

## **From Productivity Strategy to Business Case: Choosing a Cost-Effective Intervention for Workplace Innovations**

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### **Abstract**

The article presents an approach to developing cost-effective interventions for workplace innovations for entrepreneurs who seek to enhance the productivity of an organization. The business case method is used to extend the Q4-model of productivity, which supports developing a productivity strategy in order to choose a cost-effective intervention. The approach offers the opportunity to trade off quantitative factors against qualitative factors; therefore, it is applicable to both profit sectors of industry and nonprofit sectors. The study sets out the steps in the approach and presents two case studies from different industrial sectors (public services and manufacturing) in which the approach has proved applicable. The Q4-model provides practical support to entrepreneurs in their efforts to innovate and improve productivity and is not for measuring the quantity and quality of input and output factors. Entrepreneurs are supported in developing a productivity strategy, combining a mix of quantity and quality input and output factors, and in the transformation of this strategy into a practical intervention. To facilitate the entrepreneurs to choose from different commercial options, the Q4-approach allows for the definition of its business case.

*Keywords:* Q4-model of productivity, business case, workplace innovation, intervention

*JEL Classification codes:* A1, B1

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Productivity is one of the key factors for an organization to increase its competitive strength. Basically, productivity is the ratio between the outputs and inputs of an organization's production process. The inputs are the factors to be transformed into the outputs. The input factors include labor (man-hours or full-time equivalents—FTEs), capital goods (machines, equipment), and resources (people, money, raw materials, power, etc.). The outputs of the enterprise may be defined in terms of physical volumes (number of products or tons produced). This notion of productivity (where the inputs and outputs are often of a tangible and quantifiable kind) originated in the traditional manufacturing industry where the monitoring and managing of productivity is relatively straightforward. It is also relatively easy to use financial indicators (revenues or profits or added value) in such a context (Eilon, 1985; Sink, 1983).

This simplified notion of productivity is problematic in that it hampers the understanding of four inter-related issues:

1. The concept of productivity of service organizations and nonprofit organizations,
2. The measurement of productivity in these organizations,
3. The development of productivity strategies for these organizations,
4. The fact that nonprofit organizations do not operate on a market basis.

In the first place, service and nonprofit organizations usually do not make physical products one can count. Many of these organizations are characterized by knowledge work without discrete volumes of tangible products. Knowledge work, for which quality is of the essence compared to quantity in manufacturing work (Drucker, 1999), has become a crucial resource, not only in service sectors but also in manufacturing sectors. White collar workers already represent 47% of the European workforce, and this number will further increase in coming years (Parent-Thirion, Fernández Macías, Hurley, & Vermeylen, 2007). Thus, knowledge workers are rapidly becoming the largest group in the workforce in developed countries (Drucker, 1999; Jääskeläinen & Lönnqvist, 2010).

In such organizations, not only the quantity of inputs and outputs is of relevance from the perspective of organizational productivity, but also aspects of the quality (Grönroos & Ojasalo, 2004). On the input side, for instance, the creativity, the motivation, and the commitment of workers might be equally or even more important than the number of working hours. Similarly, on the output side, customer satisfaction might add more value compared to the exact volume of services. Therefore, a definition of productivity for service and nonprofit organizations that at least partly relies on knowledge work should incorporate quantity as well as quality aspects, both on the input and the output side (Vuorinen, Järvinen, & Lehtinen, 1998).

In the second place, the simplified notion of productivity does not include quality aspects; thus, it cannot fully cover the measurement of productivity (Jääskeläinen & Lönnqvist, 2009). In the third place, with the increasing relevance of quality aspects, the number of options to influence the productivity of an organization rapidly increases, which complicates the development of the most effective productivity strategy for such organizations.

Finally, many of the service and nonprofit organizations do not operate on “perfect” markets where allowances are made for inputs and outputs and the transformation process of inputs into outputs in pricing of products. On the contrary, such price mechanisms are usually absent in the public sector, which implies the need for a broader concept of productivity, one that includes the quantitative and qualitative factors simultaneously.

Recently, we proposed the Q4-model (Oeij, De Looze, Ten Have, Van Rhijn, & Kuijt-Evers, 2011a) which is helpful for three reasons. First, it helps to determine the productivity strategy. Second, it helps to design an *intervention* to enhance the productivity. Third, it helps to diagnose the relevant quantitative and qualitative input and output factors (the 4 Qs) that play a role. The Q4-model is not concerned with the exact measurement of productivity in one single measure because it is intended as a practical aid for entrepreneurs and managers (both private as well as public) with the gut to innovate. Besides, measuring is complex and often suggests a faint sense of exactness. For this reason, a specific definition of productivity is not necessary either. In our approach, productivity is similar to performance for a practical reason. Because our concern is the desired output as defined by the entrepreneur, who may use these terms interchangeably, we focus on practical usefulness instead of theoretical precision.

Although the Q4-model proved to be generally applicable in the diagnosis of the productivity challenge and to develop an intervention to meet that challenge, what is still lacking is the possibility of evaluating the cost effectiveness of such an intervention. The method of the business case can be helpful here. To illustrate how to assess the business case of cost-effective interventions to enhance productivity, we will not only present two empirical examples, but we also need to clarify what we mean by interventions. Therefore, this contribution will address the following questions:

1. How can the business case method become integrated into the Q4-model?
2. How should we understand the term intervention?
3. Can we illustrate the generalizability of the business case method and the Q4-model across different industrial sectors?

To answer these questions, we will explain the term intervention by discussing the kind of solutions that we most often use in our own practice of enhancing productivity, which can be included in the term *workplace innovation*. We then turn to some relevant literature on business cases. The article will proceed by presenting two illustrations with the extended Q4-model from the public sector and the manufacturing sector. The contribution closes with points of discussion and conclusions. We first explain the Q4-model.

### The Q4-Model of Productivity

We will briefly outline the Q4-model (Oeij et al., 2011a). In the concept of service productivity, quantity and quality aspects of input and output are considered together to provide a joint effect on the total productivity of the service firm (Vuorinen et al., 1998). Several key performance indicators are distinguished (Giertz, 2000; Grönroos & Ojasalo, 2004; Van Looy, Gemmel, Desmet, Van Dierdonck, & Serneels, 1998, Vuorinen et al., 1998). The main aspects of the quantity and quality of inputs and outputs are presented in Table 1.

Table 1  
*The Quantity and Quality Dimension of Service Productivity in an Insurance Firm*

<b>Output quantity (Q3)</b> service volume assortment market share customer segments	<b>Output quality (Q4)</b> customer satisfaction customer encounter and service standardized services access time customer co-production correct insurance registers corporate image
<b>Input quantity (Q1)</b> <i>labor:</i> amount of labor recruitment job rotations job descriptions service process reengineering error avoidance overtime <i>capital:</i> information technology electronic channels self-service policy machines headquarter and office network telework facilities	<b>Input quality (Q2)</b> <i>intangible:</i> employee satisfaction expertise and skills performance criteria recruitment and retaining personnel personnel development programs teamwork organization structure corporate culture IT breakdowns and system errors <i>tangible:</i> branch office locations branch office interiors

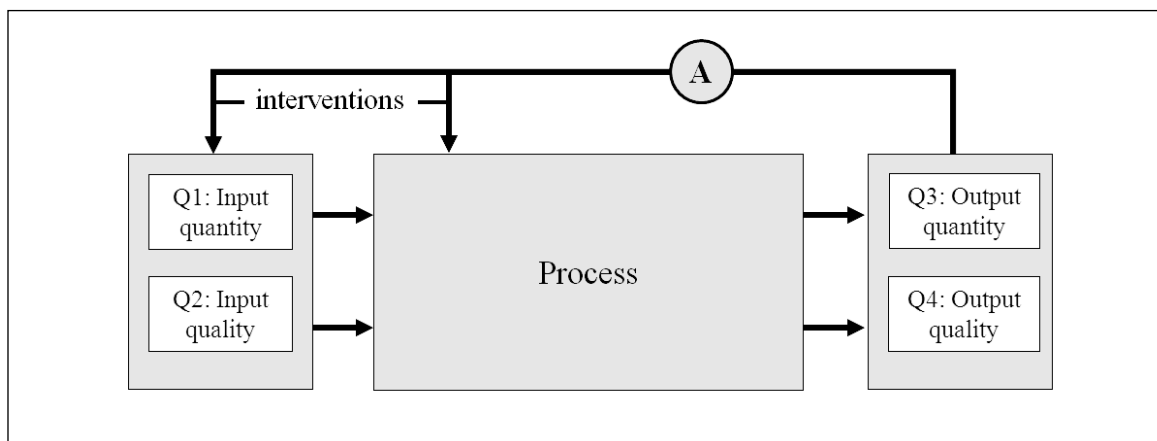
Note. (a) Vuorinen et al. (1998). (b) Qs added.

Because delivery and knowledge work are widespread phenomena in all sectors of industry, we have shown that this productivity concept is not only applicable to the service industry (see also Moxham, 2009) but that it is a generally applicable balance model, which we named Q4 (Oeij et al., 2011a). The 4 Qs indicate that the productivity of any organization reflects the ratio of outputs and inputs, where inputs and outputs cover aspects of both quality and quantity. Productivity is constituted by these four factors which are interconnected and should not be treated in isolation.

Five productivity strategies follow from the Q4-model, namely:

1. Output increase at constant input;
2. Input decrease at constant output;
3. Output increase and input decrease;
4. Output and input increase, with the increase in input proportionally less;
5. Input and output decrease with the decrease in output proportionally less (Misterek, Dooley, & Anderson, 1992; Tangen, 2005).

Once a productivity strategy is chosen, it must become effective. For this purpose, an organization needs to modify the inputs and its throughput—how inputs are transformed into outputs—to change the outputs and hence gain productivity effects. 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 organization's business model and to what it produces for different markets. In order to effectuate strategic choices, one should be able to diagnose the process which links inputs to outputs and subsequently design an intervention to implement at the operational level. Figure 1 illustrates the Q4-model in relation to the control cycle. This figure is derived from the input-throughput-outcome framework which is a familiar metaphor in systems thinking.



Note. (a) Oeij et al. (2011a). (b) A: Selecting decisions based on adapting the norm.

Figure 1. Q4-model, control cycle, and input-throughput-output metaphor.

The Q4 approach aims to support the strategic improvement of productivity in a company which we applied to three cases from the consultancy sector, health-care sector, and manufacturing sector (Oeij et al., 2011a). We determined, for each case, the main elements underlying the output quantity, output quality, input quantity, and input quality, as well as their relative importance. We then formulated their productivity strategy and, finally, the concrete workplace intervention for the improvement of their productivity. The described model, however, lacks the step of making a trade-off between the qualitative and quantitative—or intangible and tangible—factors and, in doing so, making an informed business case evaluation on the intervention that is meant to enhance the productivity. Before we arrive at that third step, we will discuss how we understand interventions.

## Workplace Innovation as Intervention

In further explaining the process of throughput and interventions in Figure 1, we need to say a few words about workplace innovations as interventions, because intervention is a central term in the Q4-model and interventions can be understood very differently. We will subsequently clarify intervention, workplace innovation, and innovation and how these are related to the Q4-model.

By intervention, we mean in this context a measure taken that will enhance productivity and which will subsequently be implemented into the work process of the organization. Such measures are usually derived after the diagnosis of what is needed or what is missing, given the productivity strategy and the options that are available. Options may be restrained by budgets, the availability of personnel, regulations, availability of technology, path dependencies, and so on. In our approach, an intervention is synonymous with workplace innovation or workplace innovation intervention.

Workplace innovation is defined by Pot (2011) as “the implementation of new and combined interventions in the fields of work organization, Human Resource Management (HRM) and supportive technologies” (p. 404). Most of the interventions that we develop in our practice are of a similar nature, namely, dealing with organizing people and technology at the level of workplaces or the shop floor (see also European Commission, 2010; Totterdill, Exton, Exton, & Sherrin, 2009, who share the same viewpoint as Pot). We regard such innovations as strategic to the organization, in the sense that they affect how the organization carries out its tasks to reach its productivity goals in new ways. Several commentators point to the fact that workplace innovations differ from strictly technical or technological innovations, in the sense that new technologies only work well if one takes both the organization and its people into account. Workplace innovation is regarded as complementary to and conditional on technological innovation. To stress this difference, writers use the terms nontechnical, organizational, or workplace innovations (e.g., Armbruster, Bikfalvi, Kinkel, & Lay, 2008; Eeckelaert et al., 2012; Hage, 1999; Lam, 2004; Pot, 2011). Although there is no generally accepted definition of the concept, we understand workplace innovation in this paper as an organizational capability to innovate or as a strategic renewal in organizing and organizational behavior (Oeij, Dhondt, & Korver, 2011b).

Finally, there is a distinction between innovation as a process (a means to a goal) and innovation as an outcome (a goal in itself). As a process, innovation at organizational level implies that organizations have the capability to innovate; here, it is an independent variable. Organizations may produce profits and desired outcomes and are able to adapt to changing circumstances because they can dispose of resources and capabilities that enable them to do so. Innovation as an outcome at organizational level becomes manifest in new products and services and new product features. In this case, the innovation itself is an end product—a dependent variable. Workplace innovation will focus on the first description, innovation as a process, because we consider innovation to be a means instead of a goal, specifically, a means to improve productivity (performance) and the quality of work.

We have already mentioned that workplace innovations vary in kind. Figure 1 on the Q4-model depicts the process of the throughput situated between the inputs and the outputs, and it mentions interventions. To design workplace innovations as practical interventions, one can analyze the causes of underperformance related to technological (T), organizational (O), or personnel (P) aspects by using the TOP-model (Jongkind, Oeij, & Vink, 2006; Oeij et al., 2006). The TOP-model offers a checklist to diagnose new information technology and applications and ergonomic aspects (T), the design of the work process, its structure, and the division of work tasks (O), and the numerical and functional flexibility of the workforce and organizational behavior (P). These aspects corroborate each other and the theoretical options are endless, so each intervention designed with the Q4-model must be tailor-made.

It is important to understand that during the throughput phase (process), input factors change. Such changes cannot be directly deduced from Table 1. For example, Table 1 presents employee satisfaction under input quality. The Q4-model, however, would regard employee satisfaction as a consequence of a change of the inputs, for example, a change of tasks or the introduction of a Human Resources activity (Q2 in Figure 1), and position employee satisfaction as a throughput characteristic (process). The output of these transformed inputs is, for example, improved productivity (Q3), more production (Q3), and satisfied customers (Q4). Hence, the Q4-model chose not to see quality of work and employee satisfaction as an output, although it is obvious that workplace innovations affect employee satisfaction.

## **Business Case**

There appeared to be one element missing in the Q4-model, and that was the ability to evaluate the cost effectiveness of a workplace innovation as an intervention. Cost effectiveness is understood as a combination of quantitative and qualitative outputs. When one defines the productivity strategy, one should specify the changes to be implemented. Each intervention may concern either the sources of input or the process by which input is transformed into output (i.e., throughput). In both cases, the throughput will always be affected by the intervention. Using the TOP-model, a variety of interventions could be defined, all potentially increasing productivity. However, one question remains only partly answered: How does one select the most cost-effective intervention?

The literature on business models and business cases helps to understand how an entrepreneur can make an informed decision as to whether an intervention will lead to productivity enhancement. Although the literature is abundant with different definitions of business models, what they have in common is offering an overall, broad systemic perspective on how to do business, encompassing organizational activities, and as a source of value creation, according to a recent meta-review (Zott, Amit, & Massa, 2010). At the level of an intervention, the business case seems eminently applicable to determine its possible outcomes. A business case is a justification for the funding of a project (here, an intervention), because it compares the costs with the benefits and it must show that the benefits outweigh the costs. In many cases, it must include a financial analysis that calculates the return on investment (ROI; Kemp, 2006).

Business cases are generally designed to answer questions about the likely financial and other business consequences if one takes this or that action or this or that decision (Schmidt, 2003). But what must one do when the business is of a nonprofit nature and the services produced are not quantifiable in terms of costs, value, or profits? For profit organizations, it is relatively easy to establish the commercial value or profit once the revenues and expenses are known. For nonprofit or public organizations, this is much more difficult. The public value is dependent on interrelated factors like cost effectiveness, citizen satisfaction, and political effectiveness. These are influenced not by cost-benefit arguments alone, but also by normative choices and interests as well. The general business case approach has major drawbacks when applied to services, especially with regard to public sector organizations. There is too strong a focus on quantity; if quality arguments are addressed, they are ad hoc and situation specific and not of a generic kind. Managers in such organizations can, nonetheless, make an informed decision about workplace innovation interventions if they are capable of making a trade-off of the quantitative and qualitative factors at hand.

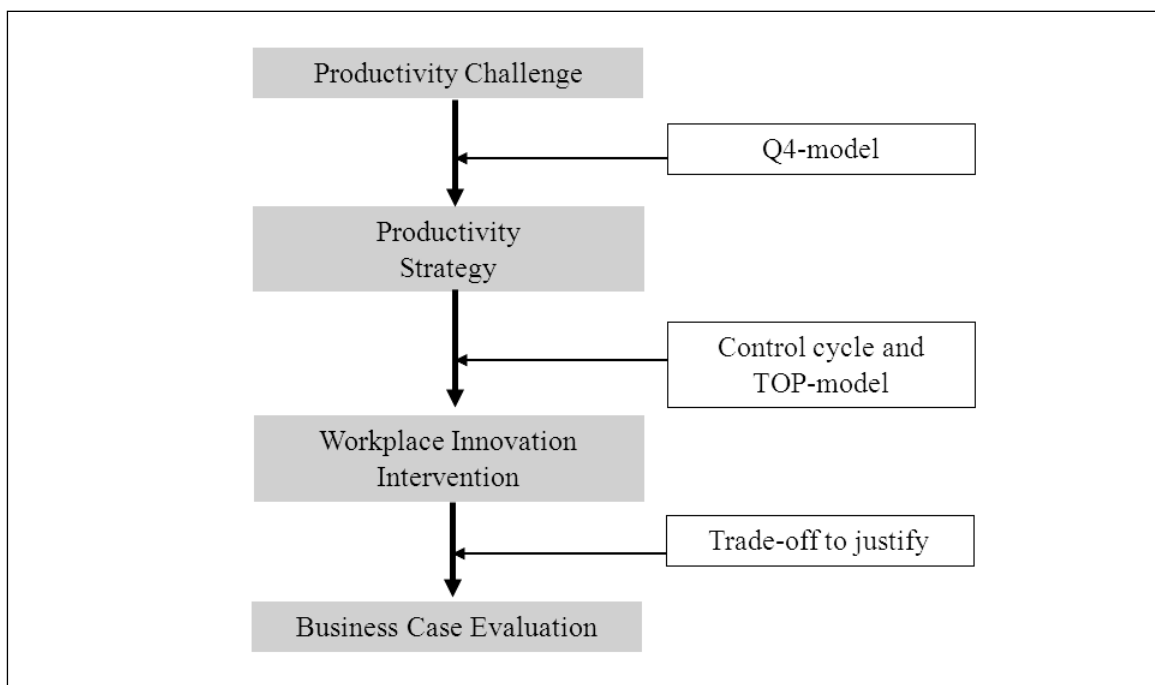
For this purpose, we have extended the Q4-approach to incorporate the business case method. To meet applicability for both private and public organizations, we define the business case as a justification for the investment of means (time, money, effort) in a workplace innovation intervention from the perspective of the organizational goals, which allows for a trade-off between quantitative and qualitative outputs and inputs. Given the desired outcome—such as enhanced productivity and improved quality of work—such an investment should be evaluated as beneficial to the organizational goals (outputs and outcomes) and not necessarily restricted to being cost-effective.

## **The Q4-Model to Trade Off Workplace Innovation Interventions for Productivity: Two Cases**

The practical approach of the extended Q4-model facilitates the work of entrepreneurs by addressing four questions:

1. What is the productivity challenge of the organization, and which quality and quantity aspects are the underlying elements with regard to this productivity challenge?
2. How can this productivity challenge best be translated into a productivity strategy?
3. How can this productivity strategy be made operational through a workplace innovation intervention?
4. What is the business case evaluation?

Figure 2 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. A discussion follows of the extended approach by illustrating two cases from different sectors of industry, namely public services and high-tech manufacturing.



Note. Extension of Oeij et al. (2011a).

Figure 2. Stepwise approach including the application of the Q4-model, the control cycle, the TOP-model, and the trade-off to justify the business case.

### **Case 1: Processing Social Benefit Requests**

This case describes a public services organization concerned with providing social welfare as well as intermediating services (Vaas, De Graaf, Oeij, Mayer, & Koningsveld, 2012). Providing social welfare refers to providing social benefits for jobless people. Intermediating services (employment finding) lead unemployed citizens towards temporary or permanent jobs. When the Dutch regulation concerning the approval of social welfare requests was changed in 2004 with respect to the number of mandatory checks before a social benefit request is awarded, the merged public services organization Job Square/Career View (Werkplein/Baanzicht) of two small municipalities as well as the larger city of Assen (in the north of The Netherlands) developed a new policy principle: “We trust the client unless there are indications to do otherwise.” Under this policy, Job Square/Career View grant a social benefit request with a minimum of (administrative) checks when there is no reason to assume fraud. As a result, the throughput time of a request is shortened, and the client does not have to present the usual long list of evidence concerning his or her financial and civil condition. The new process increased the service level. Besides, labor costs were expected to decrease.

#### *Productivity challenge:*

The productivity challenge for Job Square/Career View was to increase both customer satisfaction with respect to what is called “minimizing the administrative burden” (Q4) and waiting times, as well as to increase the efficiency of the social benefit granting process (Q3). Improving efficiency made sense as many of the checks in the original granting process did not indicate fraud; therefore, expectations were that positive results would be easily attained.

#### *Productivity strategy:*

Hence, the productivity strategy was how to produce the same quantity of output (Q3) with a higher level of quality (Q4) with fewer inputs of manpower resources (Q1).

### *Workplace innovation intervention:*

In order to realize the productivity strategy, Job Square/Career View introduced a risk evaluation method, called the Fraud Score Card, as part of the process of granting social welfare requests at the beginning of 2008. Using this method, a request is evaluated based on objective criteria such as the client's age, profession, and level of education. The method helps to classify individuals into groups that score high or low on liability to perpetrate fraud. In cases of low-risk evaluations, each welfare request can be performed as routine office work with a minimum of (mandatory) checks. Since this concerns the majority of applicants, the process becomes more efficient. The checks are more far-reaching only for those clients liable to perpetrate fraud. For instance, high-risk clients require a personal inquiry and additional verification of client data. Obviously, this is much more labor intensive. The intervention concerns all three aspects of the TOP-model: the Fraud Score Card as a new information and communications technology-tool (T) as well as a new mode of processing the requests (O), demanding more standardized competencies from employees (P).

### *Business case evaluation:*

It turned out that approximately two thirds of the social benefit requests are low fraud risk applications and hence these requests are processed by routine office procedures; the remaining third is processed thoroughly. On average, the handling time decreased from 360 minutes to 110 minutes and the throughput time from eight to three weeks per request. As a consequence, about 4.2 FTEs of a total of 13.2 FTEs responsible for evaluating welfare benefit requests have become redundant and have therefore been redeployed elsewhere in the organization, mainly in the field of intermediation services. At the departmental work process level, a saving of approximately one third of the labor costs has been realized. There are also savings at the level of the Job Square/Career View organization as a whole. As a consequence of the internal redeployment of personnel, savings of labor costs are achieved due to reduction of temporary personnel (2-3 FTE or approximately €200000 annually, Q1).

In addition, since 2008, the average duration of social welfare usage by individuals has decreased by 6 weeks annually. It is assumed that this is partly because of the redeployed human resources which meant an input of high-skill competencies. The effective extra annual benefits were estimated at €125000 (Q3). To perform a financial trade-off between the investment in the introduction of risk evaluation and the savings at the level of Job Square/Career View as a whole, we need to compare the implementation costs with the annual savings. The implementation of the risk method is roughly €50000 (mainly man-hours for developing the risk assessment method). Compared to the annual savings estimated to total €325000, the investment was earned back within a few months, from which we can conclude that the intervention was a success from a financial point of view.

From the point of view of quality inputs and outputs (Q2 and Q4), two factors are important to consider, namely the quality of service (Q4) and employee satisfaction (throughput, process). Regarding the quality of service, the majority of the social benefit requests came from low-risk clients and were processed quickly in the office, whereas the remaining small number of high-risk requests needed to be checked more thoroughly. Perhaps contra-intuitively, even the high-risk group seemed to appreciate the new method, because for them also, only a prescriptive selection (dependent on their personal circumstances) of checks is made (instead of all mandatory checks in the former situation). In addition, the average throughput time has decreased from eight to three weeks, which has added to their satisfaction as customers (Q4). The increased customer satisfaction is indicated by their increased willingness to cooperate in the mediation process towards new jobs.

The results of an employee satisfaction survey indicate that employees evaluated the new method positively because it made the work process smoother and less time consuming. A critical remark with respect to satisfaction surveys—individuals may be more pleased when seeing quick results of their work and thus are inclined to make their experiences congruent with the new situation—concerns the decrease of the applied expertise by employees. The new method implied that their years-long experience in following their professional knowledge and intuition in deciding which fraud checks to apply was being exchanged for a standardized routine method. For some employees, the trade-off was simply keeping a job or being fired. Six of the 15 employees were offered another job when theirs became redundant. The quality of jobs (to be regarded as a throughput characteristic and not as an output factor) should consequently be evaluated as mixed: it depends on who one asks about it. Figure 3 provides a summary of this case.



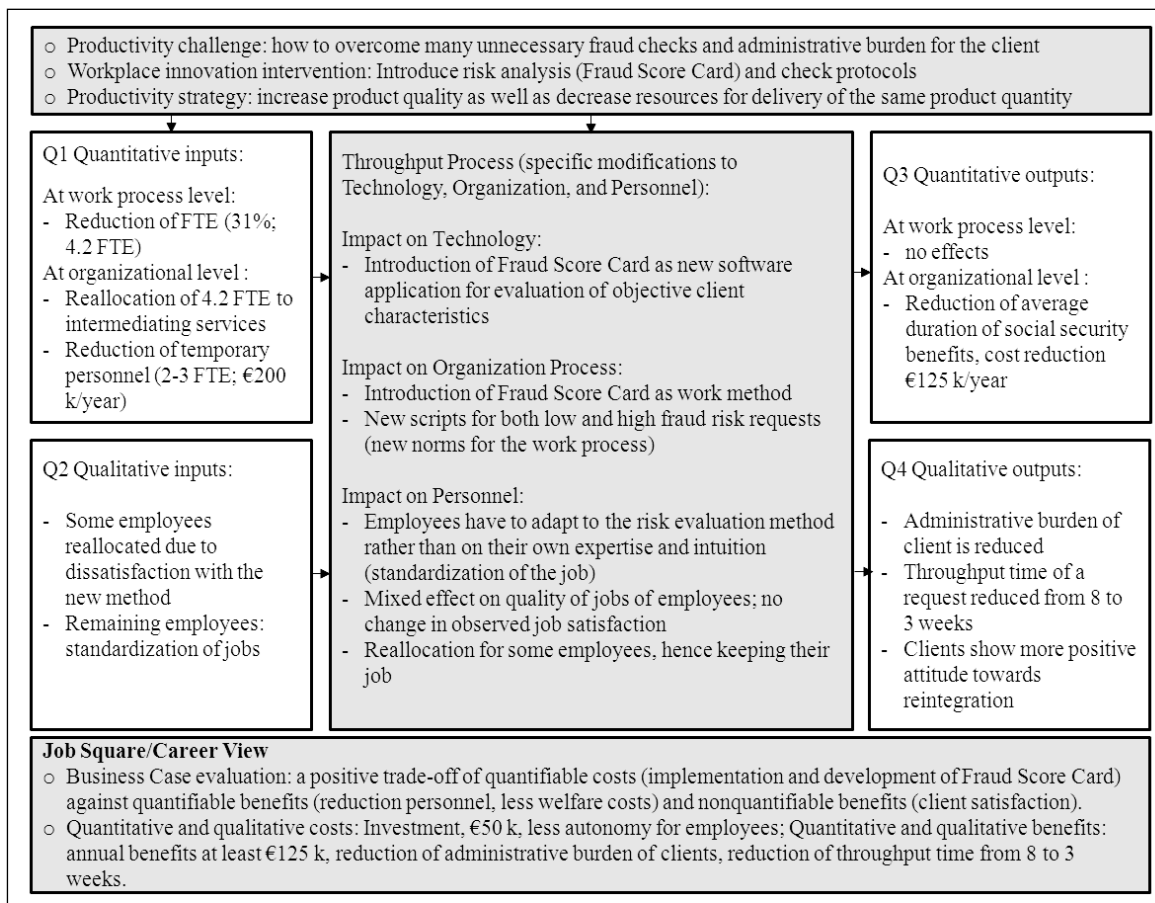


Figure 3. Summary of Case 1: Job Square/Career View.

## Case 2: Manufacturing Climate Devices

The second case involves a private manufacturing branch company called Climate Device (a pseudonym) that specializes in designing, producing, and assembling climate devices, such as “air curtains,” convection heating ventilators, and air heaters (Tuinzaad, Van Rhijn, & Bosch, 2011). The company supplies thousands of these products in different models every year to shopping malls and shops. Climate Device employs about 70 people.

### Productivity challenge:

The problem this company encountered consisted of the inefficiency of production batches, which was caused by the small number of products and extra handling and which coincided with inefficient routing (time-consuming walking up and down to grab parts and equipment). In 2009-2010, the production process was reengineered on the basis of demand flow and lean production principles (Womack, Jones, & Roos, 1991). An integrated and participatory approach was applied that improves a production processes by combining demand flow, lean production principles, and ergonomics. Participation in the change process of company representatives from various disciplines (e.g., engineering, planning, management, operations) is crucial for success (Van Rhijn et al., 2005). The management of the company faced several challenges.

The first and central objective was to increase production output (Q3) in order to improve the company’s competitive position. A second objective was to keep the number of employees constant, but to prevent chaotic, inefficient patterns and the costs of overtime work (Q1). A third objective was to reduce the lead time and work in process (WIP), which represents invested capital, in order to reduce costs (Q3) and improve delivery time (Q4). To reach these goals, management decided to reengineer, first, the production of parts of sheet metal work and, eventually, the complete production process, including the assembling of parts, into a demand

flow process. The purpose was to increase flexibility, reduce lead time, reduce waste in logistics like extra handling and internal transport, and reduce WIP. The company wished the change process to be performed with the participation of the employees to increase the commitment and motivation of the workforce.

#### *Productivity strategy:*

The strategy was to increase the output of production (Q3 and Q4) and to reduce the input of labor costs (Q1).

#### *Workplace innovation intervention:*

The basis of the intervention was to reengineer the production process (demand flow) and to redesign the product (product design for flow assembly) through the participation of the employees of different disciplines and to do that with the help of external consultants. Several of these project-based interventions resulted in adaptations of the manufacturing and assembly process and modifications of the products. Examples of these product modifications were less diversity in the casing of products and simplifications in the assembly of brackets and braces. Consequently, fewer square meters of space were needed for stocking parts along the assembly flow line. Examples of the process changes were a change from batch to demand flow production according to the pull principles (the Kanban system) and a new factory lay out with an efficient material flow in one direction and with workstations provided “just-in-time” with parts, tools, and equipment needed to perform the task.

The TOP-model was applied to this case. Looking at the throughput process, besides product redesign, mainly organizational changes (O: reengineering the production process) were observed. The technological changes (T) were modest and followed from the reengineering of the production and assembly process. Modest changes were also observed in the personnel aspects (P) in that the change was participatory and that working overtime was reduced significantly. Another personnel aspect was the reduction of the physical workload effected by ergonomic improvements that were introduced in the new layout of the assembly hall. A lifting aid (hoist) was introduced to ease the handling of the product and pallets, and the new product carrier was adjustable in height.

#### *Business case evaluation:*

The investment consisted of expenditures of about €75000 to reengineer and convert the production process. The expected benefits were less WIP, a less hectic and chaotic throughput process of orders, more regular work for employees, higher production volumes with the same number of persons, and thus eventually, a more profitable situation. The business case was a trade-off of quantifiable costs (investment in consultancy and the conversion of the production and assembling process) against some quantifiable benefits (the exact reduction of WIP was an entrepreneurial guess) and some nonquantifiable benefits (the time that was needed for the ROI was uncertain). The business case proved solid enough for the entrepreneurial risk that the firm was willing to take.

After two years, several results were realized, some quantifiable, others of a qualitative nature. The WIP was reduced by more than 50%. ROI was realized within one year. The turnover growth was 10% (Q3), and the required personnel capacity diminished by 10% (Q1). Overtime decreased yearly by €15000, and assembly time per product in hours was reduced by 25% (Q1). The qualitative effects consisted of less chaos in production, fewer rush orders, better stock control, more reliable delivery, a reduced burden on management, and more satisfaction among employees. Stock control is based on the more efficient and effective Kanban system, and work stations are equipped with ergonomically designed tooling and hoists to handle heavy parts. The case is summarized in Figure 4 below.

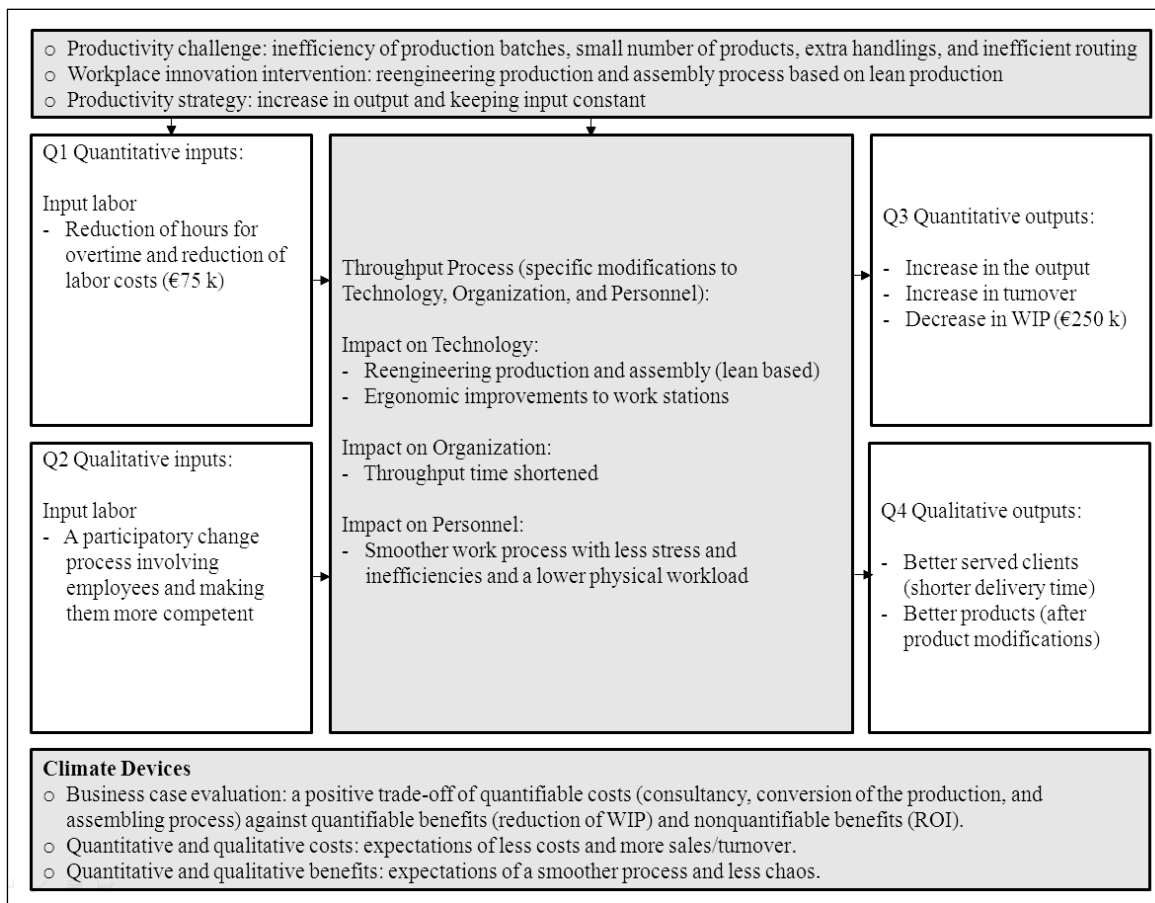


Figure 4. Summary of Case 2: Climate Device.

## Discussion and Conclusions

The lessons that we have learnt from these illustrations are that the Q4 model allows one to formulate productivity challenges, productivity strategies, workplace innovation interventions, and business case evaluations in a uniform and practical way for entrepreneurial purposes. In a previous article, the model was applied in three types of organizations with highly different productivity challenges: IT consultancy, health care, and manufacturing and assembly (Oeij et al., 2011a). They all fit within the Q4 approach, although the business case evaluation was not applied then. In all five cases, the entrepreneurs or responsible managers were able to take an informed decision about the expected consequences of a workplace innovation intervention with regard to outputs and outcomes.

Extending the Q4-model with the business case evaluation stresses the valid applicability in nonprofit environments and for organizations with several relevant but intangible factors, such as service organizations, as it offers users the opportunity to perform an informed trade-off between quantitative and qualitative factors. The importance of evaluating the business case as a final step requires managers from such organizations to take both the financial and quality aspects seriously and, subsequently, make solid choices. The business case evaluation proved to be helpful as an incentive to action.

Public-sector more than entrepreneurial organizations may be especially at risk of avoiding innovation in a time when it is needed more than ever. These organizations (for example, in Western Europe) are inherently inclined to avoid building up a sense of urgency to change and to use productivity targets as a driver for innovation. One of the issues at stake is that productivity enhancement in the public sector is seen negatively because of the association with cutting budget spending, increasing the workload of employees, and the rhetoric of empowering professionals by allowing them more professional autonomy (Oeij & Van der Torre, 2011). Nonetheless, business case methods for nonprofit organizations are an almost neglected topic in textbooks, despite the fact that more and more public bodies are forced to make their public value evident and prove the

“value for money” of their processes (Organisation for Economic Co-operation and Development–OECD, 2010). Our method may be of help in this process.

The application of the Q4-model varies according to the needs of the user. In some cases, an intensive approach is desired, whereas in other situations, a quick scan suffices. Here are a few examples of how to apply the Q4-model against augmenting work intensity:

- To make a SWOT (strengths, weaknesses, opportunities, and threats) analysis,
- To develop a new strategy or a change of strategy for the organization,
- To facilitate dialogue about change when the need for dialogue is urgent,
- To enhance insight into the relevant mechanisms of work processes and which Q-factors offer opportunities for manipulation,
- To create a social basis and stakeholder support for directions of change,
- To develop workplace innovation interventions,
- To develop alternative workplace innovation interventions for comparison and for constructing scenarios and the prioritization of the options,
- For financial and management accountability of the present situation,
- For financial and management accountability and justification of an investment (business case evaluation).

As shown in Figure 1, the transformation process changes the defined input into the defined output. This reasoning is in practice often misunderstood, as the usual error is to confuse the system input (the entity which gets changed into the output) with the resources needed to bring that transformation about (Checkland, 2001). 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. The Q4-model, thus, can be applied in different ways. One can apply it with the present situation of the process (the production of goods and services) but also with the future situation of the process in mind, and then compare the two business cases (or more future scenarios if there are more options being developed). One can also apply the Q4-model to exclusively understand the costs and benefits—the business case—of the intervention itself. Finally, one can combine the resources needed for the intervention and how the system inputs will be affected, in which case one is making the “mistake” that Checkland pointed out, but it has the advantage of arriving at a business case evaluation that includes both the workplace innovation intervention and the future state of the process and its outputs.

A shortcoming of the Q4-model might be the absence of measurement of the 4 Qs or a mathematical equation by which one can calculate the productivity (see also Oeij et al., 2011a). The gut feeling of the entrepreneur, in our view, does not always demand precision as a basis for decision making. The Q4-model of productivity is a general model applicable to unique situations. 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. We do not deny the relevance of numbers and figures, but in the process of deciding on strategy, having room to act on the basis of gut feeling or common sense seems important to us, maybe to the detriment of the financial control managers.

Two considerations can be taken into account to improve the method in the future. In evaluating a business case, it may be desirable to get a grip on the indirect effects of the intervention, the lagged effects of the intervention, and the possible wider (and perverted) effects of the intervention in other units or organizations. A more fundamental issue is the difficulty of assessing when to make the evaluation after the intervention. Optimal timing and time span depend on the type of intervention and, specifically, the time of occurrence of the desired effects. Some time is required to get the intervention into effective operation, for instance, time for individuals and departments to adapt to the new situation. But one cannot know beforehand when this will be the case. On the other hand, organizations operate in dynamic contexts, and thus the longer the applied time span, the more factors have been changed and may have affected the outcome. Although it seems advisable to control for potentially changing factors and their potential effects during this period of time, we realize that this is far from easy.

In conclusion, the Q4-model of productivity has proven to be validly applicable in every industrial sector and may help entrepreneurs and managers in developing a sound strategic argumentation for operational management decisions, namely, the workplace innovation interventions that boost performance. The model

may help to clarify strategic options and operational consequences which are of both a quantitative and qualitative nature at the same time. The model then can be used as a guide to develop concrete workplace innovation interventions with the purpose of improving productivity, in combination with a good quality of work, by closely scrutinizing how an intervention affects specific quantitative or qualitative aspects. The result is an informed business case evaluation for cost-effective interventions for workplace innovation.

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