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*The estimation  
of intangible  
investments -  
Experiment cases*

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**THE ESTIMATION OF  
INTANGIBLE INVESTMENTS**

**- Experiment cases -**

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## **ABSTRACT**

The object of this article is to present a contribution method to the estimation of intangible investments in the French industrial sector. We will take from several experiment cases to highlight the under-estimation of intangible investments by showing the malfunctionings that it brings about. We will then suggest a method to handle the overall investment : economic balances. We will draw on especially two principal interventions where we are associated with the implementation of investments, which were tangible as well as intangible :

- The first case (Case A) is that of a 2000 person food-processing enterprise with two main factories of which one has invested extensively in automation (-).
- The second case (Case B) is a 400 person metal-working enterprise which is in the process of modernizing some of its equipment and establishing new conception techniques (-).  
More several illustrations from other industrial companies.

## INTRODUCTION

Today, intangible investments represent an increasing weight in addition to tangible investments. As a rough guide, we can name a few of the reasons given to explain this phenomenon :

- For J. Morin (Morin, 1985), the reinforcement of a company's excellence in its professions not only requires acquisition of competence but also intangible investments in order to adapt and perfect its know-how.

- S. Urban and S. Vendemini (Urban and Vendemini, 1994) consider that new market organization makes additional intangible investment necessary, especially in the area of information and decision systems.

- R. Perez (Perez, 1988) through case studies, also shows that the complexity of investments in industrial automation coincide more and more with intangible investments for example in the area of adapting and perfecting equipment.

Compared with the increase in intangible investments, there is however a delay in the practices of accounting for them, which brings about general perverse effects :

- Financial reports are false because of gaps in the counting of intangible assets such as competence and experience as G. Triolaire (Triolaire, 1994) emphasizes. It has a particularly big impact in the cases of mergers ; takeovers and repurchasings, since estimation methods do not sufficiently take intangible capital and its long-term profitability into account.

- M. Marchesnay (Marchesnay, 1993) shows that the lack of assessing intangible investments false profitability calculations.

- By taking the fiscal impact to account there also can be an effect on the company's strategy. In certain cases the company opts for strategy with strong intangible investments which diminishes its company tax, but penalizes stock market rates. In other cases, the company is looking for high immediate results, and it gives priority to tangible investments, which pay for themselves over several years, and at the same time minimizing intangible investments to the detriment of long-term economic performance.

In order to take these difficulties into account, several suggestions for assessing intangible investments have been put forth :

- P. Boisselier (Boisselier, 1993), for example, pleads in favor of assessing intangible investments under two conditions :

. That the spending be integrated in a project with a clearly defined outline and which has been conceived in a profitability perspective.

. That the amounts of intangible investments be analyzed strictly in the same manner as tangible ones, which brings about the elimination of expenses at the conception phase.

- The Jenkins committee of the AICPA (Bazet, 1995) also makes recommendations for completing traditional annual reports through qualitative and quantitative givens which enable the assessment of intangible investments and their impact.

Finally, we can note that certain companies would like to be able to evaluate their intangible investments in a more complete manner, as emphasized in certain consultant reports (CEGOS, 1987).

In this perspective, the object of this article is to present a contribution method to the estimation of intangible investments in the French industrial sector. We will take from several experiment cases to highlight the under-estimation of intangible investments by showing the malfunctionings that it brings about. We will then suggest a method to handle the overall investment : economic balances. We will draw on especially two principal interventions where we are associated with the implementation of investments, which were tangible as well as intangible :

- The first case (Case A) is that of a 2000 person food-processing enterprise with two main factories of which one has invested extensively in automation (Bonnet and Leymarie, 1995a).
- The second case (Case B) is a 400 person metal-working enterprise which is in the process of modernizing some of its equipment and establishing new conception techniques (Bonnet and Leymarie, 1995b).

More several illustrations from other industrial companies.

## **I. UNDER ESTIMATION OF INTANGIBLE INVESTMENTS**

The under-estimation of intangible investments is a generality. It is particularly strong in the case of competence investments.

### **1.1. Generality of the underestimation intangible investments**

Generally, industrial companies only measure a small part of their intangible investments, except in three cases :

- That which strictly to assessable definitions of the intangible investment : purchases of patents or brands ...
- That which is directly linked to the study and the implementation of new products : time spent by survey offices and by trials ...
- The investment in training which is directly linked to the implementation of a new technology (training budget).

The estimation of these three elements alone, reveals only a small part of the overall intangible investments made by the company. Thus, in the metal-working company (Case B) we estimated that the performance indicators had only assessed 1.4 million francs in intangible investments for 1994, which corresponded to the training budget whereas a deeper assessment showed 3.6 million francs. The effect of this gap in the assessment of intangible investments was that the investments were accounting for as expenses, whereas in reality, that corresponded to investments which had impacts on the profitability of the enterprise for several years. As a result the company's decision-makers were dealing with a faulty information system which could lead to two types of managing mistakes :

- Too much importance put on tangible investments compared to intangible ones. In order to avoid cashiering the expense budget of the year in process, the company had make false savings in certain cases, for example in the area of training, with heavy impacts later on malfunctionings costs. Doubtlessly, it would have been pertinent in this particular case to make 4 million francs work of intangible investments instead of 3.6 million.

- In other cases, the company accepted to overextend their expense spending for intangible investments linked to a project in order to avoid failure. This over expenditure was absorbed by other sectors or company projects by implicitly giving priority to certain intangible investments. Since this hierarchical organization was not based on a reliable information system, it was likely that the most strategic and most profitable investments and projects would not be chosen. Sometimes the person responsible in a sector where the most investment was made, was penalized because of the budget whereas in reality intangible investments had been implemented after the decision was made at other levels of the company. That was typically the case when a new machine was act up in a production workshop and an adjustment and training time was demanded.

This example demonstrates the fact that this company should have, and would have measured their intangible investments better by using a production indicator other than an accounting indicator, which could have discerned two main categories in this case :

- Intangible investments linked to the acquisition and the perfecting of industrial competencies.

- The cost of actions linked to management perfecting.

## **1.2. Particular case of the underestimation of intangible investments linked to the acquisition and the perfecting of industrial competencies**

The analysis of two industrial investments cases discerned three main types of costs linked to intangible investments hidden in the expenses of the company at the time of the acquisition of industrial competencies. It is the time spent by directors and executives, the acquisition of external know-how other than patents and licenses, and the costs of under productivity during training.

### *a) Time spent by directors and executives*

In the case A (food product company), engineering service time and design office time were accounted for in calculating the investment amount, but the other executives and directors' time was not accounted for. At the time of our intervention in this company, it was observed that 20 % of the time that directing executives spent in one year, was devoted to a new factory project, mostly going to required meetings in order to devise the investments files. The company did not proportionately raise its number of chief executives during this time in order to avoid increasing its visible costs. The measuring of the time spent by executives during this test period showed that a part of this overload was compensated by about half by improving the executives productivity, thanks especially to getting rid of tasks that had a very small added value, or by stronger delegation. Nevertheless, approximately the other half of this work overload had an impact on the hidden costs linked to investment. The following phenomena were especially noticeable :

- Some executives accepted a heavy work overload over several months, which had medium-term consequences on their excess of stress and exhaustion with an effect on work atmosphere : exacerbated contention between certain engineers which brought about under-productivity, and the resignation of some very competent engineers.

- In addition, several important tasks were sacrificed for the project, which represented an opportunity cost to be added to the total investment. For example, the engineering service put aside tasks to improve its internal management, which led to poor quality coordination between engineers and technicians, and to under-productivity of the team members which was evaluated at close to 3 million francs a year.

*b) The acquisition of external know-how other than patents and licenses*

Patent purchases are accounted for in the company's fixed assets (count 205) whereas licenses, as well as training, come under expenses. Nevertheless, all costs linked to the acquisition of external know-how should be considered as intangible investments, being aware that the risk and the profitability of this investment can vary according to the adopted legal enforcement. This type of investment would namely of the following categories :

- Patent cost, or the flat sum paid over a minimal period of license using.
- The cost of gathering the information necessary for the study of an investment file : the purchase of documents, travel expenses linked to visiting professional shows, equipment suppliers, or other companies which use similar technology.

- The cost of time spent within the company to structure the file study (namely engineers and masters' time).
- Recruiting costs and costs linked to the under-activity of people who are learning know-how which did not yet exist in the company.
- Costs of technical assistance and training connected to the purchase of new equipment or patents.

Figure 1 introduces the case of accounted for intangible investments in a metal-working company (case B). It is the perfecting of a simulation procedure which is associated with a computer-assisted conception. This technology should allow the company to obtain markets for very highly sophisticated products, while respecting the demand for a reduction in study delays. The company identifies a formal investment of 1 million francs. It is made up of computers, software, and technical assistance. Another 1 million francs investment in intangible goods, which was not counted, had to be added, as figure 1 shows, and this almost doubled the official cost of the investment budget corresponding to his innovation.

**Figure 1 :**  
**Unaccounted intangible investment in the case of perfecting  
 a simulation procedure in a metal-working company**

INTANGIBLE INVESTMENTS COSTS CATEGORIES	QUANTITIES	COST
<u>Study and perfecting times</u>		
- Perfecting study	Engineer for 10 months	250 000 FF
- Software F perfecting	Engineer for 4 months	100 000 FF
- Software C perfecting	Engineer for 2 months	50 000 FF
- Graphic processors perfecting	Engineer for 5 months	125 000 FF
<u>Training time</u>		
- Under-activity of training at the arrival of material and software	Engineer for 6 months	150 000 FF
- Training a technician for software F and supplementary training for software C	Engineer for 2 months And technician for 1 year	325 000 FF
<b>TOTAL</b>		1 000 000 FF

*Source : Bonnet and Leymarie, 1995b.*

In this case it can be noted that accounting for this intangible investment gives several advantages to the company :

- First, study and perfecting time spent internally turn out to be much less costly than external technical assistance. This could lead to improving the complementary strategy between bringing in external know-how and innovation adaptation work done within the company.

- In addition, if necessary investments in terms of training are identified well, it prevents the under-estimation of needs. Such an under-estimation would likely bring about insufficient training sessions and high malfunctioning costs at the time of the procedure's implementation : under-productivity, quality defects, rejection reactions from personnel, etc.

*c) Under-productivity during training*

More often, investment files depend on profitability calculations which are based on the idea that there will be optimum productivity from the very start. Reality seems quite different because in order to achieve the desired level of efficiency, six months to a year are necessary. For example, this under-productivity was estimated at 1.5 million francs in a 25 million francs investment project case in the food-product company (case A). Two main reasons could be given for this phenomenon:

- Additional costs for the perfecting of procedures : even if the investment was for equipment that was already reliable, it had to be adapted to the particular conditions of the company's implementation : making it compatible with the company's other equipment adaptation of software of moulding installations considering the specificity and the variety of the products, standardization of equipment considering the environment variables which were neglected at the beginning, such as temperature, humidity, vibrations, etc.

- Additional costs in personal training : the initiation of the installation was associated with break-downs and quality defects because personnel were not sufficiently trained in the precise procedures to use in each step of production. These same phenomena were also observed in the metal-working

company where the desired production rate took 6 months to be achieved because of insufficient personnel training. The under-productivity in this case was estimated at 1 million francs for a 20 million francs investment.

## **II. MALFUNCTIONINGS CAUSED BY THE LACK OF TAKING INTANGIBLE INVESTMENTS INTO ACCOUNT IN AN ENTERPRISE**

Despite the care and professionalism used in investment budget preparation, three main deviations are observed in the analyzed cases :

- The investment budget is well overextended because of hazards or adjusting difficulties which were not expected at the beginning.
- The implementation of the investment takes longer than planned, with serious problems at the start-off.
- Once implemented, the investment does not bring satisfaction or the expected revenue.

The conjunction of these three phenomena leads to a strong decrease in investment profitability and even sometimes turns very wonderful technological projects into genuine financial disasters. We are going to examine six main causes of these profitability-loss phenomena, with the cases of industrial companies which were observed.

### **1.3. Personnel's reaction of rejecting new technologies**

These rejection reactions lead to especially high costs since the equipment is abandoned or sold in bad conditions. In case A, the establishment of a new line of production resulted in the manual use of automatic packaging machines for a year and

half. The manufacturers considered that the equipment was not perfected and in addition that this line "was not their problem", but rather the engineering services. This resulted in additional costs estimated at 10.5 million francs, meaning an excess of 28 % of the investment budget which was initially set at 27.5 million francs. Finally, the company had to relaunch a process that would increase manufacturer involvement. It took 2 more years for the line to function almost normally.

These rejection reactions are not very visible. For example, in this food-product company, we noticed that manufacturers sometimes passively watched the setbacks of new technologies without ever suggesting ways to correct them. Their behavior seemed to implicitly mean "let's let the engineering department fail in this project to show that it cannot work if we are not working together". To this phenomenon of sociological nature, more technical reasons can be added. Indeed, the users had information, often informal, about the conditions of the proper functioning of the investment. Not taking this information into account was a big mistake in that they modeled the procedures of the technology to be implemented too quickly.

#### **1.4. Personnel difficulties in learning and assimilating technologies**

In the working-metal company case, the directors were confronted with a regression in the company's traditional markets in the area of "fritté" metal production. This had led it to a strategic approach consisting in launching new products which were more sophisticated and technologically more complex which corresponded to very buoyant markets. This product innovation resulted in two new demands on personnel :

- To know how to implement the present equipment with more precision (respecting very strict parameters in temperature, proportions, etc.).
- To master new equipment which called for computer programming knowledge.

The weaknesses in the company's competencies in these two areas led to the partial failure in this product launching. Indeed, the lack of mastering technologies led to touch-up rates which were over 45% for some series, as well as more than 3 months delays in delivering the first series. The malfunctioning costs linked to these phenomena were estimated at 3.5 million francs a year, to which a considerable commercial loss must be added (loss of credibility on the market, competitors taking advantage of the company's delay, etc.). In this case, our diagnosis revealed two main difficulties in the assimilation of new technologies :

- The absence of a cartography of the company's competencies which could have helped the company target its products-innovation strategy while considering its existing competencies. A clearer view on this point would have doubtlessly led to a more pertinent "impartition" strategy and to the decision to sub contract the operations needing competence which is difficult to acquire, as well as to the implementation of adapted training.

- The lack of company competence in the industrialization of the products : what seemed feasible in the research center laboratories met with application difficulties in the production phase. This malfunctioning more specifically revealed that the company did not know how to carry out sufficient consulting between the company's different services at the time of new project. In this case of an estimated 2.6 million francs

investment, no one really thought about whether adding 0.5 million francs would suffice or not acquire the necessary know-how and avoid the much higher malfunctioning costs.

### **1.5. Investment inadapted to needs**

Normally, the investment selection and preparation procedure is conceived to avoid the risks of inadaptation to industrial projects, as well as mistakes relative to the capacity of these investments. Nonetheless, we have seen that these procedures had weaknesses. Three main malfunctionings have thus been noticed :

*a) Lack of "after-the fact" estimation of investment profitability*

This gap seemed to be systematically observed, even when companies had rigorous budget control. This phenomenon could be partly explained by the fear of having to admit that the predictions were wrong. In several cases, the company preferred to ignore the problem instead of reconsidering keeping or getting rid of certain fixed assets. It was even more damaging since the equipment was becoming quickly obsolescent. The company was putting up with only partially paid off fixed assets, which were unsaleable because they waited a year too long to withdraw investments. The malfunctioning costs were particularly high in this case because they generated phenomena of different natures :

- Accelerated depreciation of equipment
- Maintenance costs
- Costs due to congested premises

- Opportunity costs due to the fact that investments could have been made for more useful equipment if other investments had been cut before.

*b) Lack of equipment adaptability*

The diagnosis of the studied companies revealed numerous errors in investment predictions. These errors were sometimes linked to a lack of intangible investment in an environmental information system, which led to over-investing because of activity or profitability predictions that were too optimistic, or it led to under-estimating technological changes. The effects of the incorrect predictions were amplified when the equipment was not sufficiently adaptable, especially in the following cases :

- The equipment was sometimes too specialized and insufficiently multifunctional, and as a result it became outdated whenever a small change in products or procedures came about.

- Sometimes, the equipment and investments were sufficiently modular, which led to compatibility or extension problems when they needed to be complemented in order to increase production capacity. In numerous cases, this difficulty came from the company's negligent definition of equipment compatibility norms and modularity norms, before launching the project. This definition of norms could have been a very small intangible investment which could have made a tangible investment profitable for many years.

*c) Choice of immature technology*

Other needs were not taken into account in case A, when the company chose a technology that was too recent or not stabilized yet, thinking that it would get them a step ahead of their competitors. This ended up to be a handicap because the investment cost was not only higher, but in addition, they had to reinvest the following year to update and make the system sufficiently reliable. This especially was the case automatic moulding systems where the company had to reinvest more than 8 million additional francs after 2 years, whereas the initial investment was 5.5 million francs. This example illustrates the importance of equipment testing when the project is being planned. In this instance, it would have been enough to ask the technology supplier to give more references and to take the time to go visit companies which were already equipped. This would have allowed the company to realize they should wait a year for the technology to mature while improving the present equipment maintenance in order to make it last a little longer.

### **1.6. Technological perfectionism and difficulties in perfecting technologies**

If some sectors of the studied companies suffered from technological backwardness, others had additional costs because of the implementation of technology which is too advanced. This especially led to technology implementation difficulties which meant additional costs for perfecting the technology, either from additional outside assistance or from the company's personnel working overtime. At the root of this sort of malfunctioning, the diagnosis revealed a flaw which is two fold :

- The division between engineering and production departments, associated with the engineers' lack of listening in order to reasonably satisfy the minimum technological perfecting needs (Berry, 1987).
- The interest in prestige that comes with establishing sophisticated technologies. Of course, this desire could be legitimated for engineers or technicians who have very advanced technological training. However, it should have been moderated by demonstrating the obvious additional costs due to perfecting and by considering the customers final needs. This type of cost analysis would have helped to measure the reasonable level of technical perfectionism, which would have given the decision-makers a technological innovation management tool.

### **1.7. Increase of certain malfunctionings**

The new production technologies frequently represented a high investment cost in case A, and we observed an increase in depreciation allowances in the make-up of cost prices. This meant that an hour of halted production on very automated equipment was generally much more costly than on a more classic machine. Thus, the cost of stopping a production line was estimated at 5400 francs an hour, whereas a few people would have sufficed to pilot this machine.

We observed a similar phenomenon in a chemical company, where process regulating flaws led to a 15 million francs over consumption of energy, meaning four times more than in former units.

This cost increase phenomena was due to the under estimation of the risk of bringing in malfunctionings which were present

in the former production system. This importation of malfunctionings was even more pernicious since there was supposedly a complete renewal process which was carried out when the company created this new unit : the premises, equipment and technology were new, the personnel was partially renewed, and former problems were believed to be eliminated. Reality was very disappointing after the implementation of the investment when they realized the new unit had been "contaminated" by previous malfunctionings. Without realizing it the company had in fact transposed the old ideas of work organization or inadapated communication means, which had insidiously continued in the technological project.

### **1.8. Company chaos caused by investment projects**

Unlike the five previous cases of malfunctioning costs that were directly linked to investments, this type of additional cost is indirectly caused by the implementation of the investment. The effect is not felt on the equipment or product level, but in the rest of the company.

In the case of company A, the implementation of investment projects was overshadowed by delays, cancellations, despite the use of computerized project management tools. This was due to three kinds of vagaries :

- Difficulties in perfecting certain techniques
- Suppliers who delayed deliveries, which often had nothing to do with the purchased equipment, but which delayed the overall project.
- Lack of decision-making by the company about technical or investment amount choices, which forced them to start consulting suppliers all over again.

These vagaries shattered the initially planned program and led to two types of additional costs :

- Additional costs for project handling, with increased need for outside engineering company interventions.
- A loss of earnings due to the delay in starting the project.

### **III. ECONOMIC BALANCE EVALUATION METHODS FOR TANGIBLE AND INTANGIBLE INDUSTRIAL INVESTMENTS**

In order to cure the aforementioned malfunctionings, we experimented with an intangible investment evaluation method in the form of economic balances.

#### **3.1. Economic balance suggestion**

It is a matter of simply completing investment profitability calculations based on usual criteria with three types of givens<sup>1</sup> :

- Financial givens, on hidden investment costs and performances. This mainly consists in highlighting the hidden part of intangible investments as well as the expected hidden performances.
- Quantitative givens which were not completely financially estimated, and which allow a better understanding of potential generated by the investment : number of people trained in new operations, reduced number of customer complaints, etc.

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<sup>1</sup> The simultaneous resorting to qualitative, quantitative and financial givens is presented by H. Savall in *Enrichir le travail humain : l'évaluation économique*, Dunod, 1974.

- Qualitative givens which are relative to strategic advantages obtained thanks to the investment. This can be assessed either in external strategic terms (acquisition of a new profession or company image consolidation in a new market for example), or in terms of internal advantages (an increase in organization flexibility for example).

It is useful to then present these givens in a synoptic manner, in order to give the decision-makers the overall elements needed for judgment which are not explicit then only the visible cost-performance financial calculations are considered. Among the two experiment cases, one example can be given on how to set up self-regulation in a metal-working company sanding workshop (see figure 2). The tangible share of the investment consisted in setting up a small laboratory and slightly modifying the installation in order to treat and control long pieces. Thus the implementation of self-regulation consisted in getting the operators to analyze the sanding vat at each work station. Figure 2 presents the complete outcome of this micro-investment in which the reimbursement time was largely inferior to one year.

The economic balances of investment projects consisted in accounting for more givens than the usual methods used for estimating and selecting information relative to visible investment cost-performances. This especially was true for the following categories :

- Accounting for visible and hidden parts of the investment.
- The analysis of the investment impact on visible and hidden performances connected to the decrease in certain malfunctioning costs.
- The inventory of qualitative and quantitative advantages which are not entirely financially assessable, but of which the

accounting for can make the scales tilt in favor of an investment project which is of better quality than another.

The objective of economic investment balances thus consisted in making numerous variables obvious, whereas they are usually hidden by decision-making tools are too simplistic, like the case of using only visible performance criteria.

**Figure 2 : Economic balance of the investment "Wrought-Sanding"**

	<b>COSTS</b>	<b>PERFORMANCES</b>
<b>VISIBLE COSTS- PERFORMANCES</b>	<ul style="list-style-type: none"> <li>- Purchase of laboratory material 60 000 F</li> <li>- Modifications on the installation 40 000 F</li> </ul>	<ul style="list-style-type: none"> <li>- Repatriation of subcontracting in order to deal with long pieces 30 000 F / year</li> </ul>
<b>HIDDEN COSTS- PERFORMANCES</b>	<ul style="list-style-type: none"> <li>- Time spent running the project and operator training - 200 hours at 150 F/hour 30 000 F</li> </ul>	<ul style="list-style-type: none"> <li>- Reducing waiting time (100 hours/year at a 500 F margin in variable costs of this installation) 50 000 F / year</li> <li>- Reducing acid soda and treatment product consumption 110 000 F / year</li> <li>- Reducing wastes 30 000 F / year</li> <li>- Energy savings 30 000 F / year</li> </ul>
<b>QUALITATIVE AND QUANTITATIVE COSTS AND PERFORMANCES</b>	<ul style="list-style-type: none"> <li>- Necessity to clarify factory policy in the area of self-regulation</li> </ul>	<ul style="list-style-type: none"> <li>- Emptying intervals (2 months instead of 6 months)</li> <li>- Sanding quality improvement (not financially estimated)</li> <li>- Giving a sense of responsibility to operators about quality (not financially estimated)</li> </ul>
<b>TOTAL</b>	<b>130 000 F</b>	<b>240 000 F / year</b>

**OUTCOME : REIMBURSEMENT OF THE INVESTMENT IN 6<sup>1/2</sup> MONTHS + QUALITATIVE ADVANTAGES**

### 3.2. Calculating the complete cost of investment

The economic balance experiments consisted in grouping the overall costs of the investment :

- The visible costs, whether it is for equipment purchases and improvement costs, or the identified supplemental costs : training sessions, supplies and small tools.
- The hidden investment costs : time spent by directors and executives, the under-production during training periods, etc.

For instance, the setting up of new station for control with ultra-sound in the metal-working company (case B) required an investment total composed of the following :

- Purchase of an air-conditioned cubicle : 60 000 F
- Purchase of computer and software material : 55 000 F
- Improvement of handling and stock systems : 45 000 F
- Time spent in file studies, the improvement of ergonomics and perfecting assembly techniques (4000 hours at 150 F / hour) : 60 000 F

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TOTAL	220 000 F
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Through this example it can be seen that an investment cost estimation which was carried out in the usual ways would have only shown the two first elements out of the four (air-conditioned cubicle and computer equipment). That represented

105 000 F out of the 220 000 F total, which doubles the investment calculation base !

### **3.3 Qualitative and quantitative estimation of the creation of potential**

In the studied cases, the middle or long term economic performances were only partially financially assessable<sup>2</sup>. However it was useful to complete the investment files with qualitative or quantitative givens which could help the decision-makers and stock holders with criteria that could be just as important as the financial criteria. For main types of improvement impacts linked to investments could be accounted for, like we measured in the metal-working company (case B).

- An increase in the company's professional competencies or in new professions like in the case of perfecting new techniques like numeric simulation.
- An improvement of the image that present or potential customers have of the company, thanks to intangible investments which allowed the company to reduce delays.
- An increase in the company' flexibility and its adaptation ability : this was the case for installation within the production department in order to reduce conception delays. The investment in operators' competence and ability to do several jobs also contributed to making this factory flexible.
- Risk reducing, thanks to malfunctioning prevention action investments (preventive interview for example) and thanks to the extreme caution the company used in relation to its

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<sup>2</sup> For an example of a tentative to estimate long-term economic performances, see Baglin and Malleret, "Evaluation économique du juste à temps", AFC congress, 1990.

environment (making executives responsible by dividing them among product categories for example).

Some of these improvements could be directly financially estimated, like reducing conception delays which allowed them to gain market shares and increase their commercial margin. The estimation of the impact of other investments was more controversial, like in the case of risk reducing<sup>3</sup>.

### **3.4. Analysis of the investment impact on visible and hidden performances**

The economic investment balances enabled the completion of the visible performance estimation (productivity or consumption gains...) with an estimation of hidden performances. This called for an analysis of malfunctioning costs, which could be reduced thanks to the investment. For this, it was suitable to take the most complete inventory of hidden costs and to make a prognosis about the investment impact on reducing these costs. In order to remain realistic, it was suggested to list the reduction rates on a scale of only four levels (0 %, 1/3, 2/3 and 100 %) because it was practically impossible to determine these rates with more precise percentages. Figure 3 shows an example of this type of estimation in the case of a food product factory, in the

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<sup>3</sup> See G. Charreaux, *Gestion Financière*, LITEC, 1993, p. 264 and 265. Also see the authors named by G. Charreaux on this subject, like S. Myers, "Determinants of corporate borrowing", *Journal of Financial Economics*, 1977 and C. Kester, "Today's options for tomorrow's growth", *Harvard Business Review*, 1984. We keep in mind these authors' suggestion to compare this kind of investment with the options of buying stock shares while highlighting the specificities connected to the different impact of the interest rates according to the two cases, and in fact there is no exclusivity unlike stock share purchasing options.

framework of an investment project including 120 000 F in operator training in self-regulation and first level maintenance.

**Figure 3 : Prognosis example for reducing the hidden costs on a production line**

<b>Project impact on malfunctionings</b>	<b>Present hidden costs (per year)</b>	<b>Reduction rate allowed by intangible investments mainly</b>	<b>Expected hidden perf. (per year)</b>
- Poorly baked products	174 000 F	2/3	116 000 F
- Deteriorated or broken boxes during packaging	36 000 F	2/3	24 000 F
- Overweight products	150 000 F	1/3	50 000 F
- Overtime in cleaning and maintenance due to carelessness	48 000 F	100 %	48 000 F
- Useless maintenance interventions due to manipulation mistakes	36 000 F	2/3	24 000 F
<b>TOTAL</b>	<b>444 000 F</b>	<b>41 %</b>	<b>262 000 F</b>

In this case it can be noted that the prediction gave a rough value at the start. But this prediction was taken into consideration because of the fact that it was a true contract between the executives of the service which had asked for the investment, and the directors of the company, who agreed on the financing.

The addition of hidden performances with visible ones allowed them to select certain investments which would have been eliminated without the rise in value of hidden performances. In

the case of the metal-working factory (case B), the setting up of a method service unit within the workshops, corresponding to a 768 000 F investment could not be justified with only the 225 000 francs per year productivity gains. On the other hand, the analysis of the impact on hidden costs connected to lack of quality highlighted a supplementary treasury flow of 350 000 francs per year, meaning a performance total of 575 000 francs per year which enable them to reimburse the investment in less than a year and a half.

### **3.5. Contribution of economic balances to usual investment selection methods**

An investment case dealing with a sanding technique in company B proved to teach a lot about the contribution of this type of method, especially in the following points :

- Calculating the investment only on the visible costs-performances criteria would have made the project impossible, because the PNV (Present Net Value) could appear inferior to those of other big investment projects, and also because of the reimbursement delay which was longer than three years.
  
- In the factory had decided to go ahead with this investment, without clarifying the economic balance, apparent damage would have been done to the maintenance service budget, which had sacrificed part of its 200 hours of intangible investment to running the project and training operators (see figure 2). Even if this deterioration of a service budget was widely compensated by the gains of another service, one can understand that the people responsible for the service would be reticent (even hostile) about this project if their time had not been accounted for as assistance to the production service's investment project.

- The mobilization of hidden performances not only helped to finance the self-regulation project itself, but also to improve the installation. It made the overall investment project development possible in this workshop, including in the area of the improvement of work conditions.

More generally speaking, we observed that the investment selection criteria were more complete or more formalized than in the methods the company usually uses, which enabled them to progressively establish a multi-criteria method which was adapted to the company.

For example, in the case we presented, one could wonder about things like the impact of the project in the company's other investments :

- Reducing the over-consumption of products or energy.
- Impact on waiting times.
- Effects on the costs of non-quality.
- Increase in the personnel's competence in self-regulation.

We noticed that this way of proceeding enabled the financial evaluation of many criteria which remained only qualitative or quantitative in multi criteria methods. For instance, the impact of the increase in the personnel's overall competence could be measured with the decrease in quality defects due to wrong proportions used in sanding vats. The criteria which still were not financially estimated were nevertheless clarified and prioritized according to the company's strategic objectives.

For example, making operators responsible for self-regulation was important considering the company's policy to turn towards high quality products and services. One could have

even imagined the case when driven them to not choose this investment in comparison with another one with 50 000 francs plus profitability, yet without an impact on these criteria of making operators responsible. In this case, the directors could have chosen this investment after all, and consider that the 50 000 francs gap make up a long term investment under the "quality policy" category, in the frame work of a budget handled by the company's Quality Direction.

## **CONCLUSION**

The analysis of these experiments bring out three main substantial results :

- The intangible investments made by the companies we studied not only contributed to their long-term competitiveness, but they often paid for themselves in a very short time as well (an average of one year in the metal-working company). Consequently, it would have been illusory to try to save on it with the excuse of increasing the immediate results.
- The intangible investments which were associated with investments in new equipment represented a small additional cost compared to the tangible investment (6 % for example in the case of the acquisition of a new press in the metal-working company). Yet, they were an essential ingredient in the profitability of the overall investment.
- The economic balances enabled them to enrich their usual estimation methods, by accounting for not only the tangible and intangible investments, but also their short-term and long-term effects.

It is now necessary to perfect this methodology in two main areas :

- The consolidation methods of the economic balances, by studying the problem of adding up results and the problem of the possibility of separating the results of the various investments into tangible and intangible components.
  
- The perfecting of financial analysis, by possibly accounting for the impact of intangible investments on the estimation of immobilized assets and calculating profitability.

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