The various sources of uncertainties in acoustic consultancy work

The French acoustic consulting market

The French market of acoustical consultancy is rather new. Until about 1990, he was dominated by a small numbers of acoustical “gourous”. In the early nineties the actors have tried to organize themselves around the GIac (Groupement de l'Ingénierie Acoustique) which represents now the profession in “official” French organizations like government or official instances dealing with acoustics, AFNOR working groups, .... The GIac represented 80 independent consulting companies in 2004 of about 400 persons and about 30 M€ turnover. Six companies had more than 10 persons. The estimation is that the GIac represents about 2/3 of the independent acoustical consulting independent engineers or companies.

Apart from representing the profession, the GIac has also internal working groups such as:
- Professional insurance: a special insurance contract has been established in cooperation with an insurance company taking into account the characteristics of the activity of the members like transversal activities, immaterial damages, ...
- Acoustical economy survey: 4 times a year the members give (anonymously) economic data and tendencies and a synthesis is given to the members.
- Technical meetings (“Rencontres de l’Ingénierie Acoustique”) on acoustical subjects.
- etc.

The consulting acoustic market remains in France a very small economic market with the characteristics of all of “fragmented” market:
- Multiple sources of differentiation and changes (unstable market),
- No durable competitive advantage possible,
- Low barriers at the entrance,
- Few “scale economies” possible,
- Flexibility,
- Uncertainty in terms of evolution.

That means that the acoustical consultant has to deal with uncertain and unclear economical situations that he has to overcome. He need to develop many capabilities such as commercial, psychological, technical competence and creativity.

The factors acting on acoustical consulting work

To help him in taking the right decision, the acoustical consultant has to take into account the TEA factors : the Technical factors influencing his work (the acoustical consultant remains first a technician), the Economical factors and the human Actors influencing his work.
At each phase of his work, the acoustical consultant has to face these 3 variables.

The four phases of acoustical consulting work

The 4 phases of any acoustical consulting project are:

- Initial contact with the client, identifying the acoustic need
- Formulating an offer and contracting
- Realizing the work (measurements, simulations, recommendations, solutions, follow-up and receipt of the solutions, ...)
- Conclusion and synthesis of the work

Phase 1: Initial contact and entry, identifying the acoustic need

In the beginning of the work, the human factor is the key factor to focus on. First of all, the acoustical consultant has to identify the actors and has to evaluate their position related to his work. Sometimes the actor can be unique (but it is very rare), sometimes many actors can influence his work. The consultant has interest in making a list of all the actors and ranging them in a two dimensional diagram (from [7]).

The synergy: the cooperation to promote his project.

The antagonism: the opposition against his project.

The position of the actors along these two axes help to identify:

The actors who have no special position related to the project: they can be passive, hesitating (they are waiting for benefits but they doubt) or "ecartelé" (favorable to the project but not for the consultant for instance)

The adversaries: the irreducibles (revolutionary against the project), opposants (against the project but ready to listen) or unsatisfied (passive resistance)

The allies: the militants (favorable to your project) or critical supports (positive but critical allies)

The sociodynamic advise to avoid the fight against the adversaries and to invest in the "strategy of allies" that is to adapt the project to transform the hesitating and neutral actors into allies.

For each actor, the consultant has to identify their risks and objectives and their resources (see [5] and [6]).

Fig. 1: The “cup of TEA” of the acoustical consultant

Fig. 2: the sociodynamic map of the actors (FAUVET)

Fig. 3: behaviors and strategies of the actors (CROZIER and MORIN)

Fig. 4: personalities of the actors
The seductor: his relations to others are oriented to seduction. He wants to be loved. This actor is very often charismatic and fascinating. He wants to be an idol and you must be his fan.

The humanist: his relations to others are oriented to respect. He considers other persons as equal to himself.

**Phase 2: Formulating an Offer and Contracting**

When the consultant has identified the problem, the needs and the various actors, it is time to formulate an offer.

The content of the offer needs to be the best answer to the needs of the client taking into account the personality and the objectives of the different actors.

- For instance, if a client is obliged to “conformity to regulation” measurements, the content must assure the client that all legal aspects are included in the offer. The price will probably be a key factor.
- As another example, if a client needs an study that will increase his ego, nice acoustical mapping and imaging must be included in the offer.
- etc.

The price of the acoustical work plays of course an important role. From that point of view, the offer can be done in two ways:

- The price based on the “offer”: the consultant establishes first a content (or the need is very precise in terms of contents like for some quotations). He calculates his costs (time spent x hourly rate + specific costs) to realize the work and adds a margin to it.
- The price based on the “demand”: the consultant fixes the sell price independently of the content of his offer. When he fixes the price, the consultant tries to determine the maximum above which the client will not buy it. He will also determine the minimum price under which the client will not consider his offer as credible to respond to the need.

Both ways of evaluating the price of an offer have their own advantages and depend on the context and the personality of the actors and especially the decider. In practice both methods are very often interdependent and used together.

**Phase 3: Realizing the Work (Measurements, Simulations, Recommendations, Solutions, Follow-up and Receipt of the Solutions, …)**

The quality of the result will be a conjunction of the quality of the tools used and the competence of the specialist.

It is impossible to determine a priori an uncertainty for all acoustical problems. Each problem is specific and even inside one project there will be no unique value for the uncertainty.

Based on his experience, the acoustical consultant can develop some simplified schemes which will help him in globally evaluating the uncertainties and looking which particular point need to be investigated further.

**Example of Global Approach of Uncertainties in Building Acoustics**

![Fig. 5: Quality: a combination of tools and competence](image)

![Fig. 6: Global approach of the uncertainties in prediction of acoustic insulation in buildings](image)
Phase 4: conclusion and synthesis of the work

At the end of his work, the acoustical consultant has to manage the communication that is done around his work and the perception that the client has of it. The global quality of the work is when the given service as the client perceives it corresponds to the waited service [8].

The global deviation is determined by 4 elementary deviations (see figure):

- The knowledge deviation: deviation between the demand of the client and the perception of it by the consultant.
- The offer deviation: deviation between the perception of the demand of the client and the content of the offer and contract.
- The working deviation: deviation between the contract and the delivered work.
- The communication deviation: deviation between the delivered service and the perception of it by the client.

Fig. 7: global approach of the uncertainties in prediction of environmental noise

<table>
<thead>
<tr>
<th>Type of problem</th>
<th>Source</th>
<th>Distance to receiver</th>
<th>Precision Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban environment</td>
<td>1 technical equipment on the roof of a building</td>
<td>Short (example 30m)</td>
<td>Medium or good precision</td>
</tr>
<tr>
<td>Urban environment</td>
<td>N similar technical equipment on the roof of a building</td>
<td>Short (example 30m)</td>
<td>Good to very good precision</td>
</tr>
<tr>
<td>Urban environment</td>
<td>1 technical equipment on the roof of a building with screen protection</td>
<td>Short (example 30m)</td>
<td>Bad precision</td>
</tr>
<tr>
<td>Rural environment</td>
<td>Wind turbines project</td>
<td>Long (example 2 or 3 km)</td>
<td>Bad precision</td>
</tr>
<tr>
<td>Suburban environment</td>
<td>Road traffic project</td>
<td>Variable</td>
<td>Good precision for close receivers, bad precision for long distance receivers</td>
</tr>
</tbody>
</table>

Fig. 8: chain of deviations in service quality (ZEITHALM and BITNER)

Example of global approach of uncertainties in environmental acoustics
The acoustical consultant has to face technical as well as economical and human uncertainties in his daily work and he has at his disposal specific tools to manage these parameters.

The heavy tendencies of the acoustical consulting market are:
- Growing of the demand,
- Internationalization (European Directives, ...),
- Diversification of the competences needed,
- Flexibility,
- Availability “7/24”: the client would like you available 7 days a week and 24 hours a day (internet, mobile telephones, ...),
- Urgency: everything must be finished before beginning,
- Development of exigencies regarding the results: more and more legal actions.

Conclusion

The acoustical consultant has to manage a lot of technical, human and economical aspects who introduce their own uncertainties in his work. More and more, the acoustical consultant is dealing with the contradiction between exigencies of more and more precision in an always more uncertain environment.

Bibliography