SAME goes back to school

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Abstract— This project, carried out by the SAME association [1], is the result of several observations. Indeed, the PACA region is a business and research cluster in the field of communicating secured solutions where microelectronics is at the heart of these solutions. Nevertheless, we do not build a world-class centre of excellence without strong local support of the population. Unlike other areas such as the Silicon Valley, the French Riviera has not gotten a high-tech culture. The majority of engineers recruited in the companies member of SAME come from other regions or other countries. It is thus imperative that we take action at the origin and encourage our children and high school students to become engineers. In a general manner, young people give up too often on the scientific academic fields which are supposed to be difficult.

I. INTRODUCTION

Facing this reality, a promotional kit (presentation of engineering careers in general and microelectronics engineers in particular) was developed in 2007 by two students from the electronics department at Polytech'Nice-Sophia, as part of their internships, supervised by SAME engineers and a university professor. The idea of this kit is to break away from the stereotypes of the engineering career that is often unknown. Young people have an image of an austere person in a white blouse at the back of the laboratory. The courses, in particular the preparatory classes to «Grandes Ecoles», are intimidating. This kit presentation, in a « PowerPoint » document (see Figure 1), lasts about one hour. It is carried out, in theory, jointly by a professor and an engineer from Sophia, which will demystify the engineering career and show the different aspects as well as the different possible ways to achieve them.

Figure 1. Kit « Same goes back to school »

II. ENGINEERING CAREER

This presentation is fairly interactive and its aim is to make high school students react as much as possible. It begins by showing the different roles which an engineer can perform in the course of his career and of the different technical fields covered (see Figure 2).

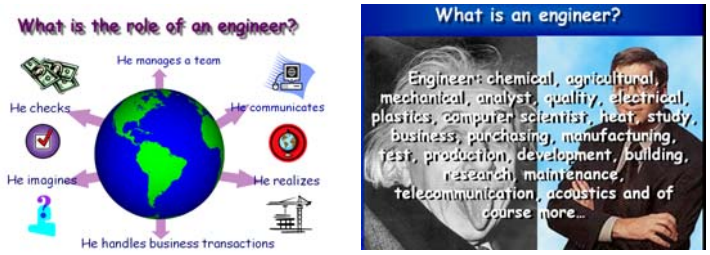

Figure 2. Engineering roles and careers

We will indeed show that an engineer's work is not limited only to the scientific field and most of all; it can be constantly changing, in the same way as his salary (see Figure 3)! All questions are welcome.

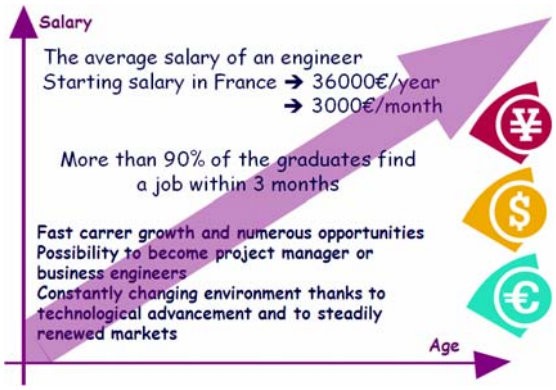

Figure 3. Career opportunities and salaries

III. MICROELECTRONICS ENGINEER

When the high school students have run out of questions, we continue the presentation more specifically on the microelectronics engineering career. Wafers, dies, packaged dies and above all "open" iPods, passed around in the classrooms show us just how far electronics have invaded our daily life. It is important to show that Europe remains a significant international cluster, particularly in the field of

design (see Figure 4). In general, high school students are not aware of the system of business and research clusters which have been put into place in France. We now give a brief description of the concept by presenting the local industries.

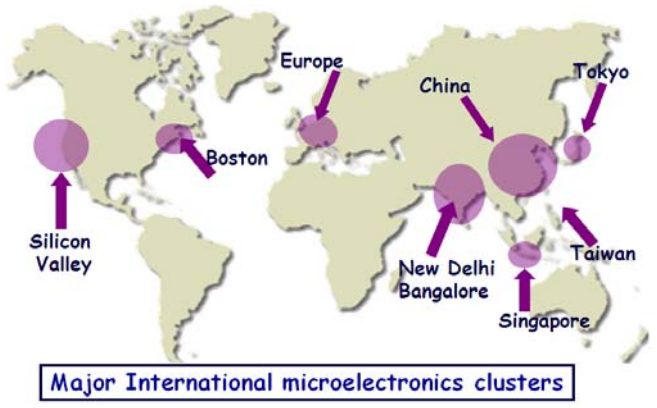

Figure 4. International clusters

A trip into the heart of the iPod (see Figure 5), which is a familiar object to high school students, illustrates the constant and fast-growing evolution of the microelectronics industry. We then show how several teams of engineers (sound, acoustics, computer, telecommunications, physics, electronics) have enabled a user to legally download his favourite piece of music from the studio recording of a rock group, rap or R & B so that he can listen to it on his iPod. Next, we convey the evolution of microelectronics technology through the different iPod (and iPhone) versions as shown in figure 6.

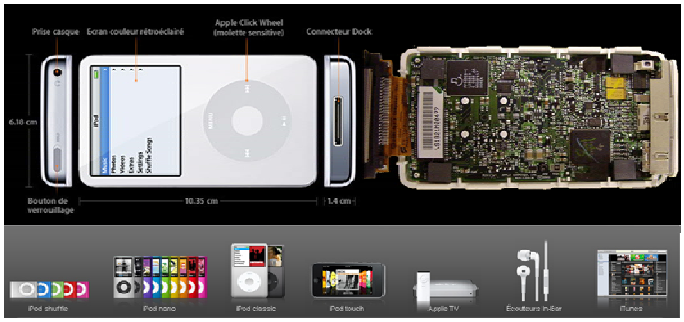

Figure 5. A trip into the heart of the iPod

Figure 6. Evolution of the iPod – The different generations

Scaling is made possible thanks to the invention of transistors which is the fundamental basis of the microchip. A microchip includes millions of transistors and can perform many more or less complex functions. If we apply the same miniaturization-performance rates to an automobile, a car today would measure 3 cm and would be able to go up to a maximum speed of 3000 km/h.

As compared to the Pyramids which total about 2.3 million stones each one, a microchip contains more than 100 million (or a few billions) transistors. To design a modern microchip, a team of dozens even hundreds of engineers is required. Unlike the thousands of slaves who built the Pyramids, engineers receive quite a high salary in exchange for their work. To reach such a density of integration, the size of the transistor over the course of the years has diminished, being divided by 1.4 every 18 months. The size today is inferior to that of a virus (see Figure 7).

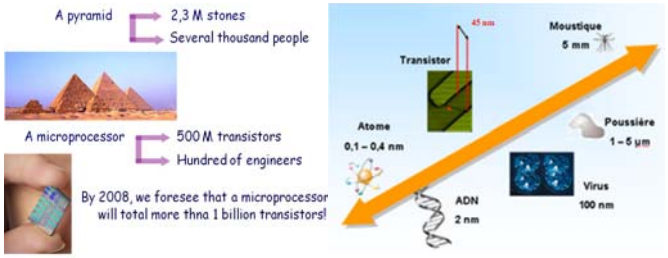

Figure 7. Microchip complexity and Comparison of a transistor size

Let us simplify by showing how a transistor can operate as a control switch and how it also constitutes the fundamental basis of digital electronics (see Figure 8). To be more precise without discouraging the high school students, we also show two videos (see Figure 9): one - an extract from the French TV show ”C’est pas sorcier” [2] and the other - a DVD directed by EDA Centrum about EDA tools and on networking problems [3].

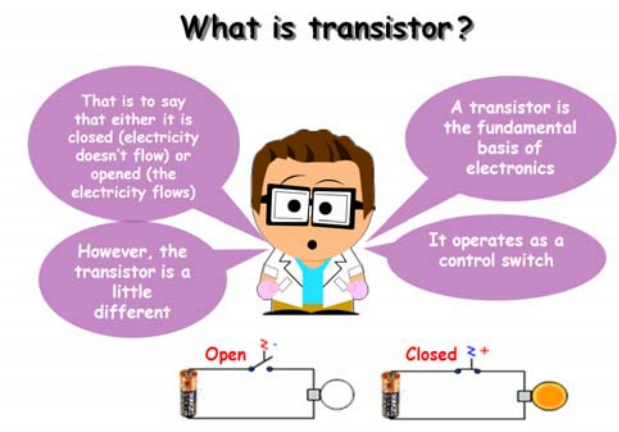

Figure 8. The transistor is the fundamental basis of digital electronics

Figure 9. Extracts from the videos shown to the high school students

IV. TRAINING ENGINEER

To conclude our presentation, we show the different possibilities available to students who wish to obtain an Engineering or a Master's degree: preparatory classes to the «Grandes Ecoles», integrated preparatory classes, universities and Institutes of Technology (see Figure 10).

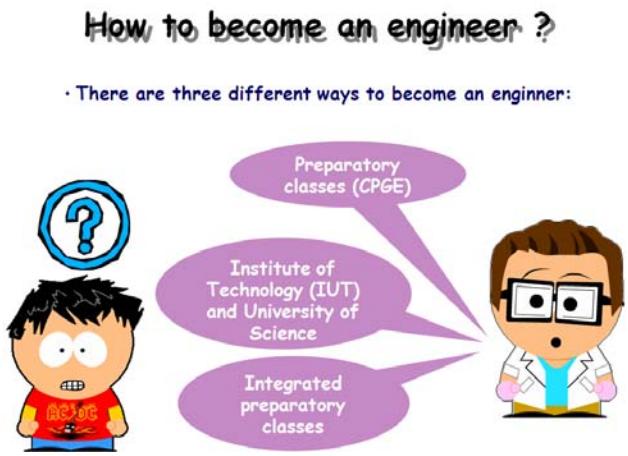

Figure 10. Three different ways to become an engineer

As high school students are not so familiar with networks such as Polytech, they usually ask a lot of information about "undergraduate programs". Questions on the practical details of admission, graduating to the next year and on the work load are asked quite often! The specifics of one type of training in comparison to another, particularly in the Social Sciences, as well as foreign languages are often questions which come up during the final discussion.

Young people today are truly interested in international experiences and the possibility to do part of their studies abroad. It is necessary to recognize that we should likewise put them at ease about the hypothetical difficulty in our academic courses.

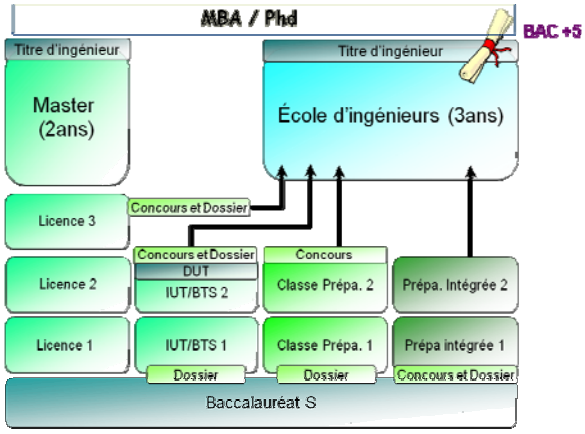

Figure 11. Different options of training to obtain an Engineering or Master's degree

The targeted public is high school students in their senior year or those preparing a French "Baccalaurat Terminale S" as well as those preparing a degree in Science, Technology and Industry. Throughout the school year 2007-2008, several presentations were done in high schools in the Alpes Maritimes Region, generally given by a team of engineer-professor (see Figure 10). The presentation is shown to students in their senior year at the beginning of the first term just before they need to make their final choice of studies for university.

At the end of the presentation, we hand out a questionnaire to each student about the presentation, their perception of engineering careers and their interest in the scientific fields. The first feedback received is encouraging because a significant ratio of high school students indicates that this presentation has changed their view on engineering careers:

- all of them found it interesting, but too short
- a lot of them asked for more information «integrated preparatory classes» schools

At the end of the presentation, a quiz to win an iPod is also given. A winner is drawn each year (second time in 2008) and his prize is given at the closing ceremony at the SAME forum.

VI. Conclusion

This is a long-term process. The impact on the culture of the French Riviera and on the ratio of natives from the French Riviera in engineering schools is measured on long-term. The next step would be to extend this project to other regions as part of economy awareness. All documents can be turned in free of charge to all colleagues in the CNFM network. We would simply expect that they hand in all modifications, a summary of their use and presentations in front of high school students.

This project is a trial balloon. SAME has not gotten the financial means or the manpower to reach out to all the high schools or the high school students of France. Our goal is to work with other associations which will relay our project in their technical and geographical fields. It is possible for us to organize training sessions of « trainers ». In the future, we would like to reach out to 15-year-olds (French school system- «3ème»), combining the presentation with mandatory internships in companies. We would also like to produce a film focusing on the main points of the presentation with a concentration on the regional employment pool.

This project will become a « success story » when we succeed in having a crowd of students, who have been partly persuaded by our presentation, enrolling in our engineering schools. Henceforth, we would like it to be known that this project was awarded, on a European level, second prize in the category « Investment in Education » which was sponsored by the journal « Electronics KTN » (see Figure 12).

Figure 12. Second prize (European finalist)

References

[1] http://www.same-conference.org
[2] http://programmes.france3.fr/c-est-pas-sorcier
[3] http://ww.edacentrum.de