

MAJOR RISK AVOIDANCE–FULFILLING OUR RESPONSIBILITIES – COSTS AND BENEFITS OF ROMANIA'S SAFETY INTEGRATION INTO THE EUROPEAN UNION

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The European Union documents regarding risks (Seveso II directive, other EU safety and health directives etc.) are novel to Romanian specialists. In the view of Romania's integration in the EU, safety issues emerging from the local implementation of these directives raise various important structural and financial issues. This paper focuses on providing a valid methodology that could be engaged for comparative analysis between both different local economic sectors and a broad range of industries within other candidate states for entry into the EU. It does so by presenting the operational analysis of a recent survey on the identification of necessary costs for compliance with the European Safety Directives, that has engaged more than 10000 various economic enterprises. Its findings were examined in relation to collected data on Romanian occupational accidents and diseases. The outcome both advances the development of a cost effective integration model based on the optimisation of expenses and touches upon practical implementation of safety issues encountered locally.

KEYWORDS: Risk, safety, integration into EU, integration study

INTRODUCTION

Romania's integration into the European Union does not simply refer the advantages offered by the European market but also the responsibilities that come with providing a qualitative shift in the living standard. As better life means better work conditions, safety and health assurance in the workplace constitute basic elements in the improvement of working environments. The close observation and implementation of the European Union social directives will be beneficial in both complying with European Union provisions and improving the actual local economy safety level. As such, the evaluation of the necessary costs for implementation is a vital task.

Assessing such costs means:

-To compare the compliance of our safety legislative system to its European counterpart.

-To estimate the real implementation costs of EU directives into Romanian economy, at its basic (enterprise) level;

While the majority of Romania's work safety documents are straightforwardly adapted from or developed in the spirit of EU trends, the cost evaluation of the local implementation of EU directives is more difficult. This paper presents some of the most significant aspects of such an undertaking by devising and testing methodological approaches and fine tuning an implementation cost model.

METHODOLOGICAL ASPECTS OF THE STUDY

The aim was to obtain a realistic mid-term forecast of the EU safety directives implementation action expressed by overall costs at national level. To obtain this forecast we worked with the safety managers of various enterprises who were requested to participate in our survey.

From the beginning we realised the necessity to work with statistically significant samples of Romanian enterprises. Our samples were built around economic activities as described in the NACE code (see Table 1). Their selection was according to:

1. Economic activity domains.
2. Financial strength – they had to have significant resources that allow that the investment they were prepared to make in order to comply with EU provisions would not disturb the financial health of the enterprise.
3. Size of the enterprise.
4. Regional representativeness: we sought to capture a uniform geographical distribution of the sampled enterprises.

The chosen enterprises were diverse in size (ranging from unit samples-industries where one unit covers near one hundred percent of the economic activity and ending with samples having thousand of units, like those in commercial services). Our time frame was fixed between 2002–2006 in order to produce an overview of the implementation process.

A number of extrapolating criteria for the whole Romanian economic activity were also considered:

1. The domain's participation in the national Internal Gross Product (IGP);
2. The domain's participation to yearly production;
3. The contribution made by the sampled enterprise to the domain.

Table 1. Major sampled activities

Sample activity no.	Main sampled economic activities
1	Agriculture
2	Wood and hunting activities
3	Fishing
4	Extractive industry
5	Processing industry
6	Production, transport and distribution of electric and thermal energy
7	Building and maintenance activities
8	Trade
9	Transport and storage
10	Postal activities
11	Other services
12	Health and social assistance

The intention to produce objective assessments was-somewhat hampered by external factors, such as the managers' belief that the forecasted implementation sum should be provided by the enterprise itself. Other managers speculated that the forecasted sum would be given by the European community in order to do the improvement. These assumptions were accompanied by a more concrete obstacle: an uncertainty at the enterprise level dealing with the difficulty in forecasting the amount of money for safety and health improvement when the work force can not always be paid regular wages.

Following this latter aspect, instead of requesting the approximate costs of implementation we offered the choice of assessment on a 0...10 scale where 0 was the minimum value (no money needed for the implementation of a specific directive) and 10 was the maximal value-1 cost unit = aprox 10 million Euro.

This scale approach has the advantages of:

1. Eliminating psychological barriers for the safety managers.
2. Using standard data collection procedures, processing and interpretation, that take into account the necessity of objective validation;
3. Providing an accurate national overview of the safety levels of various economic activities, and the possibility of comparison between various activities.

Anticipating the gap between the actual safety level of our pilot enterprises and their expressed needs we also used the 0...10 scale to assess the safety level of each enterprise taking into account:

1. The amount of incidents, accidents and professional diseases present;
2. The operating safety policies and
3. More recent safety assessments.

Using this approach we computed a reality coefficient using a formula such as:

$$Rc = \sim Abs\ (Exp\text{-}S) \qquad [1]$$

Where:
Rc = reality coefficient;
Exp = forecasted sum for the sampled enterprise on a 0..10 scale;
S = safety state for the sampled enterprise on a 0..10 scale.

FINDINGS

Our findings are significant for the financial safety needs of Romanian economy.

Figure 1 shows the implementation cost repartition on main sampled economic activities.

Samples 4–7 refer to core domains: number 5, for instance represents the processing industry that includes the bulk of industrial activities, starting with machines and equipment and ending with beverages and clothing. Domains 8 (Trade) and 9 (Postal) have had no significant safety investments made so far.

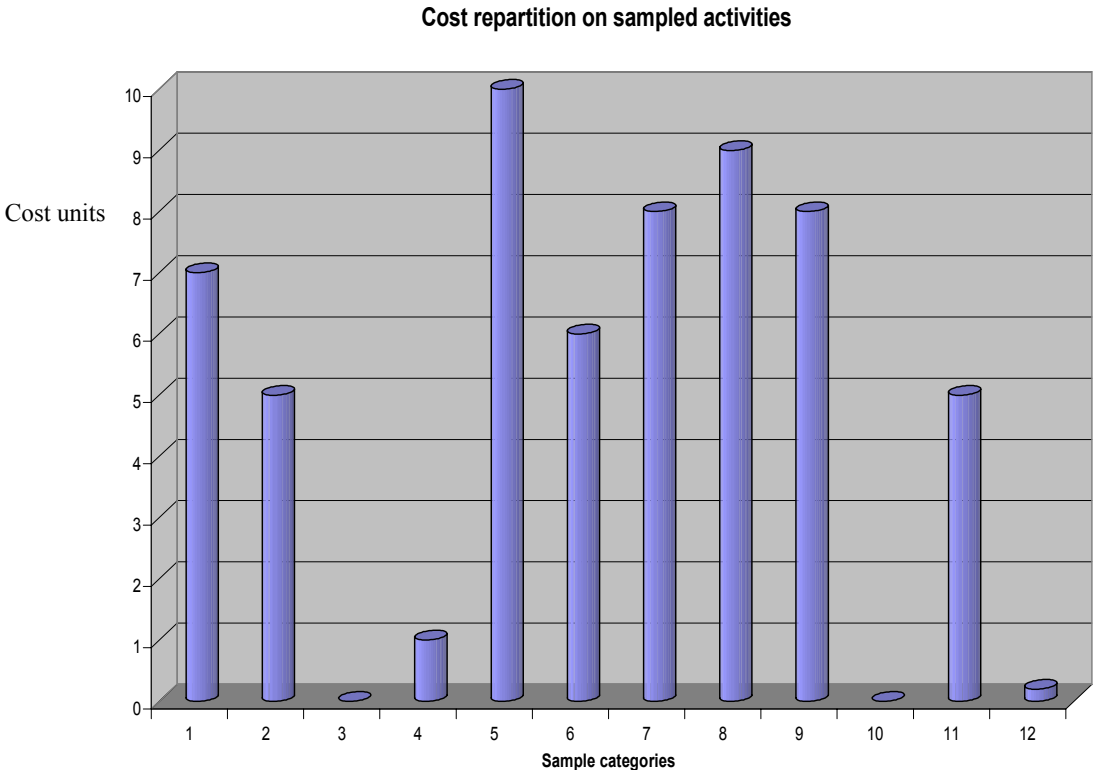

Figure 1. Implementation cost repartition on main sampled economic activities

The next graph shows previsioned costs versus safety problems.

Analysing safety problems we took into account the occupational accident statistics between 1996 and 2000, and transposed them on a 0...10 scale in order to make useful comparisons.

A closer look at the comparisons between these categories of analysis reveals that there are:

1. A "*normal*" *region* where the forecasted costs are comparable to perceived safety problems, showing that the management is aware of existing safety problems and willing to improve the safety. This refers to number 5, 6 and 7 samples.
2. A *singularity* represented by the extractive industry where most occupational accidents occur, explained by:
   -the amount of safety investments made in 1996–2000.
   -the transitional state of our economy and the actual or foreseeable closure of unprofitable mines, pits and other extractive units.
3. "*Abnormal*" *regions where* safety problems are minor but the forecasted sums are large.

Further analysis distinguishes between:
-economic activities and industries that are able to support the implementation costs by themselves;
-economic activities and industries that are not able to auto finance the implementation costs.

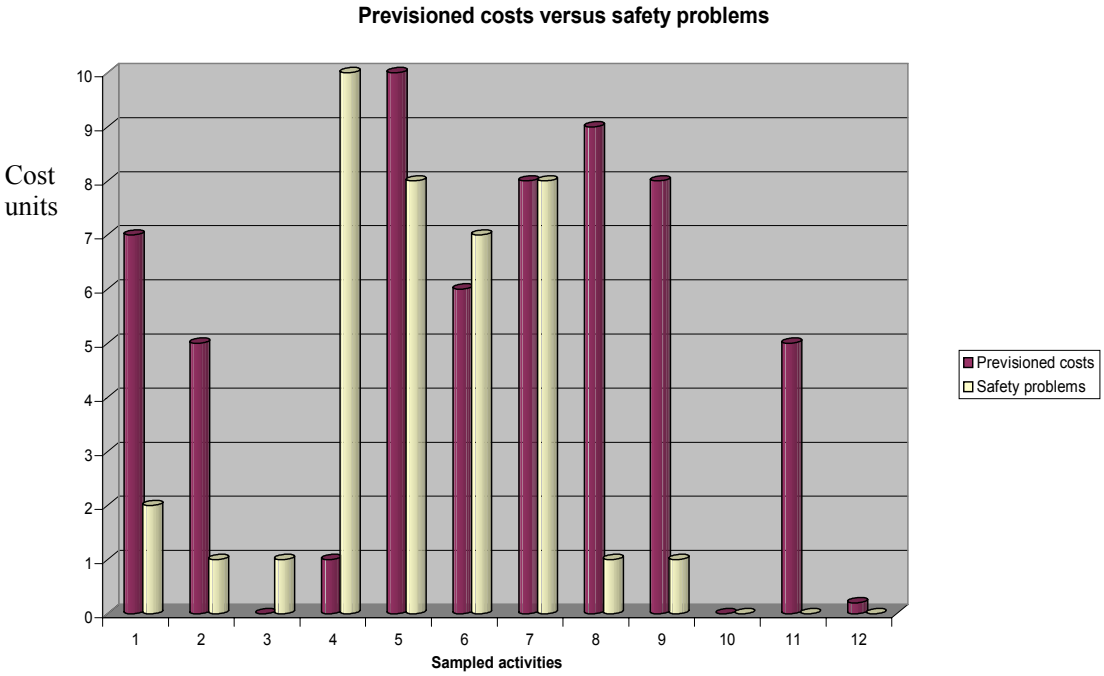

Figure 2. Implementation cost repartition on sampled activities compared with safety problems

Concerning the latter, there are two particular ways to deal with this situation: If the specific activity or industry is significant, it must be assisted in order to implement the EU safety directives by the Romanian government, possibly through EU funding. If it is not, the implementation issue should be postponed.

Figure 3 shows the breakdown of implementation costs on major specific EU safety directives.

It is apparent that the general safety directives (minimal safety conditions at the workplace (89/654), the usage of technical equipment (89/655) and of PPE's (89/656) and the protection against chemical risks at the workplace (98/24/CEE) are the most needed in the Romanian economy. In the above table the need is expressed in cost figures

The breakdown on specific cost categories is presented in Figure 4.

The cost breakdown considering the size of sampled enterprises is presented in Figure 5.

Of interest here is the co-existence of the big enterprises (over 250 employees) with small and medium enterprises (between 50 and 249 employees).

IMPLEMENTATION MODELS

The difficulties in forecasting the resources needed for implementation point to the need to develop viable cost models. Ours has the advantage of dealing with all the above mentioned aspects and with inherent uncertainty[1]. The model is presented in Figure 6.

The model's cost effectiveness relates to progress already done towards the improvement of work conditions and safety in Romania.

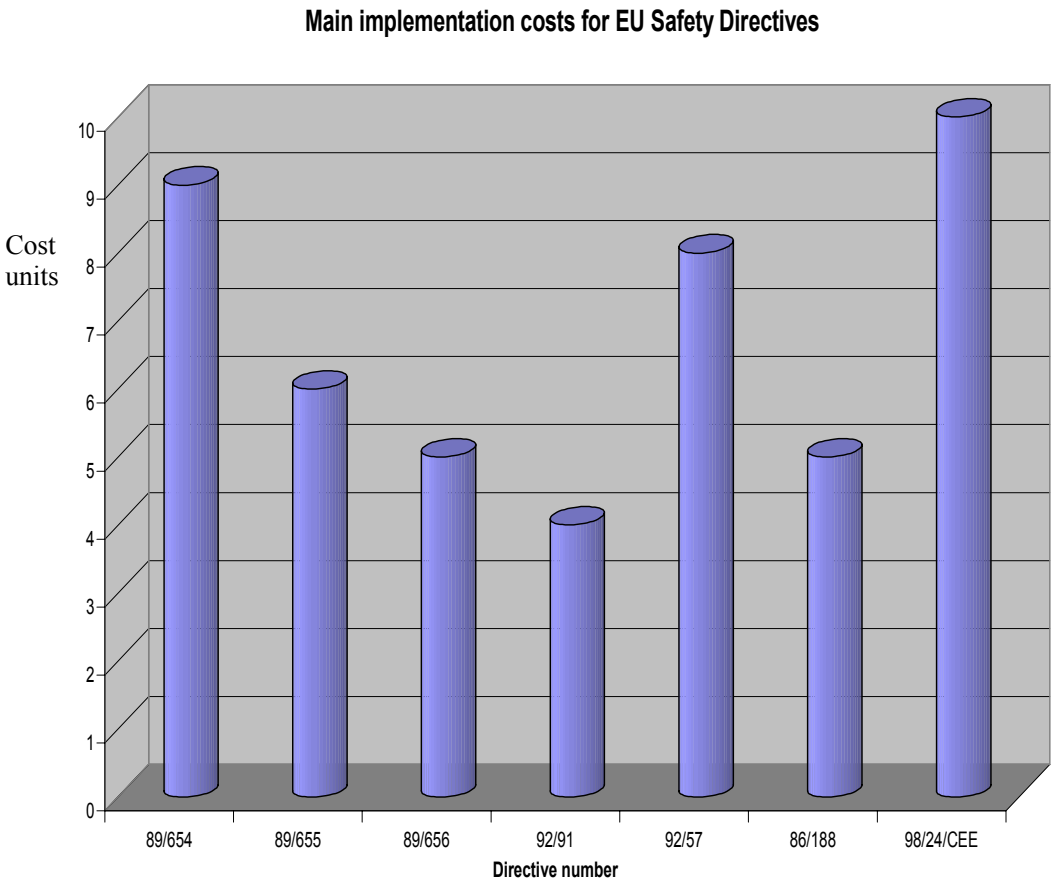

Figure 3. Implementation cost figures distributed on the significant* EU social directives

In developing this model our focus was on the results of the implementation. We classified the results according to their time span as:

-*immediate:*

-the compliance with EU documents regarding risks and major risks;

-a 25% reduction of major hazards;

-the 75% decrease of the major events covered by Seveso II Directive;

-a 25...50% improvement of work conditions on workplace;

-*mid-term:*

-a 50...75% reduction of major hazards for safety and environment;

-a 75...100% decrease of the major events covered by Seveso II Directive;

-a 50...75% improvement of work conditions on workplace;

-*long-term:*-could be defined as reaching similar safety levels as other EU countries.

The quantitative and qualitative components of our model are presented below.

* From the cost point of view

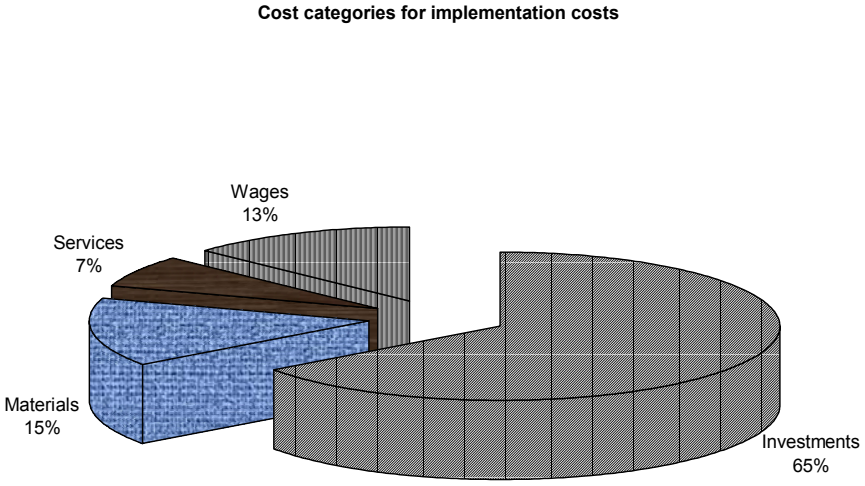

Figure 4. Implementation cost categories

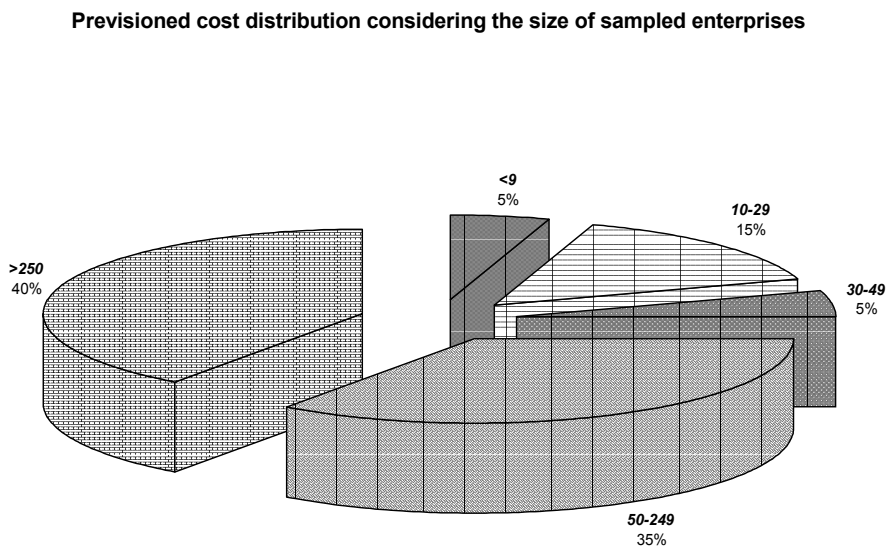

Figure 5. Implementation cost distribution considering the size of sampled enterprises

The quantitative component GEIA/SACOMO was developed based on algorithmic cost modelling, as most recent cost integration models. Here cost is analysed using mathematical formulas linking costs or inputs with metrics to produce an estimated output.

This component is presented in Figure 7.

Algorithmic models generally provide direct estimates on effort or duration.

Our quantitative model is two-levelled. The first level- ***General Evaluation of the Implementation Action (GEIA)*** is a global evaluation of the implementation effort.

Effort prediction models take the general form:

$$Eff = p*S*e \quad [2]$$

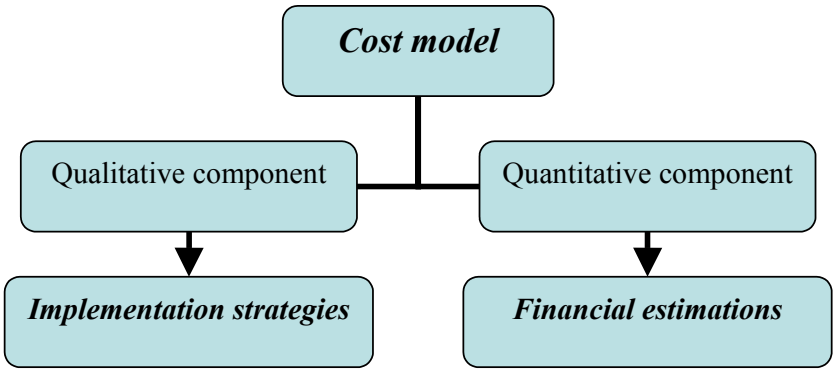

Figure 6. Components of the cost model

where

-p = productivity constant;
-S = size of implementation;
-e = economy coefficient of scale.

However, if this evaluation is not satisfactory, the second level ***Safety Constructive Cost Model (SACOMO)*** detailed at the enterprise/activity/industry level, can be observed.

In SACOMO we considered three stages:
-*basic implementation*-at the enterprise level;
-*intermediate implementation*-at the activity level;
-*detailed implementation*-at the industrial domain level, idea taken also as the basis of our qualitative component which is presented next.

The two basic equations of the SACOMO model are presented below:

$$MM = a*KDSI*b \quad [3]$$

$$TDEV = c*MM*d \quad [4]$$

where

MM[2] is the effort (usually expressed in man-months); in this case is possible to express the effort in enterprise-months implying the duration of the full implementation at a specific enterprise level;

$KDSI$[3] is the "engine" of implementation; on our three levelled scale, KDSI is different for small, medium and large enterprises; KDSI also depends significantly on resources available (e.g. internal resources, e.g. personnel and experience and external resources, such as money and knowledge of restrictions imposed).

$KDSI = a_k*f(Ri,Re,Rs)$ [5] where Ri are internal resources; Re are external resources and Rs are restrictions; KDSI could be expressed more exactly[4] by the following formula $KDSI = ak*(qi*Ri+qe*Re-qs*Rs*ets)$ [6]

where ak is the coefficient for the enterprise size,

$q_{i,e,s}$ are the weights for resources and restrictions, t is the implementation time and s is a probabilistic constant;

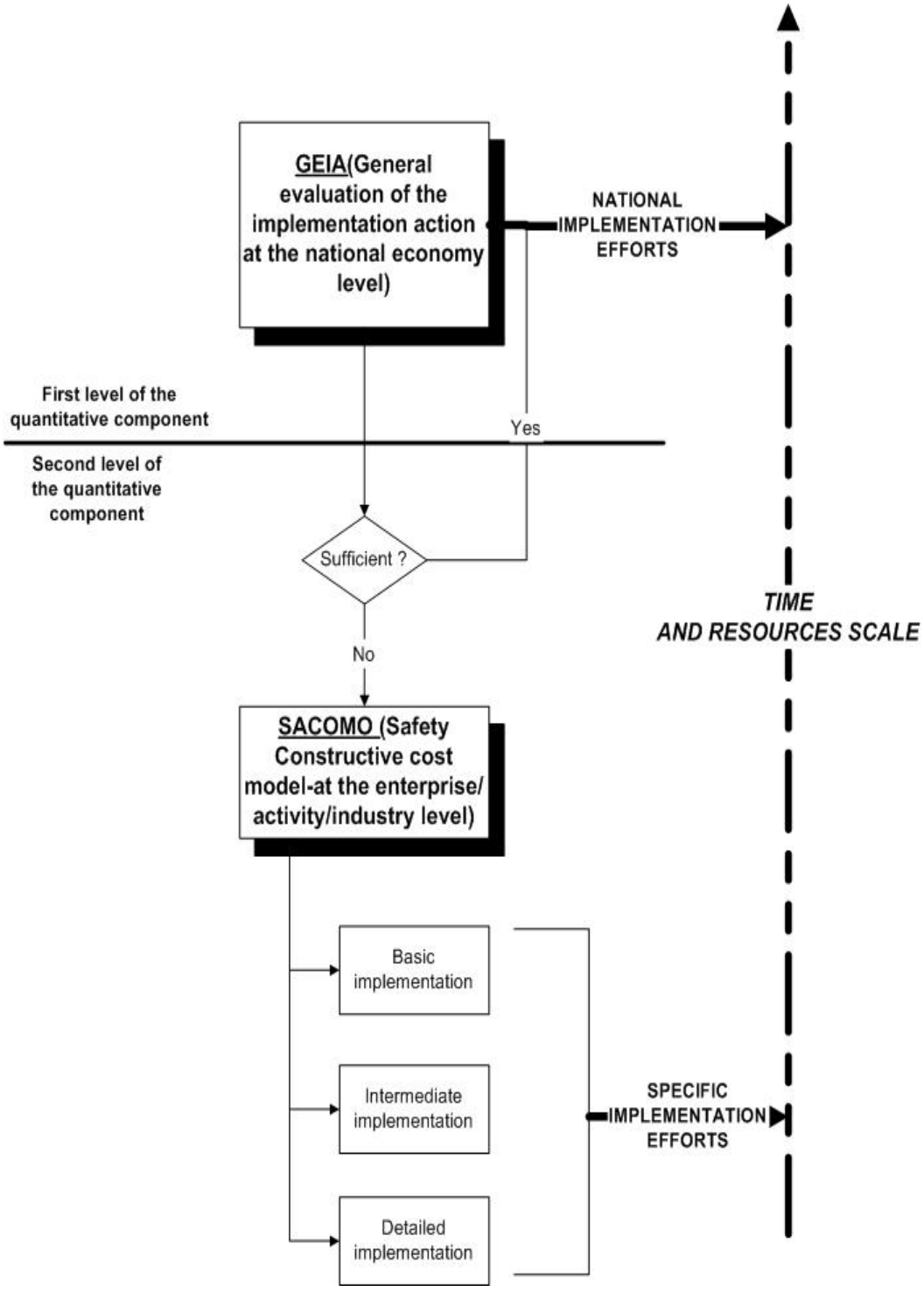

Figure 7. The quantitative component (GEIA/SACOMO)

TDEV is the development time; coefficients a, b, c and d are dependent upon the "mode" of development which could be:

-organic[5], for implementation in small enterprises with no significant safety problems;
-semi-detached, for implementation in medium enterprises, with normal safety problems;
-embedded, for implementation in large enterprises, with significant safety problems.

Table 2. Model coefficients

Development mode	A	B	C	d
Organic	3.2	1.05	2.5	0.38
Semi-detached	3.0	1.12	2.5	0.35
Embedded	2.8	1.2	2.5	0.32

The formulas used in the model arise from the analysis of statistical data[6]-the accuracy of the model could be improved later by its calibration to specific development environments.

The real model has 33 influence factors that are driving its precision towards 85–90%[7].

Some preliminary results of the model are presented in Table 3.

Table 3. Preliminary results of the model application

Result parameter	At the modelled enterprise level	At the modelled activity level	At the modelled economy level
MBIC (Model based implementation costs)	~10.000 CU[†]	~ 2.1 million CU	~ 3 billion CU
MBITF (Model based implementation time frame)	6–12 months	15–24 months	24–48 months
MBB(Model based benefits-% incident reduction)	~ 45–70%	~ 65%	~ 62.3%

It was interesting to see that by increasing the implementation expenses in our model, the time frame needed for the full implementation was reduced to a specific threshold after which the increase expense had no effect on the time frame.

The qualitative component of our model derives implementation strategies from the bi-polar integration[8] process, taking into account a cost-effective approach. HSE-AIM (Health, Safety and Environment Assurance Implementation Model) describes the steps that must be taken in order to maximise the efficiency of implementation process, isolating the non-viable enterprises and promoting the profitable ones. It is a qualitative part of the model because develops strategies and not figures.

[†]The cost unit takes into account the report between the financial strength of the national currency and the economic trends for the forecast period.

The qualitative component[9] considers implementation as a bottom-up process[10]. Therefore, the implementation costs are minimal, maximising the efficiency.

It is also a Darwinist model[11]. The market forces combined with safety barriers take out the enterprises that are not fit for implementation[12].

The idea behind this component is straightforward. On the first step of the model, if an enterprise qualifies for the implementation of EU safety directives (i.e. is a profitable one) it could get, and eventually return resources in the form of funds and specific knowledge.

If the enterprise does not qualify for the implementation, a waiting policy for the enterprise is recommended with two possibilities:

-If the enterprise becomes bankrupt – then no implementation is needed; or
-If the enterprise progress towards a profitable state - then it qualifies for the implementation. The waiting policy must isolate the enterprise through "a sanitary frontier", so that the enterprise should not develop a major occupational or environmental incident/accident in the waiting period.

At the second level of the implementation model[13], industries or specific activities must be analysed as a whole. Thus, if the activity or industry is profitable or has a profitable horizon for further national development it must get resources for implementation, resources that are expressed by funds (for example, for safety compliance assessment) and expertise. At this level, specific knowledge must be replaced by specific expertise from the EU developed countries so that all the regulatory mechanisms for the specific activity or industry at the national level should be fine-tuned to the EU pace.

At the third level, if the economy is healthy (from more than the safety point of view) a reaction occurs towards the basic level, implying a top-down safety determination derived from the bottom-up safety implementation. This component is a reactive one, the enterprise having a direct reactive link with the economy as a whole.

CONCLUSIONS

The safety integration costs of Romania into the European Union could be seen as moderate. In making this claim the economic level, the actual safety state and also the progress being made in the last years regarding safety improvements have been considered. Our past experience and our integration model show that while the profit making enterprises could support the costs, the ones that are not profitable must be closed[14]. Some success stories of foreign owned enterprises on Romanian soil[15] showed that if the investors are interested in obtaining quality products, the human safety and health is implicit. Partly, these costs must be supported by the state, eventually through foreign support. This financial support must be safety and profit oriented.

What are the benefits of the safety integration of Romania into European Union? First, the improvement of work conditions – with important social implications like the rise of productivity and the slow down of immigration. Romania could become a safe and environment friendly country in no more than a decade. More important, perhaps, is that, with appropriate aid, Romania could become a developer and exporter of safety, the experience we provide being representative for many developing countries.

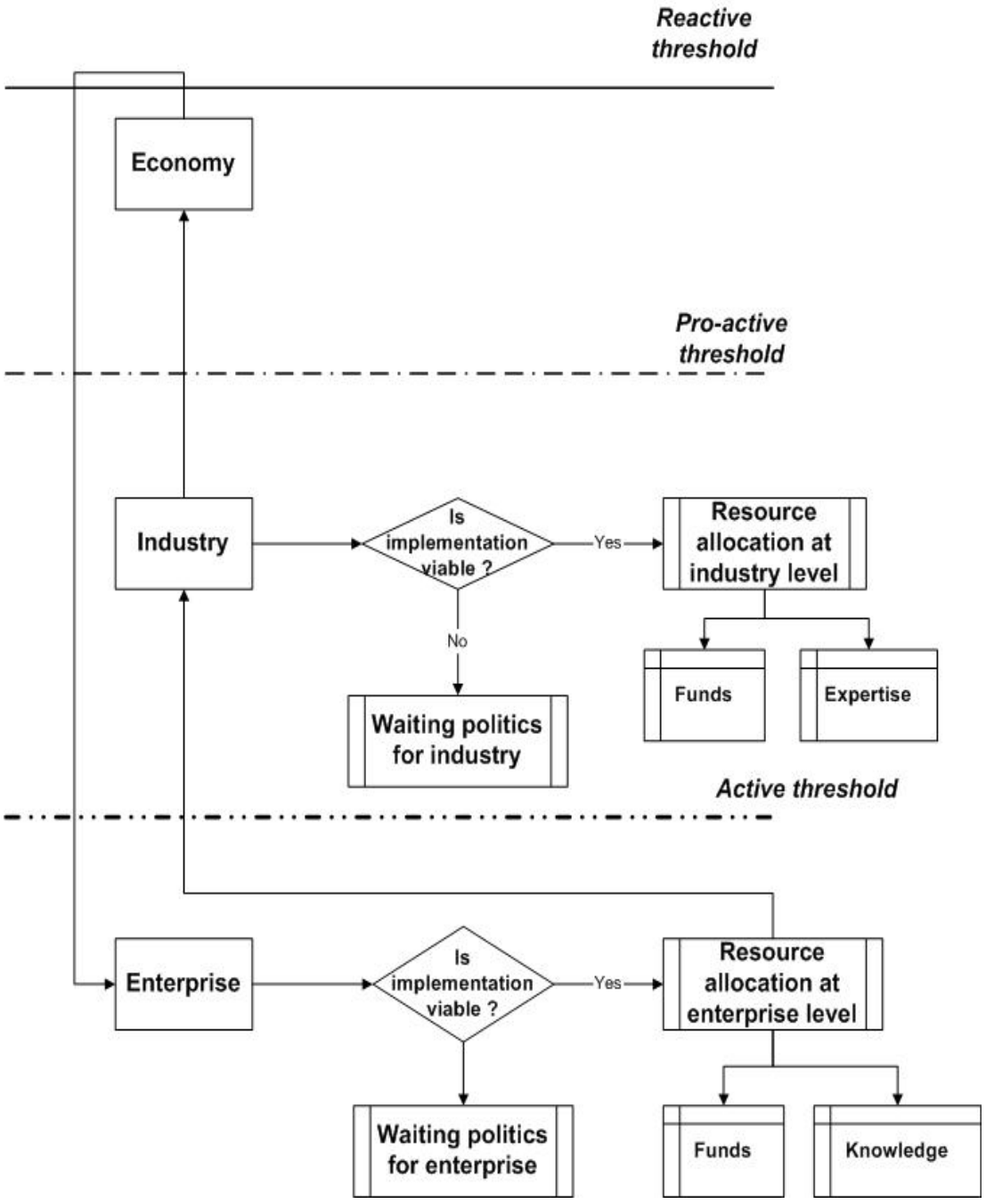

Figure 8. HSE-AIM qualitative component

In our opinion, now, our main safety necessities should be not so much oriented towards money but towards obtaining sound safety expertise. In this respect, we launched the idea of development of a European safety knowledge sphere[16].

This knowledge structure will offer, at reasonable costs, through formal and informal means, the necessary information to safety specialists. This transfer will be beneficial for all the involved parties in assuring:

-the preservation and further usage of safety individual and corporate memories across Europe;
-knowledge dissemination to all the interested parties;
-joint expertise development;
-an informal immediate warning system regarding incidents that could develop into major occupational accidents or environmental catastrophes;
-collaboration and team working to solve safety problems across Europe;
-access to the most modern and efficient assessment and prevention techniques;

The safety knowledge sphere could be developed mainly using Internet facilities. Some of the expertise exists already in the form of various networks like SafetyNet, HarshNet, and Prism.

The next step will be the development of formal and informal local knowledge nodes (big, medium and small enterprises that have safety experience to share, universities, research institutions, safety service firms, non-governmental organisations and trade unions, etc.) that will act as developers and disseminators. This will allow the development of such a network as an informal, non-centralised structure.

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