looy *et al.*, 1998), the productivity concept may cover the key factors of success for a service firm (Vuorinen *et al.*, 1998). Vuorinen *et al.* applied their concept to a large Finnish insurance company. Interviews with key-actors lead to a list of elements that could be distinguished underlying the various quantity and quality inputs and outputs (see Table I).

Vuorinen *et al.* (1998) concluded that the model provided a comprehensive approach to evaluate the total service productivity. The approach appeared to widen the

Output quantity	*Output quality*
Service volume	Customer satisfaction
Assortment	Customer encounter and service
Market share	Standardized services
Customer segments	Access time
	Customer co-production
	Correct insurance registers
	Corporate image
Input quantity	*Input quality*
Labour	*Intangible*
Amount of labour	Employee satisfaction
Recruitment	Expertise and skills
Job rotations	Performance criteria
Job descriptions	Recruitment and retaining personnel
Service process re-engineering	Personnel development programs
Error avoidance	Teamwork
Overtime	Organisation structure
Capital	Corporate culture
Information technology	IT breakdowns and system errors
Electronic channels	*Tangible*
Self-service policy machines	Branche office locations
Headquarter and office network	Branche office interiors
Telework facilities	

Table I.
The quantity and quality dimension of service productivity in an insurance firm (Vuorinen *et al.*, 1998)

company's perspective, since at the time of the survey the elements of the list were not yet all included in the firm's productivity concept. The company management acknowledged that new assessment tools needed to be developed, regarding the intangible quality elements mainly. Another lesson learnt from the example was that different types of services call for different weights of service productivity elements. For instance, in case of customized services like personal life insurance, the interviewees considered it to be very important to retain customers. For this purpose it was crucial to enhance the quality for the customer, which implied accepting smaller financial margins. Meanwhile, the opposite could be valid for standardized services like travel assurance, where customers are quite interchangeable and quantitative measurements of output volumes and labour and capital investments may provide sufficient information to monitor and enhance productivity (Vuorinen *et al.*, 1998).

Today, delivery and knowledge work are widespread phenomena in all sectors of industries. It therefore is argued that this productivity concept is not only applicable to the service industry (see also Moxham, 2009). Hence, the holistic model of Vuorinen *et al.* is considered as a generally applicable balance-model, named Q4, where the relevance from a company performance perspective of the four Qs depends on the type of organization (Van Rhijn *et al.*, 2010). By the visualisation in Figure 1, it is stressed

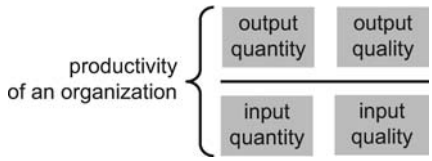

Figure 1.
The Q4-model of productivity

that the productivity of any organization reflects the ratio of outputs and inputs, where inputs and outputs cover both quality and quantity aspects and that productivity constituting four factors are interconnected and should not be treated in isolation.

Following the Q4-model, productivity may improve in several ways, namely:

- output increase at constant input;
- input decrease at constant output;
- output increase and input decrease;
- output and input increase, with the increase in input proportionally less; and
- input and output decrease with the decease in output proportionally less (Misterek *et al.*, 1992; Tangen, 2005).

This shows the various strategy options for organizations to aim for more productivity.

3. Control cycle

Another issue is how a chosen productivity strategy can become effective. In this respect it should be noticed that it is not only a direct modification of the inputs or outputs that would lead to productivity effects. It is also the modification of the so-called throughput or "how inputs are transformed into outputs" that might be effective, as illustrated by the following examples. The figures correspond to the above-mentioned five productivity strategies. A new way of producing goods and services for example, can lead to an output increase at a constant input; cutting in labour costs and combining that with such a new way of producing can result in a constant output while effectuating an input decrease; if one succeeds in cutting throughput times, which results in both lower input costs, and shorter delivery times for customers, an output increase and a input decrease are observed; investing in training of employees resulting in more than proportionally higher quality of quantity of output is exemplary for a output and input increase, with the increase in input proportionally less, and finally employing cheaper and less qualified employees resulting in less than proportional reduction of output quality or quantity can be the result of input and output decrease with the decrease in output proportionally less.

Productivity strategy refers to the decision latitude to choose from the various options how to enhance productivity, once an organizational strategic decision is taken. Organizational strategic decisions refer to the organisation's business model and its core task what it produces for which segments of the market[1]. In order to effectuate strategic choices, one should be able to diagnose the process which links inputs to the outputs, and subsequently design an intervention to implement at the operational level. This is illustrated by the control cycle in Figure 2, based on the input-process-outcome

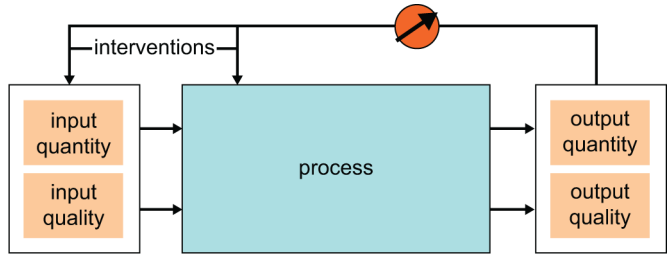

Figure 2.
Dynamic control system for improving productivity

framework which is a familiar metaphor in systems thinking (In 't Veld, 1988). The control cycle visualizes how quantity and quality inputs are transformed into quantity and quality outputs. These "inputs" and "outputs" refer to the Q4-model. The "process box" refers to the transformation process[2] reflecting the organization of series of transformations for developing, making and providing goods or services[3]. This process – which reflects the "throughput" in which "inputs" are transformed into "outputs" – should be regarded as a dynamic production system that needs to be controlled or managed. The latter is visualized by the control loop, wherein the achieved levels of outputs are evaluated by comparing them with standards or norms. If outputs differ from the standard, one requires intervening actions to restore the output to the standard or modifications of the standard. Interventions may involve input modification or process modification[4].

Both the Q4 model and the control cycle (in Figure 1 and 2) form the basis for an approach for the strategic improvement of productivity in a company. One step herein would be the definition of the main elements underlying the output quantity, output quality, input quantity and input quality, as well as their relative importance. The following step would be the formulation or design of a productivity strategy and, subsequently, the concrete intervention for improvement.

In the following Sections, this is illustrated by three case studies from different industrial sectors. Each study consecutively describes:

- the organisation or company and its the productivity challenge;
- the productivity underlying elements, the productivity strategy and the intervention; and
- the measured or expected effects of the intervention.

Figure 3 illustrates our stepwise approach including the application of the Q4- model in order to formulate the productivity strategy and the application of the control cycle to develop specific interventions to improve productivity.

4. Cases

4.1 Case A: consultancy

Case description and challenge. Logica is a large consultancy organisation in the area of information and communication technology (IT). In one of their departments, 1100 workers are located. These workers are involved in administrative work, secretary work, consulting and managing. The housing of the personnel was quite

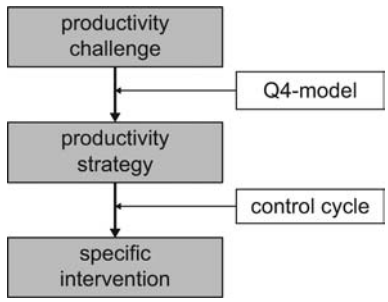

Figure 3.
Stepwise approach including the application of the static Q4-model and the dynamic control cycle

traditional. The buildings were relatively old, with interiors that were not really inspiring. The work stations were uniform: the work stations were all similarly designed and equipped, irrespective of the type of function or activity.

The sector of information and communication technology is highly dynamic and characterized by a strong competition. This faces consultancy companies like Logica with several challenges. Two main challenges that can be distinguished (Blok *et al.*, 2009):

(1) A continuous need to improve the type of services, the volumes and the service quality at minimal costs.

(2) The challenge to lower the personnel turnover. Successful consultants in this sector easily move from one company to another. This leads to extra costs related for instance to a decreased motivation of workers that are about to leave, a decreased productivity of new workers, costs to acquire new personnel and investments in training personnel.

Productivity underlying elements, strategy and intervention. From the perspective of these challenges, the productivity underlying elements as presented in Table II, can be distinguished.

The company management recognized that the primary process could be better facilitated, in particular by new office interiors and new workstations. It was assumed that this may help the labour force to concentrate and communicate more efficiently and that this may add to the satisfaction of the workers.

The intervention includes new housing for the personnel including inspiring office interiors and a diversity of new workstations specifically adjusted to the various functions and activities: i.e. specific work stations for concentration, communication with colleagues, meetings with client, telephone work, using new social media and social ICTs, etcetera)

Effects. Effects of the intervention were measured by use of a pre and post-measurement of several aspects (Blok *et al.*, 2009; Vink *et al.*, 2009). A questionnaire was filled out by 396 workers, comprising all function groups (response rate 36 per cent). The items in this questionnaire addressed the quality input and more specifically the worker's satisfaction and the potential to perform well as perceived by the workers themselves.

Significant input quality improvements were observed concerning the potential to concentrate, the potential to communicate and the potential to move quickly from individual to collaborative work stations. Positive effects were also observed for the worker satisfaction in relation to the new working environment. The workers were

Output quantity	*Output quality*
Service volume	Customer satisfaction Service quality
Input quantity	*Input quality*
Labour costs (including costs related to labour turnover) Capital costs: building and work stations	Potential to concentrate and communicate with clients and colleagues Satisfaction, stress, motivation and expertise of workers Inspiring office interiors

Table II.
Main productivity underlying elements in the consultancy case (case A)

significantly more comfortable in the new situation and rated more positively on safety, climate and atmosphere. The workers also indicated that the building was significantly more appropriate to receive clients.

With regard to the input quantity, it can be stated that investments were obviously made related to the new building facility, interiors and workstations. On the other hand reductions were realised by decreasing the number of work stations from 750 to 600.

It was assumed that the quality input improvement would result in several positive effects on the output side. The improved facilitation of the main work aspects like communication and concentration, may probably lead to increased efficiency and therefore higher outputs in terms of quantity and quality. Moreover, the increased satisfaction may lead to increased motivation and thus improved outputs, but also to increased commitment and a lower personnel turn over and thus savings of related costs.

4.2 Case B: health care

Case description and challenge. It is common practice in a specific region in the Netherlands, that people suffering from non-congenital brain injury are referred by their general practitioner for diagnosis and treatment to one out of three different medical specialists, a neuropsychologist, a revalidation specialist or a psychiatrist, each located at different institutes. Each of these disciplines involves its own type of medical approach. In this system, it frequently occurs that patients treated by one specialist require (additional) treatment by another medical discipline from another institute. This division of work may result in sub-optimal treatment, inefficient patient transfer and longer patient waiting times. Another shortcoming of the current system observed by the institutes involved is that people suffering from non-congenital brain injury in the region may not be detected and thus remain unnoticed.

From the above consideration it is clear that there is a challenge to improve the quality of this health care system preferably without any increase of health care costs (Bockstael-Blok, 2010; Van Den Heuvel, 2009).

Productivity underlying elements, strategy and intervention. Table III presents the main elements underlying the Q4 model in this case.

Health care specialists at the three institutes recognized that an improved utilization of medical knowledge and expertise in the region (quality input) might increase the quality of the health care at the same or even at lower costs. The intervention includes the installation of a multi-disciplinary expertise centre for diagnosis (Bockstael-Blok, 2010; Van Den Heuvel, 2009). This centre gives proper information to general practitioners to detect the people with congenital brain damage and to refer them to the centre. At the centre, the first step is initial screening by a specialized nurse or nurse practitioner, and the second step is a multidisciplinary meeting of medical specialists

Output quantity	*Output quality*
Number of people with disease detected	Patient waiting times
Number of patients treated	Quality of diagnosis
	Patient satisfaction
Input quantity	*Input quality*
Labour: personnel costs	Knowledge of medical specialists
Capital investments in facilities, equipment	Motivation of medical personnel

Table III.
Main productivity underlying elements in the consultancy case (case B)

on which basis the proper diagnosis and treatment is defined for each patient. The institutes have chosen to do the actual treatment after the diagnosis at the institutes. The improvement of the diagnosis process flow may yield several advantages in comparison to the former situation.

Effects. The effects of the introduction of the expertise centre have been evaluated by the use of pre and post measurements (Bockstael-Blok, 2010). Because the project stage is in a pilot stage, the focus here is on the input parameters (quality and quantity) as calculated or evaluated by the involved medical specialists and nurse.

Regarding the quantity input, a decrease of the total process time per patient by 44 per cent was observed, which had a simultaneous and similar effect on labour costs. The latter effect was mainly caused by a reduction of administrative tasks and a more effective use of medical personnel and specialists in the diagnosis process. The introduction of the screening nurse is an important element for the new practice but does not directly result in less time of the specialist as they spend much time in the multi-disciplinary meetings.

The quality of the care (input) was evaluated on four aspects: quality of the treatment plan, external communication and information, mental well-being of the patient and multi-disciplinarity of the approach. In the opinion of the specialists and nurse in the project group, the quality has in total increased from seven to eight on a ten-points scale. Especially the accessibility and pro-active approach towards patients by the specialized nurse is seen as an asset. In the opinion of the medical specialists the level of multi-disciplinarity in the diagnosis has improved from seven to eight on a ten-point scale. Specialists appreciated the multidisciplinary exchange about patients in the new situation, which indicates an improved utilization of medical expertise at the quality input side.

One of the conditions for the new situation was that the total throughput time of the diagnosis process should meet with standards of the sector. A simulation study showed that potentially the standards could be met. The total throughput time was calculated to be about 12 to 31 working days depending of the type of patient, where the standard is 50 days max. The throughput times registered in the pilot for the first patients show somewhat longer times, about 44 working days. This is caused by staff capacity problems at the neuropsychological test facilities and personnel problems in the medical staff at one of the institutes. Discussion with the project group on the simulation results indicate that waiting times for the neuropsychological tests, the frequency of the multidisciplinary meetings and the priorities in processing patient information are crucial in the total throughput time.

4.2 Case C: Manufacturing

Case description and challenge. One of the main products manufactured at Famostar Electronics in the Netherlands are emergency lighting devices. The production takes place in two departments. In the print assembly department the printed circuit boards are produced (one of the main components of the final product). Subsequently, in the final assembly department, the electronic board and other components (tube, reflector, and battery) are assembled and packed. Some years ago the company experienced a steep increase in market demands. How to achieve the required increase in production volumes with the same number of employees (same labour costs) was the major challenge. Another problem seemed to be the lack of production area (physical space) (Van Rhijn *et al.*, 2005; De Looze *et al.*, 2010).

Productivity underlying elements, strategy and intervention. Table IV presents the main productivity underlying elements in this case.

Prior to investing in more facilities, the company management decided to investigate whether production system alternatives for the batch-wise production could help to increase the output volume without any negative effects on the worker's health and satisfaction

In the print assembly and final assembly departments the batch-wise production system was replaced by a one-piece flow system; the products that were traditionally assembled in large batches (up to 60 pieces), were in the new situation assembled piece-by-piece. Additionally, work stations were ergonomically optimised (i.e. components within reach in tilted boxes, improved lighting, height adjustable tables, and job rotation).

Effects. Measurements were made before and after the intervention. The new one-piece flow production system appeared to result in clear benefits in terms of output quantity. In final assembly, the number of products that could be produced per person and per day, increased from 93 to 135 (i.e. by 44 per cent) which resulted mainly from the decrease in non-value adding activities like walking from one product to the other or searching for components (time percentage of value-adding work increased from 74 per cent to 92 per cent). Another contributing factor was the reduction of failures and thus less re-work. In the print assembly, the increase in number of products produced per person and per day was less (compared to final assembly) but still considerable, namely 20 per cent (Van Rhijn *et al.*, 2005).

With regard to the quality output, any improvement of the satisfaction of the customer was unknown. The order lead times had decreased by more than 40 per cent, but it was unknown whether this resulted in lower delivery times to the customer. By the company management it was indicated that the more clean, lean and efficient production system contribute to a better corporate image. At the input side, there were some important effects of the new production system. Most relevant are the decreased personnel costs due to the fact that less people are required to produce the same production output. Another effect concerns the capital costs. The purchase of new equipment in the print and final assembly departments obviously required a one-time investment. On the other hand, a large saving on factory space was observed. The required work space for a specific output volume had decreased by 44 per cent (Van Rhijn *et al.*, 2005).

Finally, most workers preferred the new situation. A significant decrease in the worker's experience of fatigue at the end of a full working day was registered as well. These effects may result in increased motivation of workers (not measured). Another positive effect might be that due to the improved working conditions, the work gets accessible for a more people, for instance older workers, and it might become easier for the company to attract new workers.

Output quantity	*Output quality*
Numbers of products	Customer satisfaction
Failures (rework)	Corporate image
Input quantity	*Input quality*
Labour costs	Expertise of workers
Capital investments: factory area and equipment	Motivation of workers

Table IV.
Main productivity underlying elements in the manufacturing case (case C)

5. Discussion and conclusions

Knowledge work has become a crucial resource, not only in service sectors but also in manufacturing sectors. The European work force already consists for 47 per cent of white collar workers and this number will further increase in coming years (Parent-Thirion *et al.*, 2007). Thus, knowledge workers are rapidly becoming the largest group in the work force in developed countries (Drucker, 1999; Davenport 2008 in Jääskeläinen and Lönnqvist, 2010). Against this background, the urgency for a generally applicable productivity model must be seen. The model described in this paper was tested for its applicability in three organisations from different sectors of industry. In these cases, the productivity-related challenges, the productivity strategy and the final intervention were discussed in the perspective of this model (Q4) and the concomitant control cycle.

For the consultancy company the strategy challenge was to enhance competitiveness by investing in new office interiors and new workstations enabling the company to minimize personnel turnover. The productivity strategy led to the intervention of new housing and new workstations, which were inspirational to the employees. The intervention has significant overlap with Microsoft's slogan of "The New World of Work" which integrates new ICTs and mobile working with the ability and wishes of the new generation of employees who highly value creativity and control (Microsoft, 2005). There was more satisfaction among staff with expected improved outputs, and lower costs for the reduction of work stations and personnel turnover.

The strategy challenge for the health care case was to improve the quality against a stabilization of the costs by streamlining the flow of patients across three different institutes. The productivity strategy was to improve the primary process by streamlining the workflow of patients, which would enable the staff to help more people and enhance the quality of service, while at the same time optimising the use of equipment and facilities and the use of knowledge of medical specialists. The intervention to operationalise this strategy was the establishing of a multi-disciplinary expertise centre to integrate diagnosis and treatment. The primary process became less expensive due to an efficient new division of work between specialists and nurses and a more effective deployment of specialisms, which resulted in better quality and quantity outputs for the organizations, the patients and the employees.

The strategic challenge for the manufacturing case was to meet increasing market demand. The productivity strategy was to increase production volumes without extra resources. The intervention consisted of combining a new production system with ergonomically optimising work stations in order to come to a more efficient process, and to make more efficient use of the limited space available. As a result the productivity volume almost doubled, while the personnel became less fatigued and preferred the new production system above the traditional one.

What can be learnt from these illustrations is that the Q4 model allows one to formulate productivity challenges, strategies and interventions in a uniform and practical way for entrepreneurial purposes. The uniformity of the model can also be confirmed, since the highly different productivity challenges across the three types of organisations all fit within the Q4 approach. The consultancy firm combined more outputs of quality and quantity (service volume, customer satisfaction, service quality) with variable input quantity (investing in housing and equipment but less costs for personnel turnover) and more input quality (improved concentration, communication,

satisfaction and inspiration). The health care case kept the inputs of quality stable (same specialists) and of quantity down (less administrative burdens, nurses replacing specialists by the intake) and increased the output quantity (more patients were reached and processed) and output quality (better service quality and shorter waiting and throughput times for patients). Finally it can be observed that the manufacturing company had variable input quantity (less space used; new equipment) and higher input quality (better working conditions for employees) leading to stable output quality and increased output quantity (more production at an equal workforce).

When the presented approach is compared to the approach of Vuorinen *et al.* (1998), which had the goal to evaluate the total service productivity, there are some remarkable gains to be mentioned. Although Vuorinen *et al.* were an inspiring source for the Q4-model, there is a difference in scope, system and practical potential. First of all the Q4-model covers both strategic and operational aspects of productivity, whereas Vuorinen *et al.* underline evaluating the factors constituting productivity. The Q4-model goes one step further in connecting strategic decisions with operational consequences, especially in the application of the control cycle. Second, both approaches are "holistic" in the sense that there is an open eye for the integral side of the qualitative and quantitative aspects. Where the model of Vuorinen *et al.* seems to be helpful from a heuristic perspective in showing that different combinations of variables lead to different models, the Q4-model seeks to systemise the thinking of the entrepreneur in order to improve decision making about developing a proper intervention to improve the productivity of the organisation. Deviating from Vuorinen *et al.*'s attempt to develop a coherent and complete picture of the concept of productivity and then encountering difficulties in measuring productivity, the Q4-model chooses another path and puts the practical purpose as central, namely pinning down the buttons to press on in order to enhance productivity. This third difference makes the model a powerful tool in the hands of innovative change managers, maybe to the detriment of the financial controllers of the organisation.

One shortcoming of the Q4-model approach, following from the former remark, might be the absence of measuring the four Qs or a mathematical equation by which one can calculate the productivity. Measuring productivity or performance in services, knowledge work and non-profit organizations is not easy and there is no consensus about appropriate measurement criteria. The main reason is that methods aiming at either some kind of standardization are made-to-measure for single organizations. Standardized methods cannot properly address the heterogeneous diversity, while made-to-measure approaches cannot be generalised. Some methods are too simple, and others are too complex. An approach to evaluate the productivity of such work as knowledge work and services must necessarily make room for a meaningful integration of quantitative and qualitative aspects. Any form to standardize the measurement of this kind of productivity limits its usefulness for improving productivity at the level of organizations, departments and individuals, because it offers no material for unique interventions (see, e.g. Sherwood, 1994; McLaughlin and Coffey, 1990; Jääskeläinen and Lönnqvist, 2009). Examples like those of Vuorinen *et al.* (1998) indicate that general methods are made to measure to meet specific situations, but even then, to quantify the productivity proves to be so difficult that the researchers end up evaluating different quantitative and qualitative aspects as unique trade-offs, select rather arbitrary measurable variables at hand, or proposing a taxonomy of

measurement approaches (see, e.g. Van Looy *et al.*, 1998; Helo *et al.*, 2009; Jääskeläinen and Lönnqvist, 2009, 2010).

At this point it should be made clear that there is no general method of measuring productivity that can be meaningfully related to a general method of improving productivity. The Q4-model of productivity is a general model applicable to unique situations. The Q4-model should appeal to the gut feeling of entrepreneurs. It supports the process of substantiating their productivity strategy in a systemic manner that leaves space for arguing trade-offs, instead of trying to quantify productivity as pseudo accuracy. Of course the relevance of numbers and figures is not denied, but in the process of deciding on strategy having room to exercise on the basis of gut feeling or common sense is important as well.

Nonetheless, it should be mentioned that further research into measuring productivity is needed. In general, such methods could focus on the process from an integral perspective. Probably it is a step too far to integrate various goals like productivity, quality, value for customers, etcetera, into one single instrument, and it may be more promising to combine several methods that measure different purposes, as is recommended by other researchers (Van Looy *et al.*, 1998; Armistead and Machin, 1998; Neely *et al.*, 2005; Jääskeläinen and Lönnqvist, 2009, 2010; Janssen, 2010). More specific, it is necessary to investigate the workings of the Q4-model as well. The Q4-model of productivity could in the first place be validated by monitoring the reasoning behind the three steps – productivity challenge, productivity strategy and specific intervention through in depth case studies: does this way of reasoning lead to improving results? A second step could be a survey research among a large sample of organisations to establish the determinants of improving productivity by operationalizing the four Q's. Correlational analyses into factors that explain productivity could be informative in learning what works in which type of organisations and sectors. Finally it is recommended to develop measurement instruments that combine results at the organisational level with results at team or even individual level. For example combining a well established instrument like the Balance Score Card (Kaplan and Norton, 1992; 1996), at organisational level, with a method that studies productivity at team level, like ProMES (Productivity Measurement and Enhancement System) (Pritchard *et al.*, 2002), can result in meaningfully measuring productivity at aggregated and disaggregated levels.

In summary, the Q4-model of productivity, which is applicable in every industrial sector, may help in developing a sound argumentation for organizational action that combines this strategic reasoning, which precedes the subsequent operational management decisions, i.e. the intervention. The model may help to clarify strategic options and operational consequences, which are both of a quantitative and qualitative nature at the same time. The model then can be used as a guide to develop organizational interventions with the purpose to improve productivity, by closely scrutinizing how an intervention affects specific quantitative and/or qualitative aspects.

Notes

1. Control cycles allows one to define the objective for a specific aspect of the work, measure against the work as it proceeds, evaluate the work against the objectives, and then decide if adjustments are needed to make improvements. As such this is a supporting decision tool for strategy making. It is however also possible that the configuration of the mode of production

determines strategic options, as is the case for example with production sites and plants in the processing industries. Cost-intensive production goods imply path dependent limitations on the responsiveness of productivity strategies, limiting interventions and strategic options.

2. The transformation process changes some defined input into some defined output. This theoretically strict definition is in practice often misunderstood, as the usual error is to confuse the system input (the entity which gets changes into the output) with the resources needed to bring that transformation about (Checkland, 2001, p. 74). This misunderstanding, however, is less of a problem in practice, as long as one uses the transformation process as a metaphor to illustrate how investments lead to desired outcomes.
3. What is the process box ("the system") depends on how its boundaries are defined. A process can be, e.g. the primary process, a supporting work process (like the personnel department), but is can also be a single work station or the organization as a whole.
4. Another type of interventions – not depicted in Figure 2 for reasons of surveyability- are the developing of new procedures and thus modify the standards or norms. Whereas Figure 2 is restricted to "single loop control mechanisms" for the purpose of illustrating the argument, these new procedures can be regarded as "double loop control" mechanisms. These will not be elaborated here, but to its importance to decision processes is pointed. Options for choice characterized by double loop (or even triple loop) decision latitude widen the span of control (decision latitude) and enhance the potential for richer and more complex productivity strategies.

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Corresponding author
P.R.A. Oeij can be contacted at: peter.oeij@tno.nl