■ LES AMIS DE ■
l'École de Paris

http://www.ecole.org

BUSINESS LIFE SEMINAR
Session of 10 March 1995

THE COMPANY PANEL
A time-saving, skilful hotchpotch

by Gilles Garel
Lecturer at the Université de Marne la Vallée
and researcher at the CRG Ecole Polytechnique

Report by Michel Berry

Summary of the meeting

The design and conception of metal-stamping tools ('dies') is an art that has long defied all attempts at simulation modeling. This explains why Cartesian organisation has been failed to control the costs and lead times of the process. Putting different experts together onto a panel creates a wonderful "hotchpotch" that horrifies the purists of rational organisation but can be a goodway to save time and money. This of course depends on how well the panel is organised.

I - PRESENTATION BY GILLES GAREL

Carte blanche for a black box

Many of our seminar sessions have described car manufacturers' obsession for reducing lead times on projects.[1] I studied the die design and conception processes at Renault. This sector has been rather puzzling: schedules and costs vary by 10 - 20% as a matter of course. Most manufacturers have experienced the same problems. In their definitive book on product development in the automobile industry[2], K.B. Clark and T. Fujimoto emphasise the fact that, "We *need to look more closely at the die design and the die conception processes"*. However, few close observations have been made in the sector. This is hardly surprising, given the strained relationships between manufacturers and the die-makers.

In 1991 Christophe Midler received a research proposal from Renault's Process Engineering Department, backed by Yves Dubreil, Director of the Twingo project. The proposal concerned research in the sector, with the support of Chausson Outillage, the leading French die-maker. This is how I came to be given carte blanche to study the black box of the stamping industry, from September 1991 to October 1993. I wrote a thesis on my work, under the guidance of Christophe Midler, and I presented it to the jury on December 1994.[3]

Stamping is the process of shaping a sheet of thin metal while cold and held between two tools or 'dies'. Each die weighs over thirty tonnes and costs several million francs. Between 3 - 5 of these dies are required for each part. Stamping accounts for between 10 - 20% of Renault's industrial investments. There are two elements of uncertainty surrounding the die conception process.

The first uncertainty is linked to the material. I was told straight away that stamping is not so much a science as an art that has resisted all attempts at simulation modeling: in 1991 there was little information available on the effects of the stamping action on the sheet of metal and any feasibility problems had to be solved by testing the metal. It is an extremely delicate operation: the dies are adjusted in microns and the whole process requires a high level of precision. Without such precision, there is a danger that the metal sheets tear or melt under the enormous pressure. Despite the fact that considerable progress has recently been made in computer simulations, the die design and conception processes still rely on the expertise of a few dozen people.

The second uncertainty is linked to modifications to the product and the process. As the project advances, the solutions are challenged by trials and any problems that may crop up. In theory there shouldn't be any modifications once a start has been made on building the dies, but in practise they keep being made and this disrupts the process. Changes like this often start a chain reaction: for example, the fact that the Twingo wing couldn't be stamped meant that modifications had to be made not only to the wing, but also to the windscreen and the windscreen join. In this way, Renault manages hundreds of thousands of changes every year across its whole range of products.

I analysed the Twingo case, which was an example of sequentially organised stamping. Then I studied a new project ("Project 64") using simultaneous engineering, (also known as concurrent engineering), where the different operations are carried out simultaneously, thanks to a "panel" of representatives. I also studied Japanese stamping, which is a perfect example of fast but non-

---

[1] Session No. 19 - December 1990: "Major Projects, Organisation and Urgency" (J.C. Moisdon, CGS, Ecole des Mines), No. 28 - December 1991: "How to Win With an Impossible Project" (Y. Dubreil, Renault), No. 38 - December 1992: "The Twingo Revolution" (C. Midler, CRG).

[2] Clark K.B., Fujimoto T. (1991), *Product Development Performance. Strategy, Organization and Management in the World Auto Industry,* Harvard Business School Press, 409 pages.

[3] G. Garel (1995) "Réduction du temps de conception, concourance et savoirs professionnels: le cas de l'emboutissage dans les projets automobiles", Doctorate thesis, l'Ecole Polytechnique, 435 pages.

concurrent engineering. My presentation will focus mainly on the first two cases, but we can come back to the Japanese model during the debate.

In Search of Time Lost

We all know that sequential organisation is time-consuming, but we're not quite so sure where the time goes. That's why I set out in search of time lost on the Twingo project. At Chausson Outillage, I combined an historic approach to a small number of dies with an instant analysis of a large number of dies. I managed to get the "kings" of stamping to fill in a questionnaire. My research revealed that three factors influenced the lead times:
- *he organisational factor,* involving the definition of roles, ways of co-ordinating and communicating with the various actors, task-planning and the flow of information;
- *the financial factor,* involving incentives and pay schemes, resource allocation and contracts;
- *the cognitive factor,* referring to the combination of existing knowledge and the creation of new knowledge; three types of knowledge are involved. I call this professional knowledge, after the work of D.A. Schön:[4]

    - *technical knowledge,* an integral part of the various operations;
    - *evaluation knowledge:* making financial evaluations, assessing the available information, a project's priorities, the implications of the action taken;
    - *relational knowledge,* vital for relating to others.

I see the design process as the convergence of different types of professional knowledge that are complementary and partly externalised.[5] Organisational and economic factors make them converge fairly quickly and I studied how these three factors interact.

<u>*Organisational factors interact with cognitive factors*</u>
In the sequential model, the people that have upstream technical knowledge concerning feasibility (risks of breakage and bending, etc.) have little contact with the people that have the downstream knowledge relevant to manufacturing. The consequences of this include:

• The plant has little involvement with the die-maker during the die conception process and only sees the dies when they are delivered. The fact that the plant only learns about the dies at this later stage slows the process down.

• The planning system is characterised by considerable periods of time elapsing between each project milestone, as well as by the fact that it takes time to deal with any surprises that happen while the equipment is being designed and manufactured: things tend to be sorted out along the way. But how can the gaps between the milestones be made smaller when the different specialists' keep their knowledge so separate?

• The distance between operations causes an obsession for quality, as opposed to the Japanese concern for functional quality. Renault has the quality of its dies controlled continuously by technicians from its Process Engineering Department who visit the die-maker twice a week. In addition, a supervisory commission meets in the die-maker's workshop after the dies have been adjusted. There is little or no participation from the plant (the die-maker's client) and the Product Engineering Department which designs the parts. In other words, the manufacturer's representatives are not the people who have had or will have responsibility for the dies. The commission uses essentially formalist criteria, which means that more importance is placed on meticulously meeting specifications then on considering a part's actual function (by contrast, the Japanese are less worried about how the parts look if they don't show). *"It's a way of protecting*

---

[4] Schön D.A. (1983), *The Reflective Practitioner: How Professionals Think In Action,* Basic Books, New York, 365 pages; Schön D.A. (1988), *Educating the Reflective Practitioner,* Jossey-Bass Publishers, 355 pages.

[5] In 1990, for strategic and policy reasons, Renault chose to externalise the design and manufacture of its stamping tools.

themselves from their hierarchy. They're control freaks!" This is how the die-makers describe the supervisory commissions.

• The manufacturer and its supplier are sometimes out of synch. I've shown how the workshop mainly contributed to projects in their later stages: in the early stages, the die-makers anticipate future problems, hoping that these problems will allow them to renegotiate deadlines; however, by the end of the process, the uncertainties have been reduced, the deadlines are practically definite and there is a great deal of pressure from the manufacturer. The manufacturer sees the time scale differently since he has his own milestones; for example, finding an early solution to a feasibility problem can enable a difference of opinion to be settled between the Design Department and the Process Engineering Department. However, given that the die-maker has no involvement in the manufacturer's internal problems, he optimises his own interests: in other words, he works on the most urgent ranges first.

Financial factors influence cognitive factors
In the sequential model, financial factors are not linked to the work-flows: the payment dates are fixed by an accounting system that doesn't match the rate of work. This provides little incentive for the die-makers to be more time-efficient. You can hardly expect results if you change the financial rules without also changing the organisation. If you want to speed up the adjustments, the die-makers have to understand the designers' intentions: therefore, what counts is how relations between the different specialists are organised.

Communication through the panel

Next I was asked to analyse the way a panel works on a new project. The panel is a way for the different internal and external specialists to meet up while the project is upstream. The bet was that this reduces misunderstandings, the number of modifications and last minute changes. This is why the die-makers are invited onto the panel as soon as possible. I'll give you a quick overview of concurrent engineering, so that you can grasp the context in which the panel is set up.

Setting up a partnership contract
The manufacturer no longer selects the die-makers on a cost basis, but conducts audits of their abilities and then makes long-term agreements accordingly. The manufacturer has a contract that reserves his right to a certain number of hours' work from the die-makers during a fixed period of time which might exceed the length of a project. This sort of long-term involvement is generally called co-development.
An increase in the partner's involvement both upstream and downstream
The die-makers are chosen approximately 18 months earlier than they would be with sequential engineering. The start of the die manufacturing is delayed in order to extend the design phase and anticipate problems. The die-makers provide their services at the production site until full-scale production begins.

Introduction of frequent, open information upstream
The panel encourages the flow of information from the time when the die-maker is chosen to the start of manufacturing.

The development of new knowledge and new types of organisation by the partner
The die-maker has to learn to work with the other upstream and downstream actors; in other words, he has to learn new relational and evaluation skills. The die-maker has to set up project groups, co-ordinate non-core subcontractors, introduce scheduling that allows the manufacturer to follow the rate of work and install problem detection systems.

More room for the partner to manoeuvre
In return for these additional responsibilities, the die-maker is given more freedom and can renegotiate terms according to any problems that arise.

A more coherent allocation of the sets of parts
The die-maker takes on the responsibility for a batch of parts. In this way he is in charge of the development and realisation of a particular function (on one recent project, the "side bodywork" batch comprised 30 parts). This makes it easier to sort out interface and compatibility problems.

The panel follows the project along its different stages: from the Design, Product Engineering and Process Engineering departments to the plant. For this reason, the panel does not always meet in the same place. It's a real hive of activity: some members may be absent from a meeting if they are needed elsewhere but other experts are invited in an impromptu manner. The panel is so full of people, parts, computers, bits of modelling clay and tracing paper, that people often call it the "hotchpotch". However, I looked behind this apparent disorder and analysed several factors that give structure to the panel: cross-functional actors, management tools, direct contact between the actors and objects.

The role of cross-functional actors

The role of cross-functional actors (project leaders and cross-functional project/operational actors) is to ensure that important problems are not ignored: the panel members come across so many problems that they can neglect to anticipate future difficulties. The cross-functional actors determine the costs, deadlines and the effects of technical decisions, and in doing so underline the risks of ignoring problems. They don't necessarily base their evaluations on complicated calculations: with the Twingo, it was said that each unit price of one Franc equalled a million Franc investment. The cross-functional actors must have a certain status within the company (seniority or expertise) and be backed by top management in order to succeed in this role.

Management tools and agreeing on deadlines

The panel uses a large number of management tools: comparisons between forecasts and actual achievements, the time taken to solve problems, the rate of unsolved problems, etc. These tools enable the panel to go beyond the spontaneous representations and to co-ordinate the rest of the workers. Above all, they're useful for setting terms and deadlines that spur the panel members into action. However, there are two conditions for this:

Firstly, the terms and deadlines must be acceptable: you can't ask a team to develop a car in 6 months flat. 'Acceptable' doesn't have to mean 'reasonable'. It would be crazy to ask a die-maker to halve his lead times with sequential engineering but this is conceivable in a concurrent engineering. It all depends on the means made available to the actors to enable them to respect the deadlines and their degree of autonomy: there's no point getting the best technicians together on a panel if they cannot make their own decisions.

Secondly, the terms and deadlines must be taken on board. This isn't always the case on the panel, where you might hear questions like, *"Can you remind me what that milestone was?"*. At Chausson, I even saw some urgent matters being made trivial. All the same, concurrent engineering introduces new milestones. The die-maker takes on the responsibility for any modifications he might request that overstep the milestones, whereas they would previously have been the responsibility of the manufacturer. This system has enabled modifications to be spotted right from the design stage. The rule which ensures that payment of modifications fits with the project milestones is inextricably linked to the panel set-up: *"You were on the panel 18 months ago and you could have contested it, but it's too late now: you'll have to pay up"*. With the sequential model, a project milestone wouldn't have stopped the die-makers who could have claimed that the design was weak, seeing as they hadn't been brought into the design stage. Concurrent engineering plays on the virtues of transparency and give-and-take, along with the strengths of constraints and turning a blind eye (*"I don't want to know about it: you have a deadline to meet"*).

The impact of direct contact between actors

Communication is all the more effective when the actors are close. This is why the panel is made up of small groups. When the panel meets in the Product Engineering Department, the plant and the Process Engineering Department are only represented by a few people, whereas all the Product Engineering designers are there to hand. The members from outside the company are not present all the time: the die-makers only join the panel by appointment every two or three weeks. Certain experts are hardly ever there, due to their commitments on other projects or their involvement in other areas of the same project. For example, fewer than 10 people are experts on upstream stamping feasibility, given that the knowledge is so specialised. However, even when it isn't possible to have direct contact between the appropriate experts, the project activity can still go ahead if the engineers who are on the panel act as a link. This is why relational and evaluation knowledge is important.
The panel brings together people who contributed to earlier projects without ever meeting. It creates familiarity between the members and encourages them to get involved, since each person is aware of being watched by the others: *"You can't back down after you made a commitment last week in front of us all"*. What's more, the die-maker's involvement tends to recreate a Renault identity: the Product Engineering Department and the Process Engineering Department moderate their disputes in front of a partner. The die-makers work with other manufacturers and the thought of Renault being compared with its rivals is one factor that brings the company's experts closer together.

In addition, the die-maker needs these evaluations: given that he is not regularly present at the panel meetings, he needs precise dates, up-to-date schedules, corrected plans, etc. He is also more aware than the manufacturer's technicians of cost-related problems: the fact that his company is small means that he genuinely understands what it means to lose money, unlike a Renault technician working on a huge-scale project. Anything that can be anticipated, reduced or avoided saves his company money. Financial constraints are therefore an issue for the panel, largely thanks to the die-maker.

The panel is a means of learning. Each member gradually learns how to interpret the others' behaviour and to take their constraints into account. For example, the designer started to incorporate plant constraints into his analyses after having been rebuked three times by the manufacturer. However, mutual give-and-take is no miracle cure: the combination of prior knowledge and new inventions raises two sorts of problems.

Firstly, the knowledge doesn't automatically add up: it's not enough for people to simply put their heads together. Problems of communication tend to crop up: for example, the upstream actors have trouble expressing their knowledge to the downstream actors who are used to more abstract knowledge, and it's difficult to get financial matters across to technicians who are focused on technique or to get the different types of technical expertise to link up. This means that the knowledge can be expressed badly, not expressed at all, given the wrong emphasis, unreliable, premature, too late or insufficient.

Secondly, new knowledge can be a problem as it can take time to solve complex problems. Concurrent engineering puts the experts in an uncomfortable situation, where they're asked to express their doubts as early as possible to 10 technicians, 6 of whom come from outside the company. They're also expected to proceed by trial and error. Compare this with sequential engineering, where they would only express their ideas after they had been validated.

The panel puts pressure on the members and there's a lot of joking to ease the tension. The die-maker who has just learnt of yet another delay will say, "*What's the answer to the problem ? 'll let you know in a year !*" This is a way of challenging the others' expertise: *"I know that you don't know anything about stamping so I'm not going to go into the nitty-gritty!"* It's also a way of relieving the pressure: *"So you want the plan in 15 days' time ? Wouldn't you prefer it in 3 days ?"*

The role of the physical object

Much has already been said, particularly in this seminar, on the virtues of the 'Genbutsu' and the 'Gemba', so I'll just say a few words on the matter.

A music teacher will play his instrument to show how he wants his pupil to play since he can't put it into words. Similarly, the panel sketches designs, takes photos, makes mock-ups, plays with modelling clay and uses scraps of paper and bits of wood. I've often seen technicians use modelling clay to get their point across: *"Look, it's something like this"*. This is how they imagine what the future car will look like, which is something that takes experience. Objects help people to express themselves and demonstrate things in a way others can understand. They're also a powerful means of solving disputes: *"In that case I'll go and get the part so you can see for yourself that I'm right"*.

Objects help the actors to develop shared knowledge: they're involved in real activities as opposed to talks in the conference room which tend to result in opposition. On the panel, the presence of complementary expertise enhances the experts' status. *"We developers know how to get on together. As proof, we've just anticipated a feasibility problem."* I'm talking about shared confidentiality.

Finally, objects are a more immediate reminder of current and past projects than plans or reports that are kept at the back of cupboards. It's not uncommon to see old or prototype parts being referred to in technical discussions. More progress can be when a mock-up is reworked by a Process Engineering technician and a Product Engineering technician under the watchful eye of the designer than when each works separately. A visiting manufacturer can understand his colleagues' technical plans from a mock-up. Nonaka believes that objects act as metaphors by explaining tacit knowledge.[6] Finally, I'll quote K. Weick's aphorism: *"How can I know what I think before I see what I say ?"*[7]

Initial results and conclusions

The initial results of Project 64 show that the lead time for the die conception process has been reduced to a few months. Rises in the cost of dies have been checked, although Renault has not benefited from lower prices on account of the lack of competition between die-makers.
However, the drop in the number of modifications is a major gain.
In conclusion, there are several implications of changing the organisation of the conception process in order to reduce design cycles:
- a long learning time is required: the new organisation has been broken in with Project 64, making the most of the opportunity to experiment with new types of co-ordination; stopping at this point would mean that what we have learnt from the experience would go to waste;
- concurrent engineering doesn't hinder the various operations; on the contrary, it structures relations so that the different specialists really listen to each other; this will be crucial for future projects in the automobile industry;
- organisational, financial and cognitive elements should all be involved. It isn't enough just to bring all the best experts together on a panel if you want to optimise the quality-cost-time relationship. I believe that the cognitive element is the key since this is the real source of innovation in the automobile industry. The further upstream you go, the more abstract the activity and the more important cognitive processes become.

---

[6] Nonaka, I., (1994), "A Dynamic Theory of Organizational Knowledge Creation", Organization Science, Vol. 5, No. 1, February, p.14-37.

[7] cited in Imai K.H., Nonaka I., Taheuchi H., (1985), "Managing the New Product Development Process: How Japanese Companies Learn and Unlearn" in Clark K.B., Hayes R.H., Lorenz C., *The Uneasy Alliance,* Harvard Business School Press, pp 337-375.

II - DEBATA skilful hotchpotch

Yves Dubreil (Y.D.): What you called the 'hotchpotch' comes from the complexity of the car design process. The secret of co-operation is to make the whole caboodle visible by presenting it to the panel. With the old organisation, the hotchpotch was masked by the way problems were broken down analytically. The stamping process in particular was approached in a very taylorian fashion: i.e. the Product Engineering designers who had been designing parts for 20 years had never seen the dies being manufactured.

Let me tell you an anecdote to illustrate this. With the Twingo, we were in the habit of sending the designers to Chausson to have meetings with the die-makers there. One day, a designer who arrived early was milling around in the workshop. He heard people talking about a problem: a part he himself had designed could not be stamped, since it came out with an unwanted hole in it. They had tried everything to solve the problem. The designer therefore talked to the die-maker about it. The die-maker changed the die with a portable drill, making alterations that the designer approved of, and the problem was solved in half an hour.

This would have taken several months with the classic organisation. A person from the Process Engineering Department would have been informed of the problem during one of his fortnightly visits. He would have sent a memo to his colleague in charge of relations with the Product Engineering Department on the Twingo project. Then that person would have gone to see the relevant technician, whose first reaction would have been, *"There shouldn't be this sort of problem if the die-maker is doing his job properly"*. The problem could go round and round like this until enough pressure had built up for proper action to be taken. A panel can save a lot of time, despite the apparent chaos, since it establishes direct contact between the different specialists.

Likewise, people used to say that the die-making process could not be made any faster since it all depended on the speed of the machines. However, Gilles Garel showed that the tools were idle for 75% of the time, which is something everyone had overlooked.

G.Garel (G.G.): The anecdote about the hole says a lot but not every problem can be solved in a few minutes. I once saw something extraordinary happen: there was a problem with the stamping and the experts looked dumbfounded at the part for a whole hour then left without saying a word. The problem was only solved later on by modifying the part.

In the workshop, I showed how management through urgency was responsible for the down time of certain tools. With the Twingo project, a controller from Process Engineering Department used to visit periodically but he had no access to the planning details and didn't know why certain tools were idle. What's more, nobody else knew precisely where the tools were up to. The new panel organisation made Chausson's planning details visible by requiring reports to be made to the project team. The workshop now runs Japanese-style with rigorous production management methods and extremely fast tooling machines.

Q: How exactly do the Japanese work ?

G.G.: I was impressed by the power of their tooling machines and by their rigorous internal organisation, but I was also very surprised by the fact that they don't use concurrent engineering, despite everything we hear. The Japanese manufacturers are very skilled at upstream processes and they give extremely well-thought out plans to their die-makers who are in effect mere tooling sub-contractors rather than partners. Another point is that they don't know how to adjust their dies. Renault worked with the world-leading (Japanese) die-maker and found that none of the dies worked. This was because skills are not spread out in the same way in Japan: plant employees only visit the die-makers to adjust the dies.

Christophe Midler (C.M.): The panel idea makes sense because two key types of knowledge, feasibility and adjusting, are largely held by the die-maker. The Japanese don't need panels because they have these skills within the firm. However, this limits their capacity to innovate because you need to have close links between the different specialists if you want to develop major innovations in the product or the process. You can't achieve this if there's a strict separation between manufacturers and sub-contractors.

Bertrand Ciavaldini (B.C.): The Japanese are not very innovative when it comes to bodywork: the front of the 1994 Toyota Corolla is the same as the 1983 model. You don't have the same need for a panel like that if you stick to the same solutions for 10 years.

C.M.: If we believe that future progress in automobiles will come from a more highly integrated vehicle system, then there's no getting around the need to increase the interaction between equipment suppliers and manufacturers during the design phase.

Engineering the panel

Q: How well the panel performs depends on the procedures it uses: as they say, it's the little things in life that count. How do deadlines operate ? In France you often have to make it costly to miss deadlines if you want people to keep them.[8] As Gilles Garel said, you can argue with a supplier that he should have mentioned earlier that there was a problem if he wants to be paid, but do people keep track of what has been said?

G.G.: I didn't make an ethnographic study of the panel because I spent a lot of time in the workshop. So I'll just say a few words on the procedures.

A panel had never been used in stamping before and it was difficult to introduce new practises with the old teams. In particular, they had trouble accepting the new deadlines: the die-maker who had always negotiated the modifications during the dies' actual production didn't like being asked to give detailed reports a year earlier than he was used to.

Reports had been made of each meeting but they used to be filed without anyone reading them, much to the dismay of the business officer who wrote them. In this field, the culture is more verbal than written as it's difficult to keep up with the events in writing with everything changing all the time.

C.M.: I went to two panel meetings for the Twingo project, where there was a sound structure to the proceedings: i.e. a report was made at the end of each meeting, as opposed to later on, and a copy was given to each participant.

G.G.: On my panel, the reports were written after each meeting and were not commented on at the next. However, everyone took photos or parts away with them. These objects served as reminders.

Michel Praderie (M.P.): As Gilles Garel said, modelling clay can be useful for getting points across to the other panel members. But these things don't stay in people's minds: after three months everyone may already have forgotten about them. This is perhaps not the case with the die-makers, who share solid skills and belong to very traditional corporations, but it may be the case in other parts of the automobile industry. In general, at Renault we don't really make the most of our past experience: the leader of a new project often acts as though he's starting from scratch.

Y.D.: It's not exactly like starting from scratch. I had long talks with the leader of Project 64, as well as with the leader of the Laguna project, Mr Savoye. He adapted a certain number of our dies. I admit that he liked to use photos and we liked reports, but it seems perfectly natural to me that each project should have it's own style. All in all, there does seem to be a progression from one project to another.

M.P.: But there is no formal process for passing on the knowledge.

G.G.: The top managers do build on their predecessors' experiences. However, from what I've seen, the technicians seem to want to reinvent the wheel. Clark and Fujimoto acknowledged this

---

[8] Session No. 51 - March 1994 : "The Researcher's Agenda : Making Good Use of Deadlines and Rituals", M. Berry.

problem and concluded that this is a western attitude (not part of the Japanese culture, for example).

B.C.: This goes beyond Renault. My research indicates that one problem with organising the panel is keeping track of previous decisions. Objects or reports are certainly useful for acknowledging decisions, but they don't count for much later on. This has several implications:
- projects have a long life (4 - 5 years) and agreements made early on may be denied at a later stage;
- after the project, the actors make no attempt to explain the logic behind their decisions to future project groups;
- the actors leave no traces behind them for many reasons, including not wanting to risk leaving proof of anything that might have been done badly.

Y.D.: Exactly. The panel set-up makes sanctions much more difficult since much of the work is done as a group, unlike sequential engineering where everyone had a precise role. But what's better: an inefficient system which allows sanctions to be made or an effective system which only works through mutual confidence and flexibility ?

Whilst we haven't found a way to make each person's responsibilities clear, we have found a way of making people share the pressure. For example, the day that Mr Schweizer told Mr Savoye in public *"The Laguna will be launched on 14 January 1994 and I hold you responsible for meeting the deadline"*, he gave him enormous power to act. As a result, Mr Savoye and his team had an obsession with the deadline, and they tried to pass this on to all the others, who couldn't then hold the project up without putting themselves at risk.

Cognition and passion

C. Riveline: I don't like the term 'cognition', although it's very popular with researchers at the moment. It encourages analyses where people reason like computers and it tends to strip matters of all passion. One key question remains to be asked: why do people outdo themselves in this sort of highly-charged context ? How do they each manage to keep a sense of self ? My current research leads me to say that two factors make people sit up and take notice: a stimulus and security.

The stimulus is the whole drama of the project. But this in itself isn't enough: if it would be a disaster for the project to fail, for example if this would cause unemployment, few people would be prepared to take such risks. Hence the need for some sort of security. This is where the pool of different skills comes in: people can always fall back on their trade if they don't get on in the project groups. This also gives the project leaders some security, since they can lose a member and quickly find a replacement.

The panel is therefore like a crazy centre of activity in the middle of an organisation that calmly manages the skills. However the system breaks down if you get rid of the pool of skills, for example by trying to organise everything in terms of projects.

G.G.: I'm aware of your reservations concerning cognition but I wanted to show that skills play a key role in stamping. What's more, your model of identity management doesn't work 100% in the domain I studied. There are so few competent specialists in stamping that you can't get angry with them: the reserve of skills is too small.
C.R.: What makes them act then ?

Participant: Doesn't it have something to do with physical objects? On the panel, objects are used to help people understand various problems and communicate non-verbally. They also give a visible track-record of the projects. Surely this motivates people?

G.G.: Yes, this is true, especially if the objects are taken to negotiations. In three hours the panel members can transform an object and back up their conclusions with tangible evidence.

Y.D.: We shouldn't underestimate people's curiosity and good intentions. When people come across a problem they naturally want to solve it. I've never heard anyone say, *"Here's a huge problem. I think I'll just leave it as it is! "*

I think C. Riveline's hit the nail on the head. If you want to motivate a project team you need to give them a challenge, but also an acceptable risk: if people are too worried about failing, they stay on their guard. People take more risks when they know that they have something to fall back on if things go wrong.

C.M.: What I found interesting in G. Garel's case study was the role of competence. Of course, the members of a project team on a panel have to be passionately interested in what they're doing and work impossibly long hours, but they also need to see things with a clear eye. Blind passion isn't a good idea.

One of the hardest things in organisations at the moment is being able to concentrate on more than one thing at a time: for example, motivation and competence or skills and projects. Another difficulty is knowing how to deal with combinations of skills: we shouldn't aim for everyone to be generalist but instead we should try to make people more competent in their specialist fields. When something doesn't work on the panel, it's never because the experts are too specialised but generally because they are lacking certain knowledge in their field. They should therefore be encouraged to polish up their knowledge and be made to listen to others. Each field demands much more of its experts.

Q.: How can human resources be managed in the 'hotchpotch'? Shouldn't the company protect everyone's right to be recognised and appreciated? Are we going to have new specialists in projects or panels ?

Y.D.: Now there's a problem: how do you characterise 'panel' skills ? A Chinese proverb says "More men build walls than build bridges". The panel members are bridge-builders but it's hard to find an objective definition for this type of skill. This is why managing the complexity of automobiles also means knowing how to accept people's subjective opinions.