The Engineer's view is opposing « reverse causality »

In her book « ***La Gloire des Ingénieurs*** [1]» (Albin Michel – 1993), Hélène VÉRIN wrote that engineers are the best candidates for a management post because « *by nature they have at their disposal the ability to generate, that inborn power of mind which, by its own virtue, drives them to find what is unknown* ».

The main difference between the engineer's view and that of most other "white-collar" high level professions (we'll leave out the specific case of teaching) lies in the way the actual work and the concomitant thinking **are related, on a time scale,** to their object itself, which we'll call the « ***generating fact*** ». Let me explain it with some examples.

Let's first consider the case of an engineer who has to work on constructing a bridge or a complex machine. Here, the generating fact is the construction itself and almost all the engineer's work will take place **upstream** of the generating fact : studies, calculations, plans, etc. … The engineer has therefore a direct action on the carrying-out of the generating fact. He is involved in a **proactive** process. This will not prevent him, whenever possible, from **following up that project** until it is completed, and even beyond that during the operational stage.

On the other hand, let's consider the case of a lawyer who has to minimize the consequences of an offence ; or the case of a doctor who has to treat a patient ; or else the case of an accountant who has to draw up the balance sheet of a company. The generating fact is the committal of the offence for the first one, the occurrence of a disease for the second one, the accounting situation of the company for the third one. For the most part, their work will take place **downstream** of the generating fact. They have therefore no influence on that generating fact, which presents for them a **random** characteristic. They have a **reactive** approach. For the main part they conjugate their activity in the past tense, and sometimes in the future perfect, while **engineers conjugate in all tenses**, including, and above all, **in the simple future tense** !

This different positioning with regard to a generating fact is at the origin of what we call **reverse causality**. Let's consider a simple example : a crossroads was the scene of several fatal accidents and the authorities reacted by placing a roadside notice : « *Be careful, dangerous crossroads : already 4 fatal accidents !* ».

In this case, it's obvious that the authorities have had a reactive approach with regard to a generating fact, which is the occurrence of several fatal accidents. They considered that generating fact as an unpredictable event and their notice conveys the following message : « ***This crossroads is dangerous because 4 fatal accidents happened*** ».

[1] Engineers' Glory

Everybody will understand that this is reverse causality, as the actual causal relation is : « ***Four fatal accidents happened because this crossroads is dangerous*** ». In this case, the engineer's proactive approach would have been to study the design of that crossroads extensively enough to minimize the risks of fatal accident.

Such a reverse causality is an **extremely common mechanism**, which also affects the **company management**. So, when a company has to be restructured because its results are inadequate, we have an example of reverse causality : the inadequate results are perceived as the random generating fact (supposedly unpredictable, or at the very least unpredicted within the framework of short term management) and restructuring is the reactive process. Actually, the causal relation goes in the opposite direction : it's because the company's structure was inadequate that its results became mediocre. It should have adopted the engineer's proactive approach so as to modify the company's structure gradually and equip it to confront changes that were mostly predictable.

I haven't enough space here to identify the origin of this phenomenon. We could search for it in education and in social constraints : essentially, adaptation is a typical example of a reactive process ; now both education and social constraints have become enormous machines to train and to model adapted people ; this is not the best way to favour a proactive approach, the aim of which consists exactly in breaking here and there the vicious circle of adaptation. That's maybe why there aren't enough engineers any more : they are too cramped for space in a structure that doesn't give them enough opportunity to express their creativity and their entrepreneurial spirit.

The challenge is therefore twofold : on the one hand, to attract a growing number of our students to the engineering profession (the present lack of commitment of the European governments following the conclusions of the « *Lisbon Agenda* », relating to the flagrant lack of engineers in Europe to be capable of responding efficiently to the technological breakthroughs of the next few years, is particularly frightening) ; and on the other hand, to motivate engineers to apply for management posts, so that they may apply their proactive approach to the development of society in general and of companies in particular.

Be that as it may, our little group within SEII is far from having enough power to make things change through willpower alone. We can only inform, inform and inform again, while searching simultaneously for the best information channels and for the best targets. And without too much delay, for time is running out.

Brussels, September 2006

Marc GOOSSENS,

Member of SEII's Board of Directors & Executive Committee