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Improving the bid preparation process through a benchmarking approach : an industrial case study in 3 french companies (among which 2 SMEs)

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1. INTRODUCTION

The benchmarking study presented in this paper aims at improving the bid preparation process of three companies (2 SMEs and a workshop in a big company). It has been initialized and managed by GRAI/LAP and has been performed within the frame of the EUREKA (Σ) TIME GUIDE project (Tools and methods for Integration and for Management of the Evolution of industrial firms - GUIDing the Evolution).
The EUREKA TIME GUIDE project (EU 1157) aims at providing a set of tools and methods to support the evolution process of manufacturing systems taking in account economical, technical as well as social criteria. To reach this goal, the project is decomposed into 4 workpackages. Among these, workpackage 1 aims at developing and at testing through applications the GEM TIME (GRAI Evolution Methodology - TIME) methodology. It will provide an integrated methodological support to guide the strategic evolution of industrial companies ([**Doumeingts et al. 95.1**]). It is built up of several methods developed in the frame of the 3 other workpackages among which workpackage 3 is dedicated to benchmarking.
This benchmarking study has allowed the GRAI/LAP to design and test a benchmarking structured approach based on a synthesis of the TIME GUIDE partners' proposals as well as on the GRAI/LAP background in modelling techniques and re-engineering approaches.

G. Doumeingts et al. (eds.), *Modelling Techniques for Business Process Re-engineering and Benchmarking*

We shall first describe, step by step, the theoretical approach used, the suggested work organization and a short description of the three companies involved will also be given : two are SMEs (less than 50 employees) located around Bordeaux (FRANCE), working in the field of plastic transformation; the third industrial partner is a mechanical engineering workshop (around 50 people as well) within a big firm working for the French Ministry Of Defence.
Then, we shall illustrate, from the origin of the study to the determination of the action plans, how this approach has been implemented among the three companies, focusing on the difficulties encountered as well as on the methodological and practical means used to solve them.
We shall conclude by summarizing the main results of the benchmarking study undergone and by indicating some future tracks, for the companies as well as for GRAI/LAP.

2. THEORETICAL APPROACH

2.1. Overall presentation of the structured approach

Hereafter is a short description of the structured approach used and implemented during this study, through the description of the different phases. As a matter of fact, the approach will be described in detail through the study presentation.

- ***Initialisation and identification of the Process candidate to benchmarking***

This step consists in measuring the performance of the different sub-processes against their contribution to the overall performance of the company.
The process to improve should be selected according to its contribution to the overall performance.

- ***Process modelling (in all the companies)***

During this step, the process to improve is modelled at a global level as well as at a detailed level.

- ***Measurements (in all the companies) and assessment***

This phase includes the definition of the improvement objectives, the data collection and the performances assessment
The performances of each activity of the process are measured. According to the objectives of the company, it can be necessary to measure cost, quality and/or leadtime performances within the selected process.

- ***Comparison & Adaptation of the (relative) best practices to the specificities of each firm***

The (relative) best practices are identified thanks to the measures performed, as well as the causes explaining such best practices, and the way of adapting them to the other companies is contemplated.

- ***Action plan (one for each firm)***

These adaptations are implemented in the companies through an action plan.

2.2. Work organization

The participants involved in the study have been divided into three different kinds of groups, according to the role they have to play :

- the project boards (one per company) include the managers of the industrial system; they provide the orientations and validate the key results of the study at the end of the main phases;
- the analysis group is composed of specialists who have in charge to apply the method, to collect the information and to facilitate the emergence of the solutions;
- the synthesis groups (one per company) are built up with the people who have the main decisional position within the studied business process.

These three groups work together all along the study, with respect to their role, and Figure 1 hereafter provides an overview of the main steps in the approach, indicating also the actors participating in them.

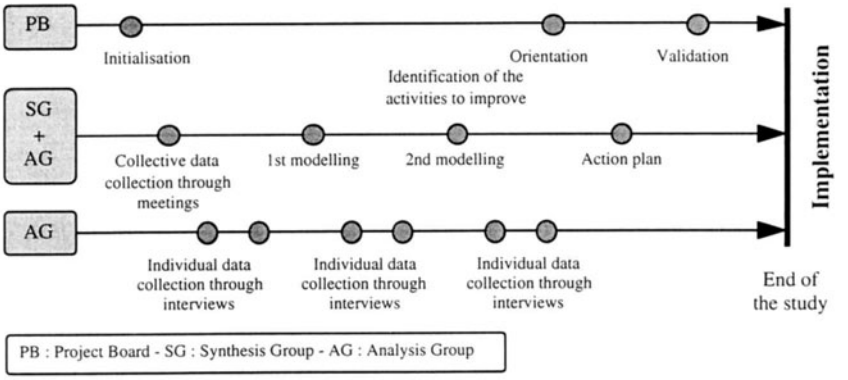

Figure 1 - Study structured approach

Hereafter is a brief description of the three companies involved in the benchmarking study.

COFALU is an SME (35 to 40 people) located near Bordeaux. Originating from a company manufacturing aluminium games, created in 1947, the company has diversified its activity, and works today in the field of thermoplastic transformation, with a supplementary toolmaking activity. Most of COFALU's customers are located in France, in very diversified sectors. COFALU follows a strategy of differentiation based on a superior service level.
PSD is a 34 people SME, also located around Bordeaux.The initial activity was the manufacturing of cement-made objects, moving in 1968 towards polystyrene manufacturing. Today, the company defines itself as "a specialist in shockproof and isothermal wedgings".
It essentially shares its activity between wedgings and mouldings making.
The third industrial partner is a mechanical engineering workshop (around 50 people as well) within GIAT, a big firm working for the French Ministry Of Defence. Located in TOULOUSE , GIAT G.O. is comparable to an SME by its size and functionning.

We shall now contemplate how the theoretical approach described above has been implemented in the three companies for improving their bid preparation process.

3. THE STUDY

3.1 Initialisation of the study and process identification

The effective duration of the whole study is five months : it has begun in June 1995 and has ended up in November 1995, including two months of interruption (summer vacation).

On one hand, the benchmarking study has been triggered by the results of a GIM (Grai Integrated Methodology) application in a mechanical workshop at GIAT G.O. Toulouse. The analysis step of the GIM study undergone there ([**Doumeingts et al. 95.2**]) had highlighted seven improvement tracks within the manufacturing system, among which one was related to the improvement of the "bid preparation" process. Another improvement track had been the organization of a benchmarking training course at GIAT G.O. The proposal was made - and agreed upon - to look for improvement solutions in the bid preparation process through a benchmarking approach and it was decided to perform a benchmarking study in cooperation with different partners whose manufacturing systems would include a bid preparation process.

On the other hand, the GRAI/LAP laboratory had organised a series of presentations of its methodologies and modelling techniques in front of industrial representatives from UPAPC (Union Patronale d'Aquitaine des Plastiques et Caoutchoucs). During these meetings, two SMEs belonging to UPAPC, COFALU and PSD, had shown a special interest in the GRAI methodological approach and were willing to participate in an application. A visit at COFALU and PSD had allowed to select four subjects interesting each company; the only common interest shared by the two SMEs was the improvement of the bid preparation process. Once the benchmarking partners - and the process candidate to benchmarking - found, each company participating in the study has been presented the precise structured approach that would be applied. An agenda for the study has been agreed upon, the working groups have been defined and a confidentiality agreement has been signed (2 by 2) between the companies and the GRAI/LAP laboratory. This has ended up the initialisation phase.

3.2 Modelling phase

The next step has consisted in modelling the bid preparation process in the three companies. First, a definition of the boundaries of the process to be modelled has been agreed upon : "all preparation activities taking place between the reception of the customer requirement and the production start-up" (see figure 2 hereafter).

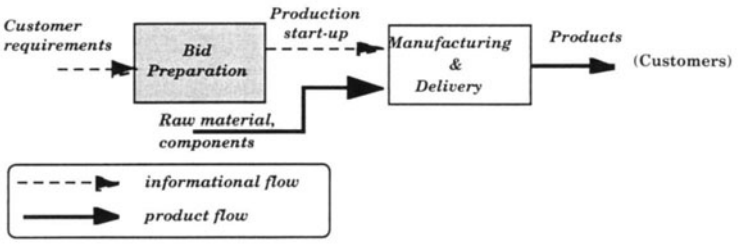

Figure 2 - Domain covered by the study

One company (GIAT G.O.) had already used modelling formalisms (IDEF 0 actigrams and GRAI nets and grid), while the two other ones had no modelling experience. IDEF 0 has been chosen mainly because it was easy to understand in a short period of time (one meeting was enough, including presentation of the formalism and beginning of the modelling (A-0 level)).

Moreover, IDEF 0 allows to perform a hierarchical modelling, from a very broad and global view to a detailed view. In each company, the process has first been modelled at a global level (all the activities of the process) through meetings with the analysis group and the synthesis group, in order to get a commonly agreed vision of the bid preparation process. Then, in a second time, the process has been modelled in detail (activity by activity), in order to identify, within each activity, all the potential key resources and procedures that could explain a higher performance level. During this phase, as well as during the whole study, the analysis group has shared his time to work in parallel in the three firms, so that the models, and further on all the study results, could be obtained approximately in the same time, in order to allow and fasten comparisons through a kind of "concurrent modelling" approach. The main difficulty in the modelling phase was to find a trade-off : on one hand, participants had to feel completely free from the formalism used so that they could express all their opinions and points of view; on the other hand, the resulting models had to depict as precisely as possible the real process functioning and thus a strict structured approach had to be applied.

3.3 Definition of the process objectives to reach

As it has been indicated previously, the overall objective of the study was the improvement of the bid preparation process; yet this goal was not detailed enough, and a clear definition of the study objectives remained to be given.
At GIAT G.O., the main reason for initiating such a benchmarking study was the willingness of improving the conformity of the bid preparation estimations. Beginning with this objective as an initial proposal, a brainstorming session has been organized in all the firms; it has allowed to determine a set of improvement objectives for the whole benchmarking study :

● OBJECTIVE 1 : minimize the overall bid preparation process leadtime.
This objective being ensured by minimizing :

$$\textbf{Min}\ (t_{\text{production start-up}} - t_{\text{customer req. arrival}})$$

● OBJECTIVE 2 : maximize conformity of the cost estimation.
This objective being ensured by minimizing :

$$\textbf{Min}\ (\text{production cost}_{\text{realized}} - \text{production cost}_{\text{planned}})$$

● OBJECTIVE 3 : maximize conformity of the leadtime estimation.
This objective being ensured by minimizing :

$$\textbf{Min}\ (\text{production leadtime}_{\text{realized}} - \text{production leadtime}_{\text{planned}})$$

One can notice that objective 1 is a time-oriented objective, while objectives 2 and 3 could be considered as quality-oriented objectives, for the conformity is a quality feature of the quotations made by the bid preparation process.

Once the models of the bid preparation process of each firm have been realized and a common set of objectives has been determined, it still remained to assess performances against the objectives previously defined in order to define the "best practice". Figure 3 hereafter illustrates the link between these three objectives and the measures to make all along the process. For confidentiality reasons, the name of the companies will not appear, and they will be referred as Company 1, Company 2 and Company 3.

	Company 1	Company 2	Company 3
Objective 1 : minimize the BPP leadtime.	✔	✔	
Objective 2 : maximize cost conformity	✔	✔	✔
Objective 3 : maximize leadtime conformity		✔	✔

Figure 3 : Objectives per company.

An important aspect concerning these objectives is the fact that the induced measures are absolute, and thus depend upon the product characteristics (complexity, raw material used, etc.); it will be shown later on how the measures performed in the study, have been *a posteriori* made relative in order to allow further comparisons.

3.4 Elaboration of the data collection documents

According to the objectives of the processes analysed, namely the reduction of the estimation leadtime and the maximization of the estimation conformity in terms of cost and leadtime, the analysis group has defined two distinct documents for collecting the relevant data in order to assess the bid preparation process performances.

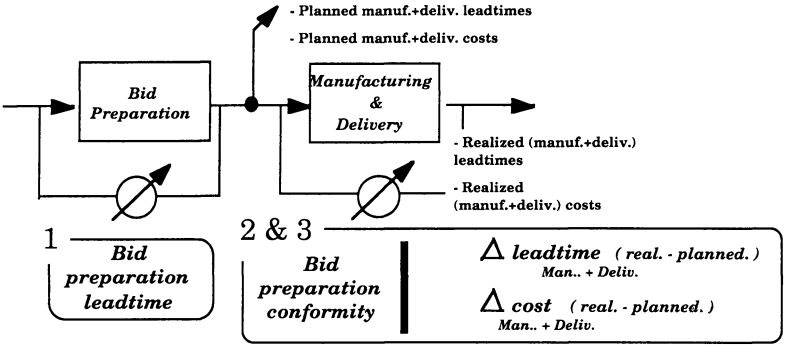

Figure 4 Study objectives and measures to make.

The framework and underlying logic of these documents remain the same in the three companies, and this ensures that further comparisons between the companies can be made; yet slight differences exist, because these documents have been tailored to the characteristics of each specific process, so that the data capture they supported would follow very precisely the working procedures in use in the three companies; as a matter of fact, the study has given evidence of the importance of that feature for getting people filling in the documents.
The document related to the estimation leadtime measurement is the "follow-up form" (FuF). The FuF aimed at supporting the estimation of the bid preparation process overall duration by measuring the elementary duration of each activity in it. It has been built on the basis of the activities identified in the IDEF0 models realized in the previous phase, allowing in the same

time a validation of the IDEF0 models performed with and by the companies, through the measurements made.
In addition to the fields "beginning date and hour" and "ending date and hour" for each activity, the form included two identification fields (customer and Order n°) and one "remarks" field to gather explanations about the activity duration when required (reasons for a longer duration than usually, for not having indicated the data, etc.). The framework of the "Follow-up Form" is provided hereafter Figure 5.

Customer :
Order N°:

Activity	Beg. Date and hour	Ending Date and hour	Remarks

Figure 5 Follow-up Form.

For the measurement of the companies'performances against the two other objectives, conformity of the cost and leadtime estimations , we have used the same document, called "Conformity Form" (C.F.), presented hereafter in Figure 6.

Customer :
Order N° :

Quotation date :
Order date :
Delivery date :

COST CONFORMITY	Estimated	Realized
Material		
Manpower		
Misc. (Subcontr., Deliv., etc.)		
Total		

LEADTIME CONFORMITY	Estimated	Realized
Delivery leadtime		

Figure 6 Conformity Form.

Data collection

The data collection was performed by each company, using the measure documents as described above. The duration of the whole data collection phase was approximately 1 month (in any case, this phase should not last less than the bid preparation process leadtime).
Concerning the bid preparation process duration measurement, it was impossible for the three firms to provide the duration of each activity in the process *for past orders* ; thus, this measure had to be based on new orders (about 15 in each company).
For the bid preparation process conformity (cost and leadtime), it had to be based on successfully completed orders, because we needed to know the realized manufacturing leadtimes and costs; 25 past - and successful - orders have been considered there.

The nature and the number of orders has been chosen in collaboration with the industrialists, in order to get a sample that would be as representative as possible.
Finally, for convenience, security and reusability reasons, we have developed a database which allows to capture and to process the data measured.

3.5 Assessment, comparison and identification of the best practices

Assessment

Once the measures made, the underlying performances have been evaluated. The assessment has been performed objective per objective and company per company. At this step, no comparison has been made between the bid preparation processes of each company, only intra-company improvements have been proposed, on the basis of the strengths and weaknesses identified. We shall depict hereafter the main elements of the assessment performed for each objective.

objective 1 : Minimize Bid Preparation Process (BPP) leadtime

Two companies have used and filled in the Follow-up Form. Before proposing any evaluation, we had to "clean-up" the data, for some orders were not processable (negative duration of some activities, etc.); the non-coherent data have not been considered. Moreover, the sequence of activities used in the Follow-up Form is the same as in the IDEF0 model of the process previously realized, and this allows to check the validity of the model as described with and by the industrialists.
For each activity, three kinds of quantities have been calculated : the average duration, the standard deviation and the percentage related to the whole process duration (representing the weight of the activity in terms of time). Finally, another key issue there, is the fact that inter-activities together with activities have been measured, providing an indication of the "non-efficient" time within the process.

The average total duration of the bid preparation process was around 100 days for Company 1 and around 10 days for Company 2. Another interesting finding was that Company 1 spent 85 % of the whole BPP duration in interactivities.
Concerning the temporal weight of the various activities on the overall process duration, company 1 spent most of its time in the downstream part of the process (pre-production activities). Company 2 spent most of its time in the financial estimation of the bid.

objective 2 (BPP cost conformity)

This measure is the only one which has been fulfilled by the three companies, and this could indicate from the companies a satisfying knowledge in, as well as an interest for, financial issues.
Yet the measurement of this objective should have been performed through the calculation of :

$$\Delta = \text{average}(\text{planned cost} - \text{realized cost})$$ or, preferably

$$|\Delta| = \text{average}(|\text{planned cost} - \text{realized cost}|)$$

(as a matter of fact, $|\Delta|$ evaluates any kind of deviation, whether it is positive or negative, while Δ compensates positive gaps with negative ones).

Instead of gathering cost data, the first measures that industrial partners have provided us with were planned costs and realized selling *prices*. This problem of vocabulary between price and cost forbidded to undergo a cost-based analysis and only could provide a *margin*-based

analysis. The companies have then been asked to provide us with the realized costs, and the calculation of Δ could be performed correctly.
Figure 7 hereafter depicts different situations, according to the value of Δ; it also illustrates the link between cost-based conformity assessment and profitability evaluation (price-based analysis).

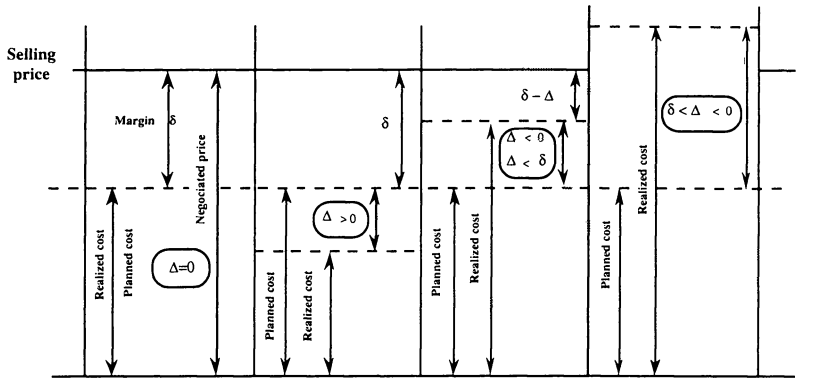

Figure 7 : Three different situations according to the value of Δ

The ideal situation is when |Δ|=0 : it means that the planned cost target has been reached exactly, which supposes that the company has a very good knowledge of its cost elements. All other situations (|Δ|≠0) indicate gaps between what has been planned and realized in terms of costs: yet, one situation remains bearable - when Δ>0 - because in that case, the real margin is superior to the planned one (∂): conformity performances are not good, but the business remains profitable; the worst situation is when Δ<0 and Δ>∂, indicating that neither cost conformity nor profitability are reached.
In the present study, in any case, no company among the three reaches the cost conformity objective (|Δ|=0).

Another intesting feature for cost conformity measurement is the fact that a common cost structure could be found, aggregating all decompositions made in each company; this decomposition is the following : material, manpower and miscellaneous. This has allowed us to perform the comparison for the overall cost as well as for each cost category.

objective 3 (BPP leadtime conformity)

Only two companies among the three were concerned with this objective, and thus have filled in the second part of the conformity form. As for cost conformity, the assessment of the leadtime conformity was performed through the calculation of Δ = average(planned leadtime - realized leadtime) and of |Δ|.
In some cases the leadtime was provided by the companies in the form of a date, in some other cases in the form of a duration (still, the measure unit varied from week to day or to hour); moreover, some measures were absolute while other ones were related to the order confirmation date by the customer. Thus, an homogeneization of the leadtime data has been performed before processing them.

At the end of this phase, one could consider that three separate diagnoses had been undergone in parallel; each company had been evaluated against the three selected objectives. Yet the main interest in a benchmarking study is to compare differents working practices, and the next phase in our process was to compare the three bid preparation processes.

Comparison, identification of the best practices and action plan

During this phase, the comparison between the three companies has also been performed objective by objective; it was later on, in the phase of action plan elaboration, that the influence of each improvement action on the three objectives together has been considered.

objective 1 (BPP duration)

Due to big differences between the firms in the complexity of their product, it was not possible to compare directly the leadtime of their bid preparation process. It has soon become obvious that comparing a bid preparation process of 100 days in average for Company 1 with 10 days for Company 2 had no meaning.
The first solution would have been to change the measure. In order to ensure comparability, an evaluation of the product complexity could be made, and the comparison could then be performed based on the measure : (BPP duration / Product Complexity). This solution supposed an assessment of the product complexity, which was a very difficult task.
The selected solution is twofold. The first part has consisted in changing the objective and the related measure : considering that the Bid Preparation Process Leadtime is the sum of Activities Leadtime and Interactivities Leadtime, instead of the initial objective of *minimizing the total BPP leadtime*, the objective has been restricted to : *minimize the ratio (inter-activity leadtime / total BPP leadtime)*. The interest of such a change is that it allows comparisons : in terms of leadtime, reducing the inter-activity time would contribute in reducing the total BPP leadtime; moreover, whatever their product complexity is, companies can compare one another with the ratio (inter-activity leadtime / total BPP leadtime).
The second part of the solution has been the elaboration of a macro-model allowing to compare inter-activities and activities.
The macro-model has been built by aggregating the BPP models performed in the three firms : even if each company practice was specific, common macro-activities, such as "to realize the feasibility study" or "to negociate", could be found in all the processes modelled. Each macro-activity regrouped different activities according to the company, but their overall finality was the same. Thus it became possible to make comparisons at a macro-level through the ratio *macro-activity leadtime/total BPP leadtime*. Figure 8 hereafter shows the macro-model elaborated.

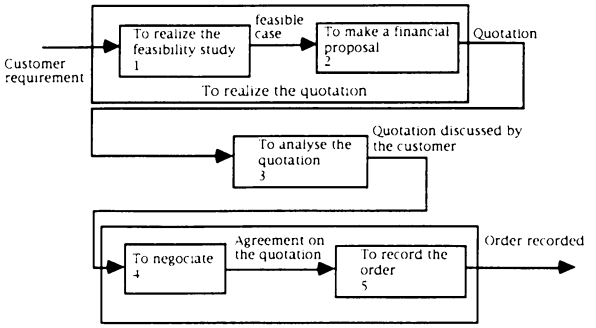

Figure 8 : BPP Macro-model for comparison

According to the assessments made on the conceptual basis as described above, Company 2 has the Best Practice for the objective of minimizing the BPP leadtime. A deeper analysis has shown that the main reasons why were a good coordination of the resources and a very small inter-activity leadtime. The adaptation of this practice by Company 1 (through the development of meetings to spread among people concerned with a business the knowledge about this

business and to dispatch the work) is in process. The Follow-up Form is still in use in Company 2, to check the improvements made in terms of leadtime; this illustrates the adequateness of the measures allowed by the FuF with the objectives of company 2.

objective 2 (BPP cost conformity)

The comparison for the BPP cost conformity was easier, through the measure of :

average (/ (planned cost - realized cost) / realized cost /)

Company 3 had the overall best practice, due mainly to a computer-based accounting system and a classification of businesses according to a historic, allowing together precision and traceability of past and present cost estimations.
Yet, the fact that a common cost structure could be found, namely : material, manpower and miscellaneous, has allowed us to perform the comparison for the overall cost as well as for each cost category. Surprisingly, Company 3 did not have the best practice in any cost category : Company 1 had the best practice for cost conformity of the material, while Company 2 was best for manpower and miscellaneous cost conformity.
This demonstrates two things :

- being the best on a part does not ensure to be the best on the whole;
- further improvements remain possible for Company 3 as well.

objective 3 (BPP leadtime conformity)

Company 2 had the overall best practice for the BPP leadtime conformity. The main cause for this Best Practice that has been identified is the following : Before the order acceptance by the customer, Company 2 uses to manufacture a sample of the product, allowing a much more precise estimation of the manufacturing leadtimes.

Action plans have been proposed for each company, in order to operationalize and implement the improvement ideas and suggestions resulting from benchmarking. Special attention has been payed to the coherence of the set of actions : an action that would contribute to improve one objective (minimize BPP leadtime, for instance) could have a counter-effect on another objective. The implementation of the action plans is still in process in the companies,

4. CONCLUSION AND PERSPECTIVES

The benchmarking study described in this paper is the first attempt of applying the theoretical structured approach developed at GRAI/LAP. The interest, participation and motivation of the industrial partners during the whole project, as well as their willingness to carry on with the improvement process is, in itself, the best answer to the question of whether benchmarking could be applied in SMEs or not. We shall list some of the most significant lessons learnt from the study by all the partners (industrialists as well as academists), and contemplate future prospects, for all partners as well.
First of all, it is compulsary to be very precise in the way of managing the project : in order to ensure the information exchange and the knowledge sharing among the firms, the modelling phase, as well as any data collection phase, should be run in parallel in the three companies. Thus, meetings and interviews should be planned a long time in advance, especially when more than two companies are involved.

Another difficult step in the approach, which becomes a Key Success Factor when fulfilled correctly, is the determination of the measures to perform, followed by the data collection : we have been lucky in the study to be able *a posteriori* to assess and compare the bid preparation processes against the three targetted objectives. The best approach would consist in defining *a priori* some measures so that further comparisons could be performed, through a commonly

shared measure unit. Precision is also required in the definition of the measures : no ambiguity should remain in the vocabulary used (price instead of cost, for instance) to name the element to be measured. Finally, the data collection should also be undergone precisely, on a significant sample of businesses, and in the aim of providing measures as complete and coherent as possible. As a matter of fact, uncomplete data are difficult to process. Moreover, it should be taken care that the data collection phase does not take place in the same time as vacations or slack periods.

The study has also given rise to specific findings about, for instance :
- similarities between the ISO 9000 certification approach and the benchmarking structured approach,
- reasons for confidence and participation of the industrial partners, etc.

No business looks like the previous one : depending on the case, some activities will be performed or will not (for instance, at Company 2, the activity of checking the customer's solvability is only performed if the customer is a new one or if the business exceeds 50 KF). We consequently propose that the first model of the process candidate to benchmarking that is realized should represent *the most complete activities sequence as possible* ; after measures are taken, the model can further be validated - and eventually simplified - and several models per category (of customer, of product, etc.) can be identified.

Finally, we believe that the main lesson learnt through this study is the evidence made of the applicability - and of the interest - of benchmarking for SMEs.

Concerning the way after the study, we shall distinguish the improvement actions and projects undergone by the industrial partners on their own process and the GRAI / LAP improvements around the methodological approach.

For Company 1, the measure documents (Follow-up Form and Conformity Form) are still in use for controlling permanently the improvements toward the objectives. Moreover, the bid preparation working procedure has been modified : instead of a sequential process, the bid preparation process is performed since its very beginning through a meeting involving together all people concerned within an cross-functional working group. Company 2 is currently implementing a CAPM system and takes into account the benchmarking study results; company 3 has temporarily delayed the implementation of further improvement actions because bigger changes are occuring there.
GRAI / LAP will carry on with this benchmarking study through two tracks :
- the development of some specifications and associated software to support the bid preparation process;
- some supplementary methodological work on a (GIM + Benchmarking) combination, integrated through the use of :
    - a common reference model : the GRAI model;
    - common - and enriched - modelling formalisms (IDEF 0 actigrams, GRAI grid and nets, etc.)
    - a coherent structured approach.

Finally, the whole production system life-cycle, from the analysis phase till the implementation phase, should be covered and supported by a methodological approach. This is the aim of GEM-TIME, which will embed GIM, benchmarking and other techniques in a common methodological framework for supporting the evolution process ([**Doumeingts et al 95-3**]).

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