Dr. F.P. (Frank) Carrubba, executive vice-president and a member of the Board of Management and the Group Management Committee of Philips Electronics N.V., was born in Waterbury (United States) in 1937. He studied electronics and operational management at the University of New Haven in the United States, which later awarded him a doctorate for his work in the field of computer development and industrial research. Before joining Philips on September 15, 1991, he was managing director of Hewlett-Packard Laboratories. He began his career in 1960 at the Thomas J. Watson Research Laboratory of IBM, where he worked for 22 years before joining Hewlett-Packard. He is a member of the board of a number of scientific institutions.
The Electronic Highway: an academic issue?

By Dr. Frank P. Carrubba
Executive Vice-President
Philips Electronics N.V.

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Introduction

Good afternoon, ladies and gentlemen. Today, I should like to begin my talk by congratulating the Eindhoven University of Technology on its 39th anniversary. Ever since its foundation, there has been a fruitful cooperation between this prestigious University and Philips. It is my conviction that these ties will only be strengthened, because the successful implementation of technological developments in society increasingly requires the joint efforts of universities, industry, and government alike. As an example, I have chosen to devote my contribution today to the much heralded electronic highway.

In my presentation, I will discuss three topics. First, I shall go back in history, explain Philips' role in the foundation of the Eindhoven University of Technology, and talk about current forms of cooperation. I will also show how, over the years, strong ties have grown between the two organizations. Second, I will elaborate on the electronic highway and the related concepts of multi-media and convergence in the electronics industry, and highlight their importance. Third, I shall describe what, in my opinion, is the role of universities in helping to bring about the electronic highway.

The TUE and Philips

Immediately following World War II, administrators of the provinces of Noord-Brabant and Limburg, and representatives from trade and industry formed the foundation that, in 1956, would lead to the Eindhoven University of Technology, the second University of Technology in the Netherlands.

Frits Philips, then vice-chairman of the Philips Board of Management, was one of the driving forces behind this foundation. Over the years, contacts between the University and Philips have been intense. A large number of contracts allow for the unimpeded exchange of knowledge and expertise between the two bodies. The University has been a breeding ground for numerous engineers who joined Philips. Philips, in turn, has supplied the University with many of its professors.

A very important, direct link between Philips and the University is through
the IPO, the Institute for Perception Research. Being a manufacturer of audio, video and communication equipment, Philips has always been strongly interested in knowledge on human perception. With the foundation of the Institute for Perception Research in 1957, incidental research projects carried out at Philips Research Laboratories were given a continuous character. One of my predecessors, former Philips Executive Vice-President Professor Casimir, who was at the time head of Philips Research Laboratories, played a leading role in the establishment of this partnership between Philips and Eindhoven University of Technology. Today, as they did then, IPO researchers aim to obtain an understanding of how people use technology. This requires a focus on human needs and desires, on human perception of vision, sound and text, and, most important, ease of use. The resulting insight can be employed to improve the quality of electronic products and increase the level of benefits to end-users. It was a detailed investigation by IPO into the perception of sound by the human ear that laid the groundwork for the audio compression system of the Digital Compact Cassette. With its unique expertise, IPO is also well qualified to significantly contribute to progress in a new, promising area of technology and business: multimedia

The electronic highway

To explain what multimedia is, I prefer to first discuss the related concept of the electronic highway. The electronic highway is a catchphrase incorporating many different concepts, from interactive multimedia, edutainment and infotainment to interactive technology, cyberspace and new media. The main driving force is the rapid evolution of digital technology that is reshaping the electronic industry.

The cost of capturing, storing, manipulating and distributing data in digital form is decreasing. Digital audio and video compression techniques are becoming more powerful. Soon, most information in consumer electronics is expected to assume the same digital form as computer data. A similar trend can be observed in telecommunications. Content software in digital form is now beginning to add more value than hardware. The availability of text, graphics, voice, still images, full motion video, and music is essential for the viability of the hardware. Functions traditionally implemented in hardware are rapidly being replaced by embedded forms of software. These trends combined are causing boundaries between traditional segments of the electronics industry to blur. The consumer electronics, computer systems, information,
telecommunications and parts of the entertainment, media and publishing industries are expected to merge into a single market. Thus, a continuum is created from information carriers to information content and from tangible products to intangible services.

One of the buzzwords today is multimedia. This new concept is best explained by looking at the traditional media: The term “media” has historically described a number of separate industries each producing, packaging, transporting and displaying analog-based information in one primary form. Examples are the newspaper, book publishing, broadcasting and film industries. Consumers employ these media in a passive and linear way. By contrast, multimedia is the combination of sound, still images and motion pictures, graphics and animation, data and text, all in digital form. Consumers use this information in interactive, participatory ways. Given that multiple forms of media are used in displaying and communicating this type of information, the multimedia market draws players from many different industries. These businesses are now converging and competing in many ways. Especially in the United States, this has caused a frenzy of mergers and acquisitions among telephone companies, cable operators, computer firms, and the media industry.

It is not by accident that the United States has been at the forefront of the convergence in electronics and developments in multimedia. The U.S. government is actively promoting the electronic superhighway. The regulatory environment is less of a problem in the US than in Europe. There is little doubt in the United States that the electronic superhighway will actually be built. It will become a network of networks. By the year 2000, all classrooms, libraries and hospitals in the United States will be connected to the electronic superhighway. Already today, the U.S. initiative Internet, a civil, global network that links universities, research institutes, individuals and commercial computer services, is rapidly gaining acceptance and offers those who get on-line a galaxy of information.

Visionaries expect the electronic superhighway and multimedia to yield a plethora of new products and services. Some have already been introduced or are being tested, others are merely speculative. Emerging applications include interactive TV with video and games on demand, home shopping, home banking, edutainment, distance learning, on-line information, telecommuting, videoconferencing, telemedicine and so on. Multimedia products and services will help overcome barriers of distance and time. Where you live will become
less important. Students all over the world, for example, will be able to take any class they desire and interact with top professors. In time, the resulting fragmentation may make the current concept of unified education at least partially obsolete. People, data and information will be accessible instantly, no matter where they reside. To illustrate this, I should like to share a quote from a recent TV commercial of the US telephone company MCI; you might have seen it on CNN. The commercial depicts a young girl, standing on a deserted beach, saying:

"There will be a road ...
It will not connect two points ...
It will connect all points.
Its speed limit will be? ...
The speed of light.
It will not go from here to there.
There will be no more there ...!"

The role of universities

In time, I expect multimedia and the electronic highway to have an even more profound impact on business and society than electricity and computers. It will allow people to get more control over their lives and help them become the best they can be. These developments have obvious implications for a university such as Eindhoven University of Technology. Multimedia inherently combines different technologies, academic disciplines and industries. As a consequence, universities need to train students to work effectively in multidisciplinary teams. To contribute to the field of multimedia, universities will have to expand the scope of their curricula. Developing the required content, for example, requires skilled, creative and intelligent people. Currently, there is hardly enough imaginative skill to satisfy our present needs. One just has to look at the number of reruns shown of TV. In addition, authoring tools will have to be developed as well.

There is little doubt that academia and industry have to cooperate closely to further explore the possibilities of multimedia and find answers to questions such as how to translate this emerging technology into the added value that enhances people's lives. Dedicated multimedia centers of academic cooperation, such as there are in the United States, may well serve as an example. These centers, on campuses as the University of Southern California, University of Michigan, Massachusetts Institute of Technology, and Georgia Institute of Technology explore applications in cooperation with industry and governments. Exploratory environments allow for testing novel concepts and deriving early indications on interoperability, usability and acceptance.
Furthermore, dedicated curricula are being developed, and numerous alliances between universities and industry are being formed. I believe that having similar exploratory centers in Europe is a requirement for defining and developing future multimedia applications. This approach requires a different mindset and people who are willing to reach beyond their departments and beyond the immediate future.

In this perspective, it is encouraging to see that the Eindhoven University of Technology actively supports the Digital City foundation in Eindhoven. It is also encouraging to see that within the University, initiatives are being taken to venture onto the electronic highway. I am, however, slightly worried about the general decrease in interest in technical studies, which is also noticeable here in Eindhoven. Not only could this endanger the supply of highly qualified engineers to industry, but a reduction in the number of students would also translate into less income which, in turn, immediately impacts the funding of new initiatives. To generate income, the knowledge and skills present within the universities could be made available to society via Internet. If this implies the commercialization of the transfer of knowledge, so be it. It would give the University revenues which in turn, it could use to fund new initiatives in this field.

Conclusion

British poet William Blake once said “Man’s desires are limited by his perceptions; none can desire what he has not perceived.” This, I believe, is a statement that is very applicable to the electronic highway. This catchphrase, that is on everyone’s mind these days, is a phenomenon that is driven by technology, but also offers a social challenge. How shall the electronic highway, the importance of which is only now beginning to be acknowledged by industry and universities, be accepted by the consumer? There is no doubt that, at first, the electronic highway will be reserved for an exclusive group of users. Over time, however, it will radically alter the way we work and live, and evolve into a tool that is available to everyone, in one form or another. One just has to look at mobile telephones to see how within a time span of just a few years, a product can evolve from being a status symbol into an everyday product that is within reach for everyone. But making the electronic highway happen still poses numerous challenges. Cooperation between industry, universities and government will have to improve. Regulatory aspects such as copyright protection, open access and universal service will need to be clarified. To appeal to the end user, new multimedia products and services will have to provide
genuine benefits and fundamentally extend quality of life and work. It is a challenge for academia to help bring the electronic highway to life by emphasizing these human aspects in its curricula and research programs. There is an important and necessary role for the Eindhoven University of Technology.

Ladies and gentlemen, thank you for your kind attention.

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