Megatrends in the Nomadic Age

In-Stat Conference, Phoenix, 1994

Keynote Speech

Commentary

This keynote speech was delivered at In-Stat Conference by the invitation from Jack Veedle, the president of the company. Thanks to the progress of semiconductor technology, electronic equipment tends to become an intelligent portable device with higher performance, higher functionality, lower power, and smaller size. As the result, people are freed from the constraint of time and location which results in the new lifestyle. With the rise of new lifestyle, new Megatrend will be created; this is the dawn of the "Nomadic Age".

Three years later of this conference, in 1997, David Manners and I published a book titled "Digital Nomad" in UK, based on this speech and other materials. I later learned that our book became one of best sellers, onetime in Scotland, probably thanks to its innovative concept.

In this speech, a new idea called "Figure of Merit" is proposed as a quantitative way to assess the overall progress of electronic equipment. Two cases of Figure of Merit are shown, as examples, for computers and calculators in order to see the speed of progress. There seems to be no alternative way to assess the overall progress of electronic equipment, as of 2018, so that the concept of Figure of Merit can still be useful with the suitable choice of parameters.

The core engine in the Nomadic Age is no doubt the semiconductor. Among other things, newly developed single chip RISC microprocessors are now playing important roles with their superior MIPS value at low power. Comparison is done between CISC and RISC architectures with some existing examples such as Hitachi's SH Microprocessors. At the same time, field programmability is important to respond to users' needs promptly, and F-ZTAT MCUs, developed at Hitachi, are shown as actual examples.

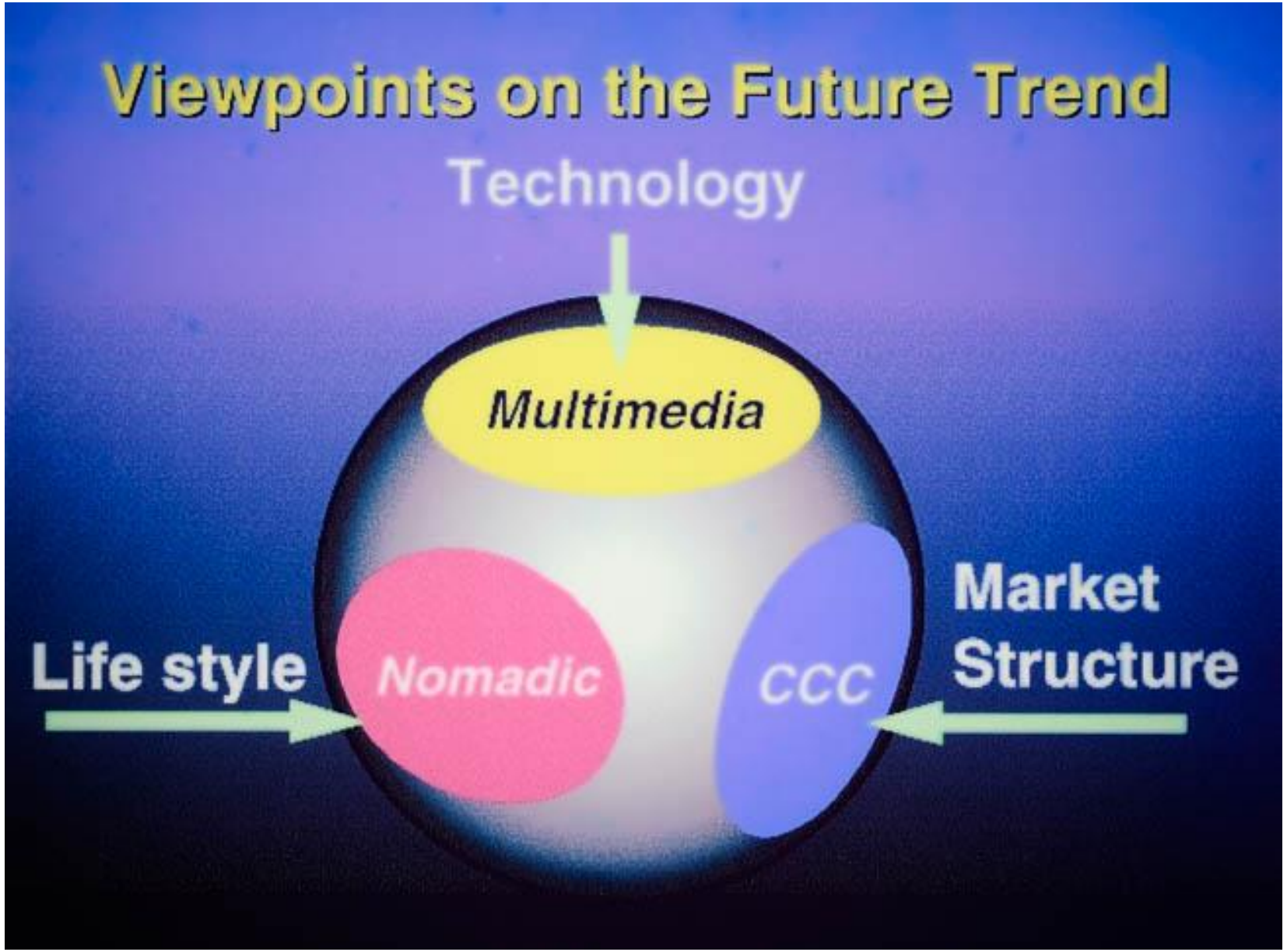
Continued to next page.

At the end of this speech, “Murphy’s Law of Semiconductor” was introduced, which was a modified version of “Murphy’s Law of Golf”. It was intended to be an additional entertainment at the end of the speech, but I found later that this entertainment was very popular and well accepted by the audience. Based on this experience, I added this entertainment, if appropriate, at various occasions in later days.

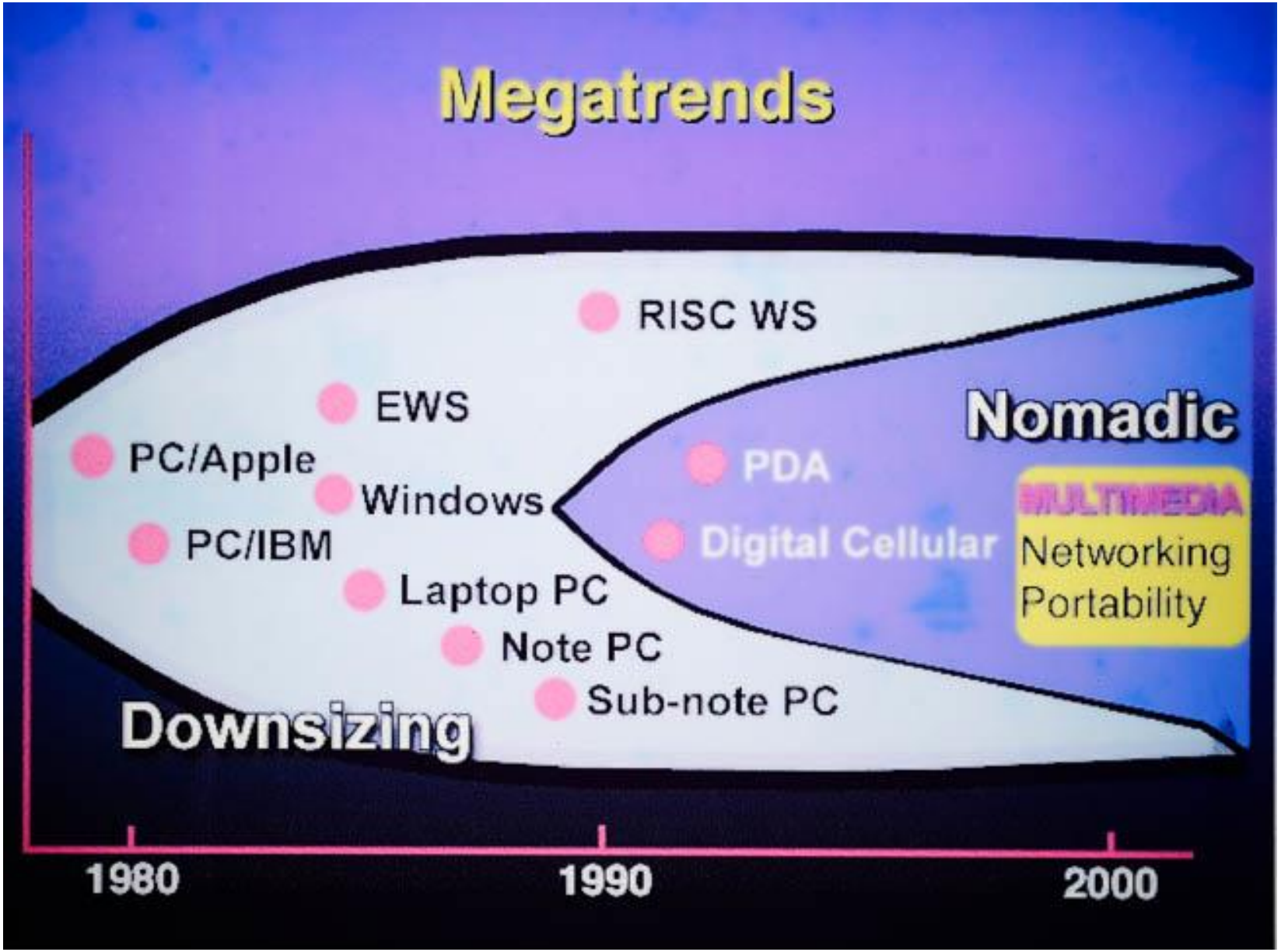
“Digital Nomad” published in 1997 by T. Makimoto & D. Manners
Japanese and Chinese versions were published in 1998.

This is a speech at In-Stat conference in 1994. Since this material was digitalized from OHP sheets, there are some portions where readability is poor.
Thanks to the progress of semiconductor technology, electronic equipment gets smaller and portable, and people are free to move around like nomads.

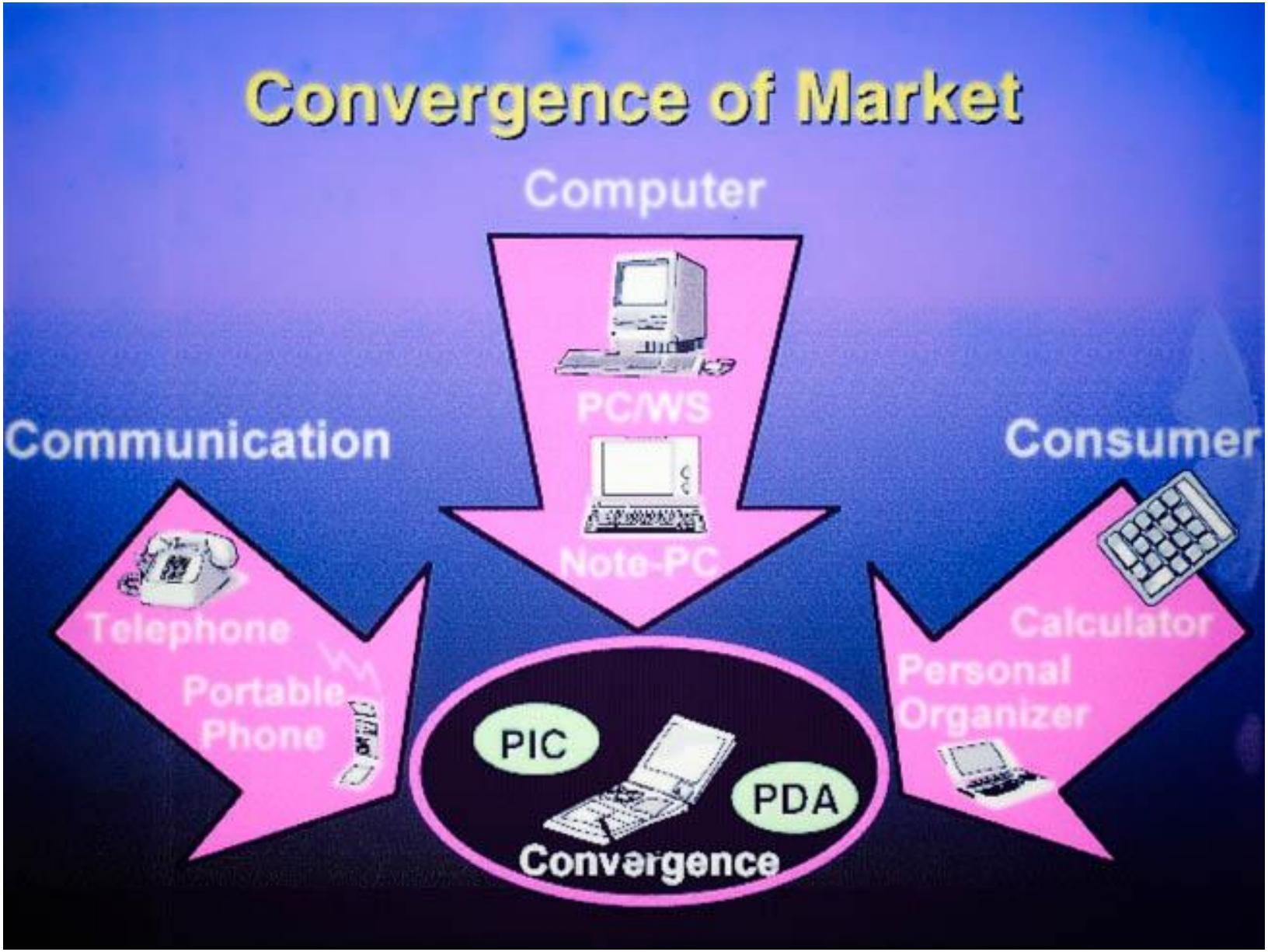

Megatrends in the"Nomadic Age"
1. The "Nomadic Age" is Coming
2. Technology Evolution for the "Nomadic Age"
3. What is Happening?
4. Semiconductor Technology for "Nomadic Age"
5. New Life Style



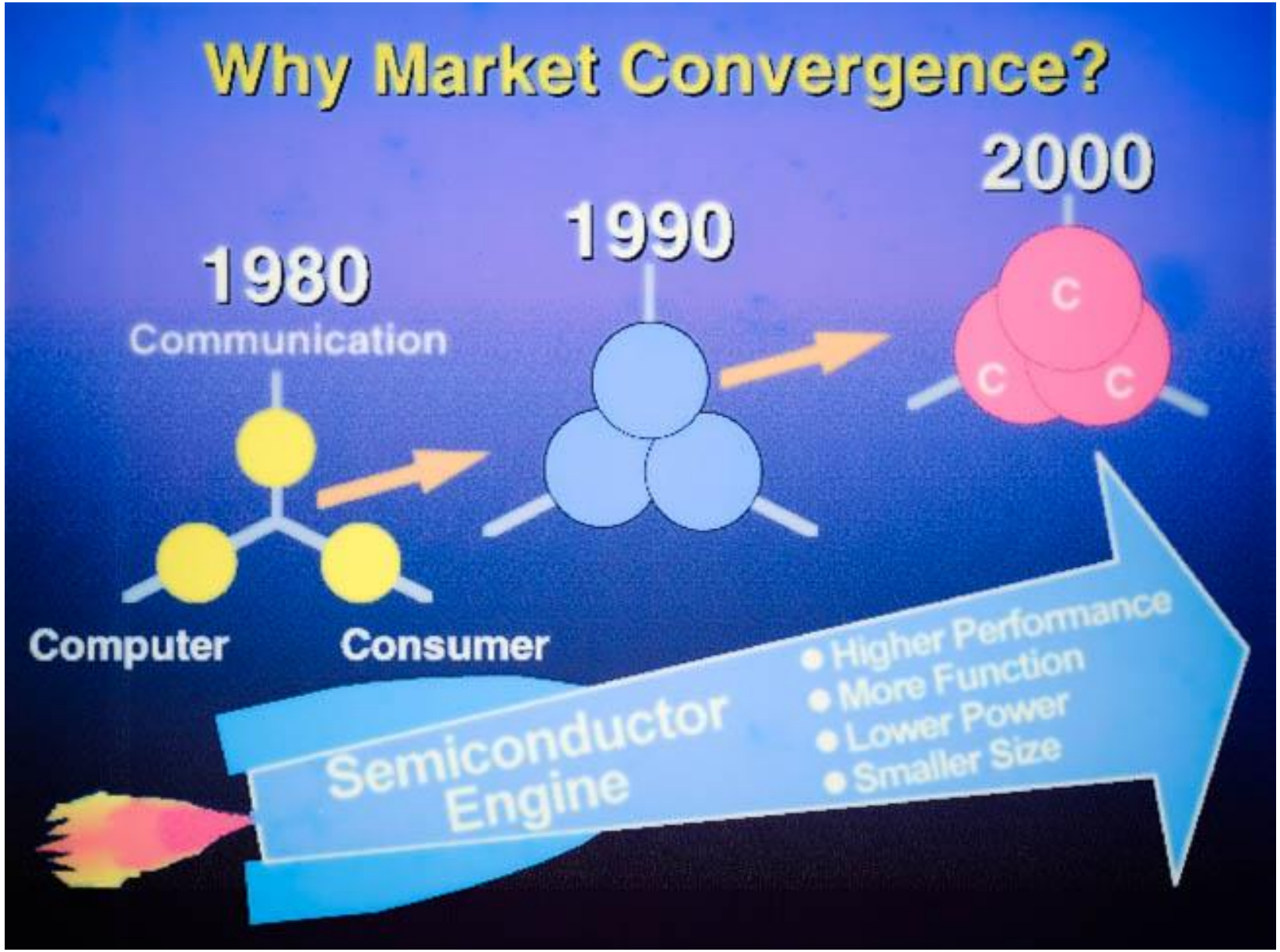
Multimedia is a new technology trend toward the future. Three market segments, or computer, consumer, and communication, will converge on one segment called CCC. The new lifestyle, called nomadic style, will spread in the future.



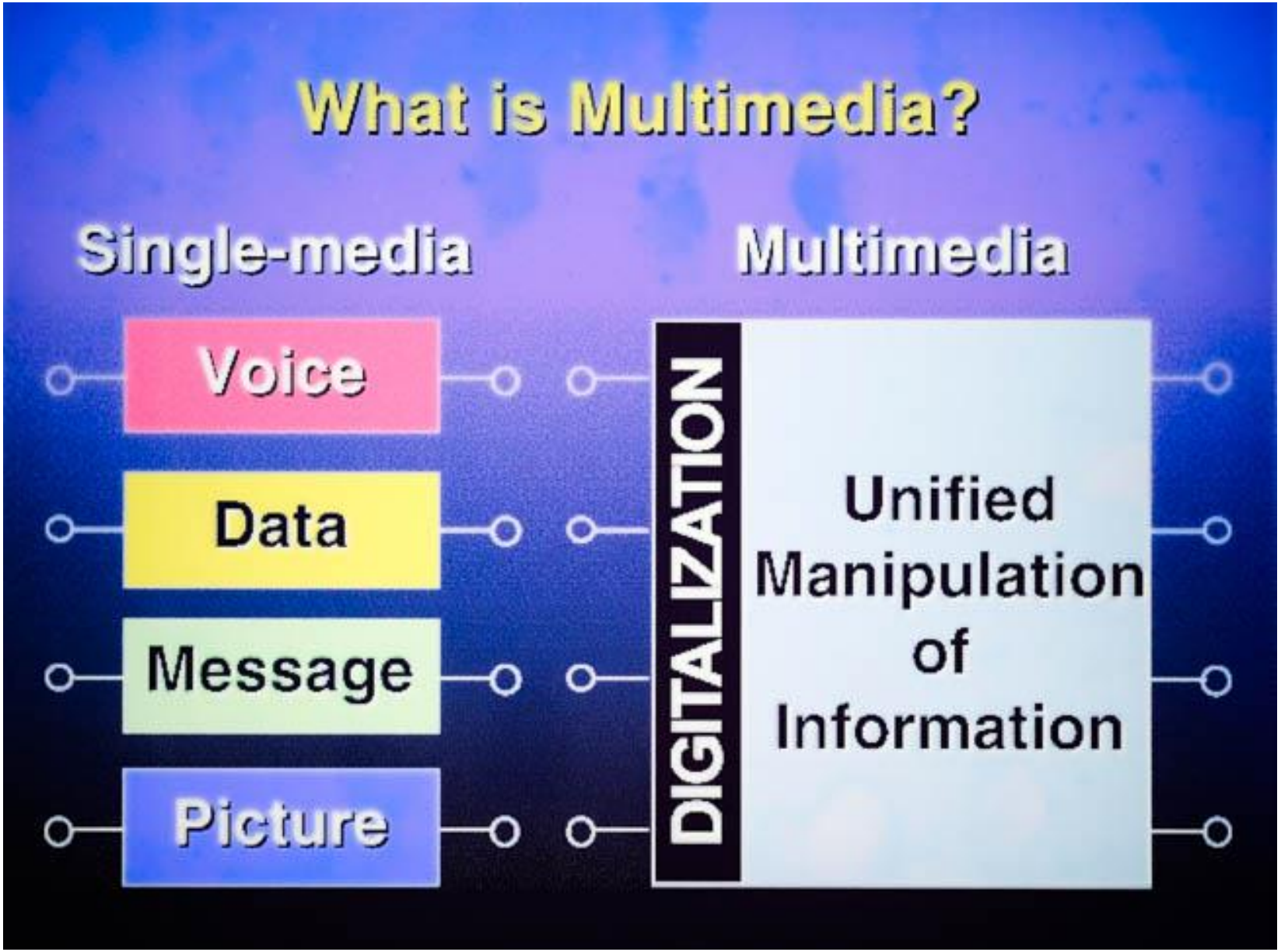
PC segment started to rise in 1980s and replaced mainframe computers. This trend is called downsizing. In 1990s, portable equipment such as digital cellular phone and PDA are rising which will lead to the opening of the Nomadic Age. Three essentials of this trend include multimedia, networking, and portability of equipment.



In the past, three market segments were clearly separated. However, because of the emergence of portable electronic equipment such as PDA, market boundaries will gradually disappear and they will converge on one segment.



What is the engine for market convergence? It is the progress of semiconductor which pushes this trend. Four important factors comprise “higher performance”, “more function”, “lower power”, and “smaller size”.



What is multimedia? In the past, methods of handling voice, data, message, and picture were entirely different and independent. In the multimedia, all the data are once digitalized and Manipulated in a unified way.
Today, in 2018, this kind of explanation may not be required, but it was different in 1990s.


Backgrounds for
Market Convergence
Technology Advancements
Digitalization
Market Requirements
Infrastructures
De-regulations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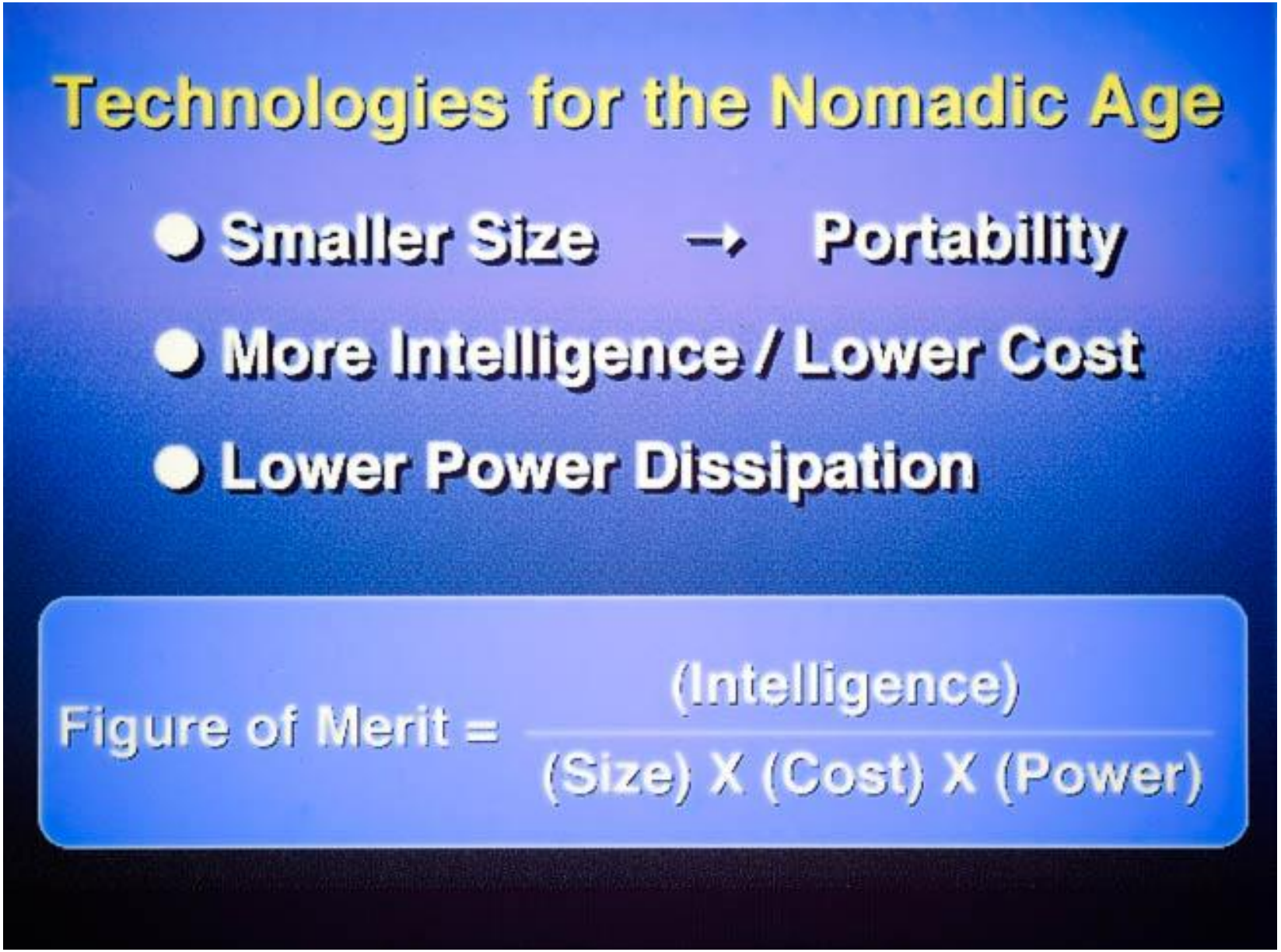
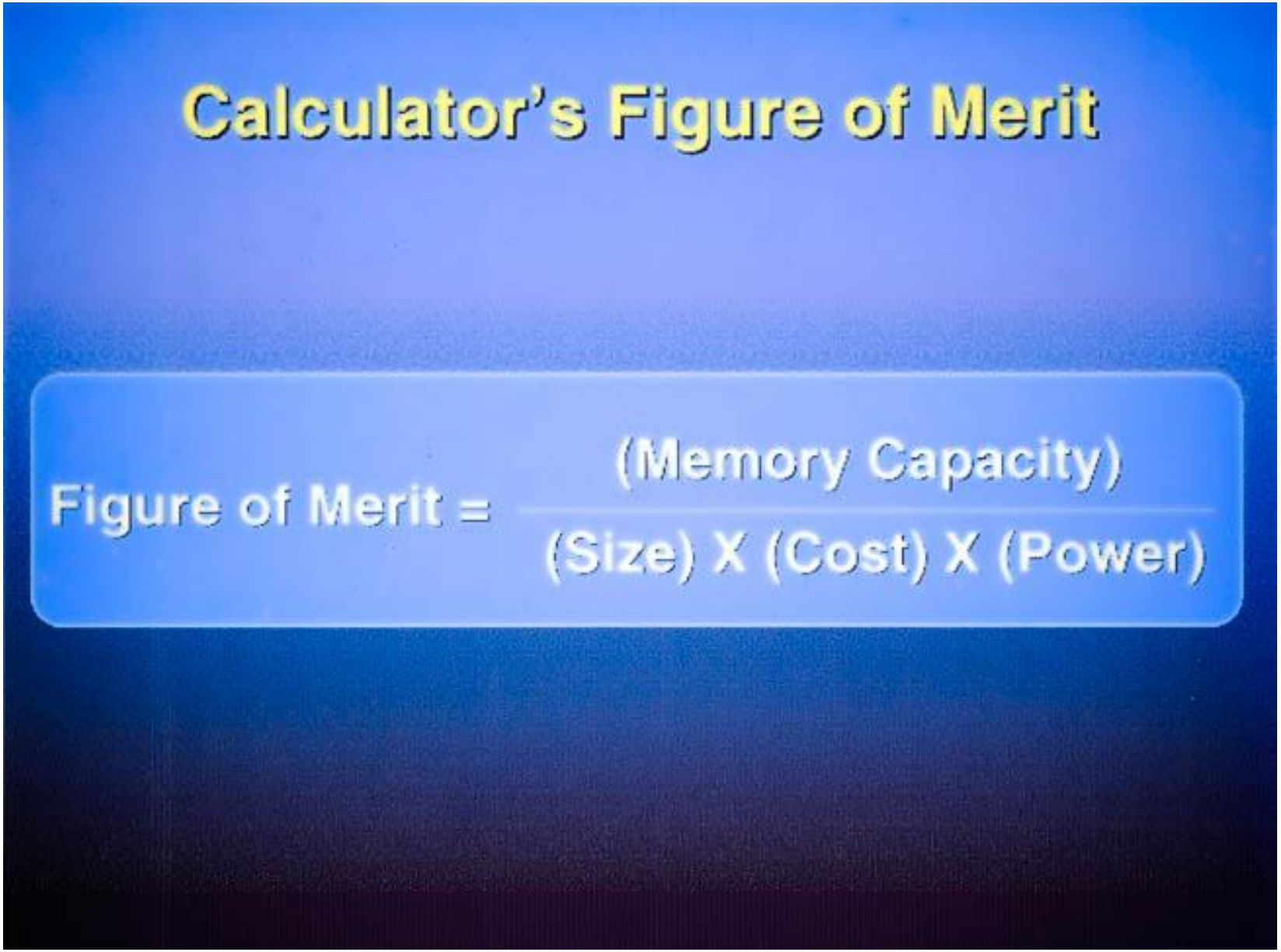
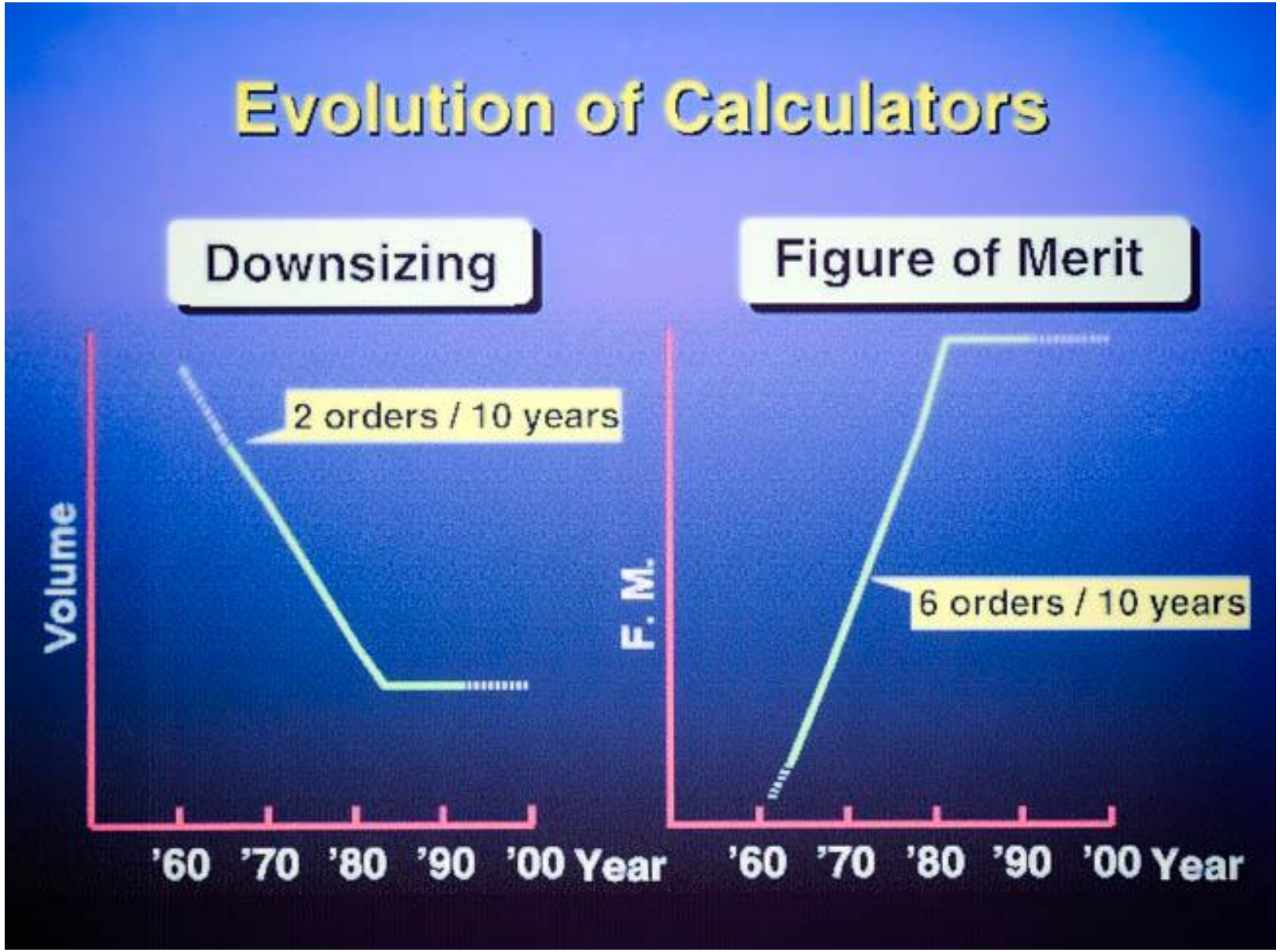


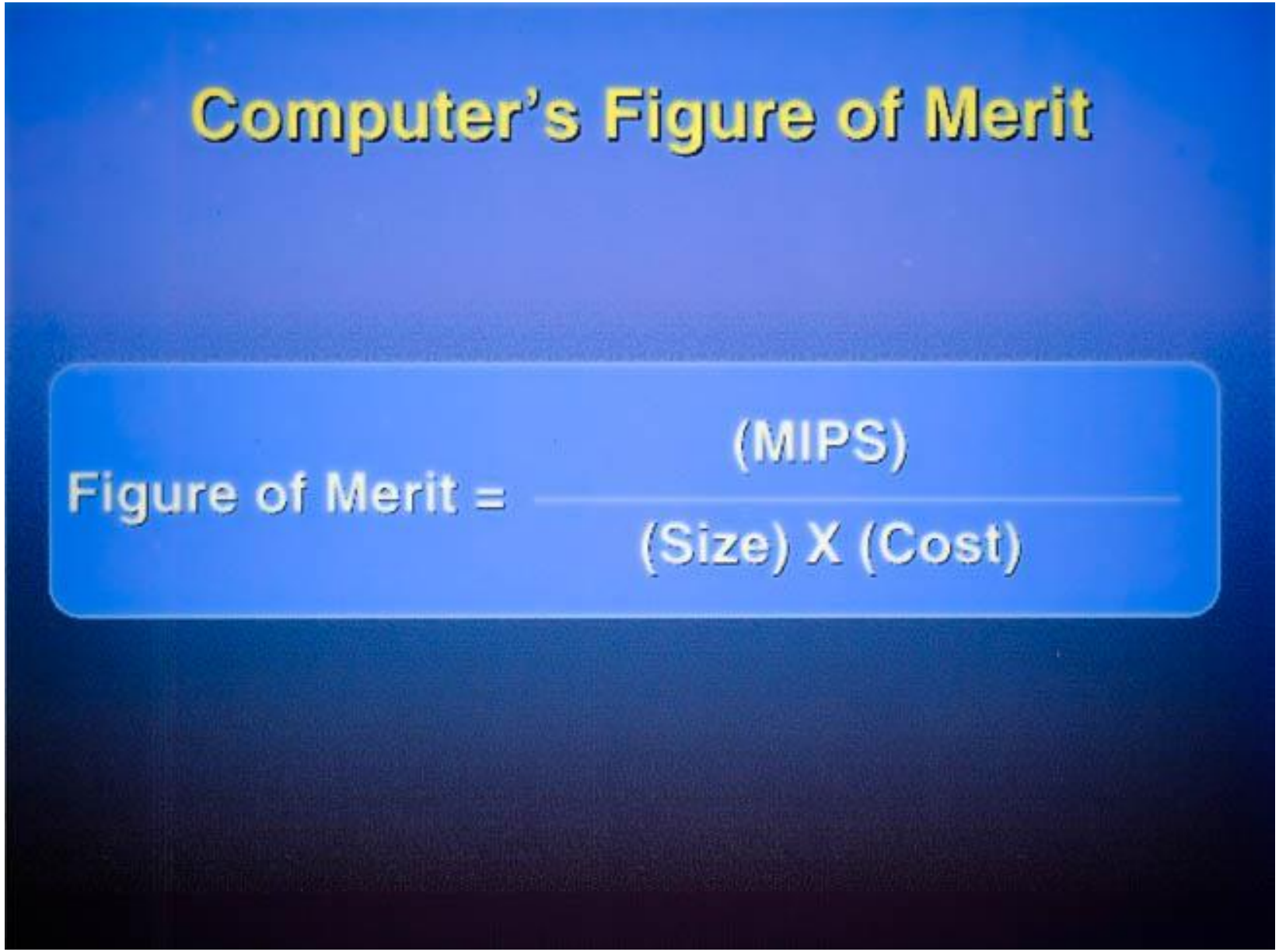
Four important factors in the Nomadic Age are “portability”, “performance / functionality”, “low cost”, and “low power”. Combining these four factors, “Figure of Merit” for electronic equipment is defined as shown in the equation.
This is my proposal for quantitatively defining the overall merit of electronic equipment.



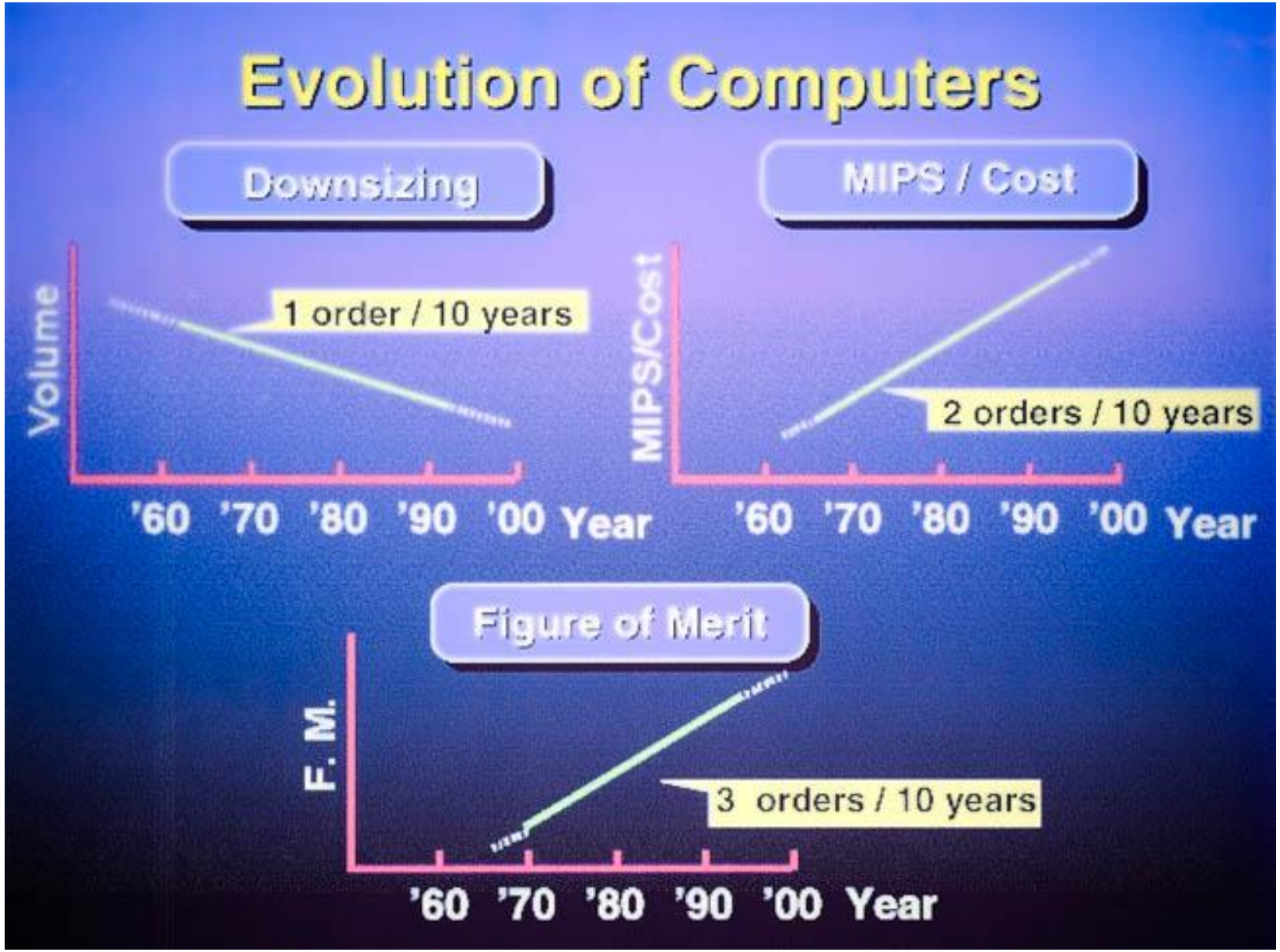
Let's take the case of Figure of Merit for calculator as an example.
"Intelligence" factor in the equation is defined as memory capacity, since there is not so much difference in functionality and performance.



The figure at left hand side shows the trend of volume which decreased by 2 orders in 10 years. The figure at right hand side shows the trend of Figure of Merit which increased by 6 orders in 10 years. It is to be noted that the progress of calculator stopped in 1980s. It is due to the fact that the size has become as small as a credit card, and no needs were there for smaller size.



In the case of computer, MIPS value is chosen as "intelligence" factor in the equation. The power factor is not included in this equation because it is not as important as other factors. However, it may be needed in the case of power sensitive system.



Size reduction was made by one order in 10 years, MIPS/Cost increased by 2 orders in 10 years, and Figure of Merit increased by 3 orders in 10 years.
It should be noted that “Figure of Merit” provides a macroscopic way to measure the progress of electronic equipment.

Principles of the evolution theory can be summarized by two phrases: “Struggling for Existence” and “Survival of the Fittest”.
Based on the above theory, it can be said that the success in business will depend on how to adapt to the Nomadic environment.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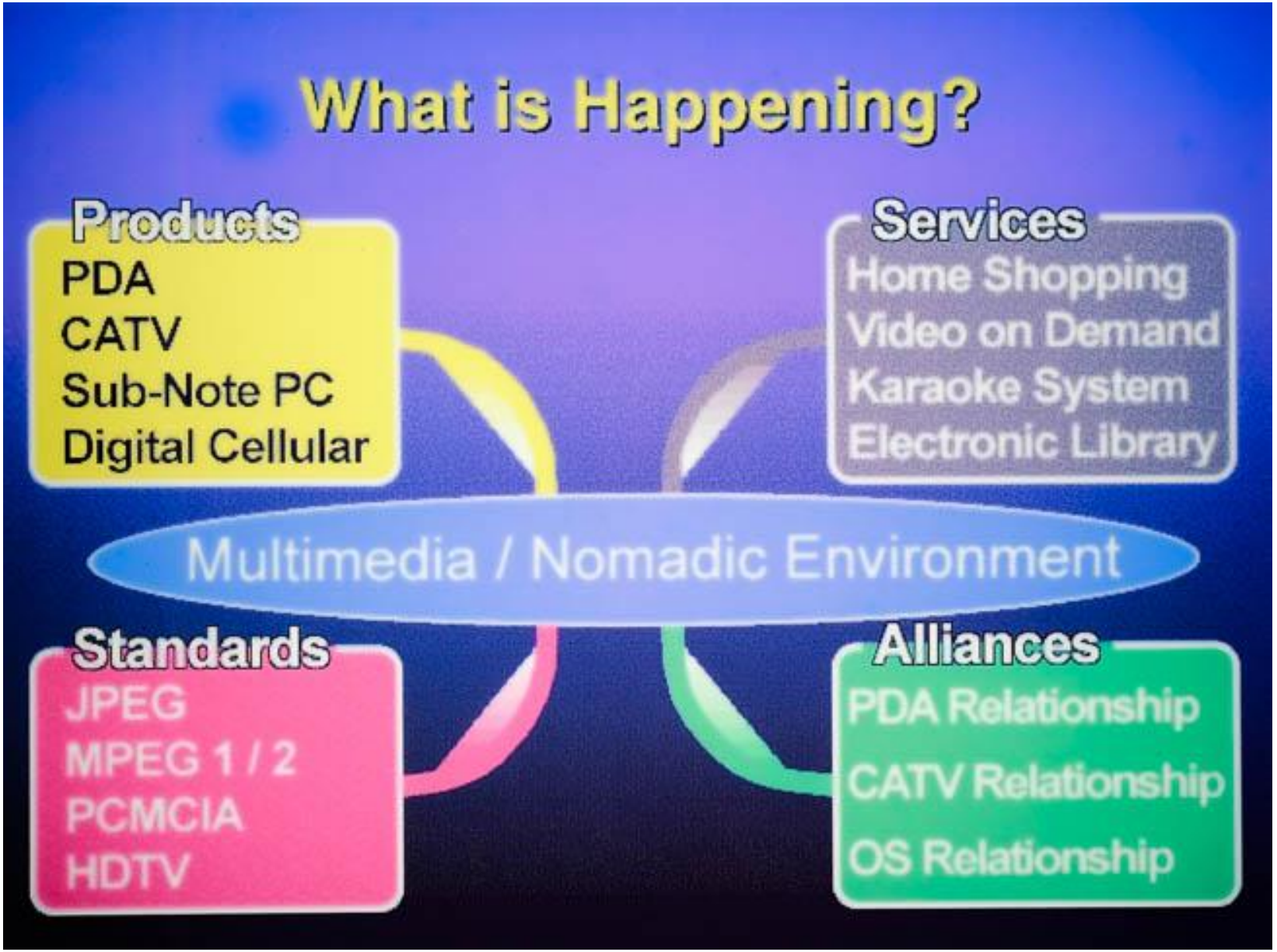
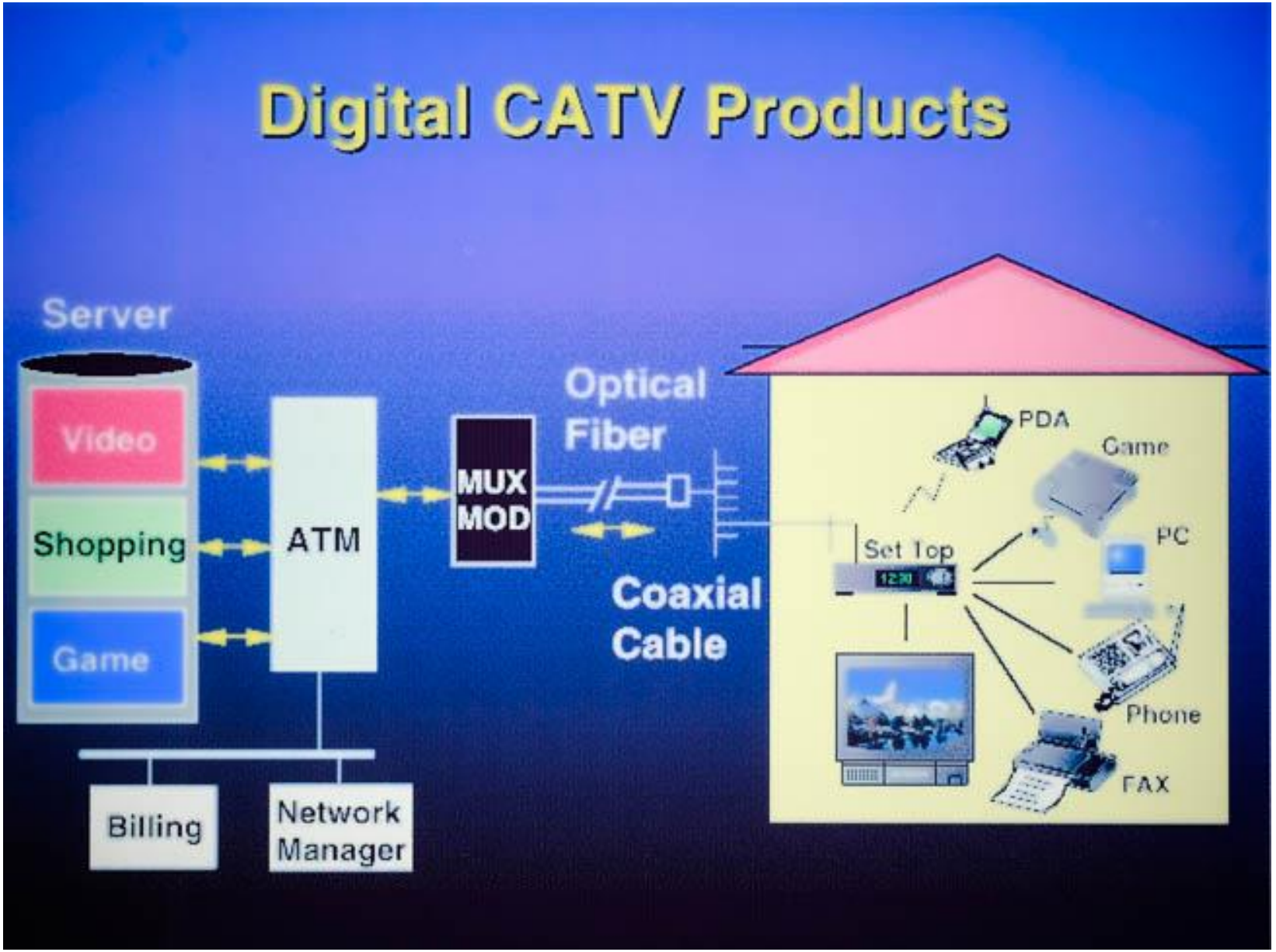
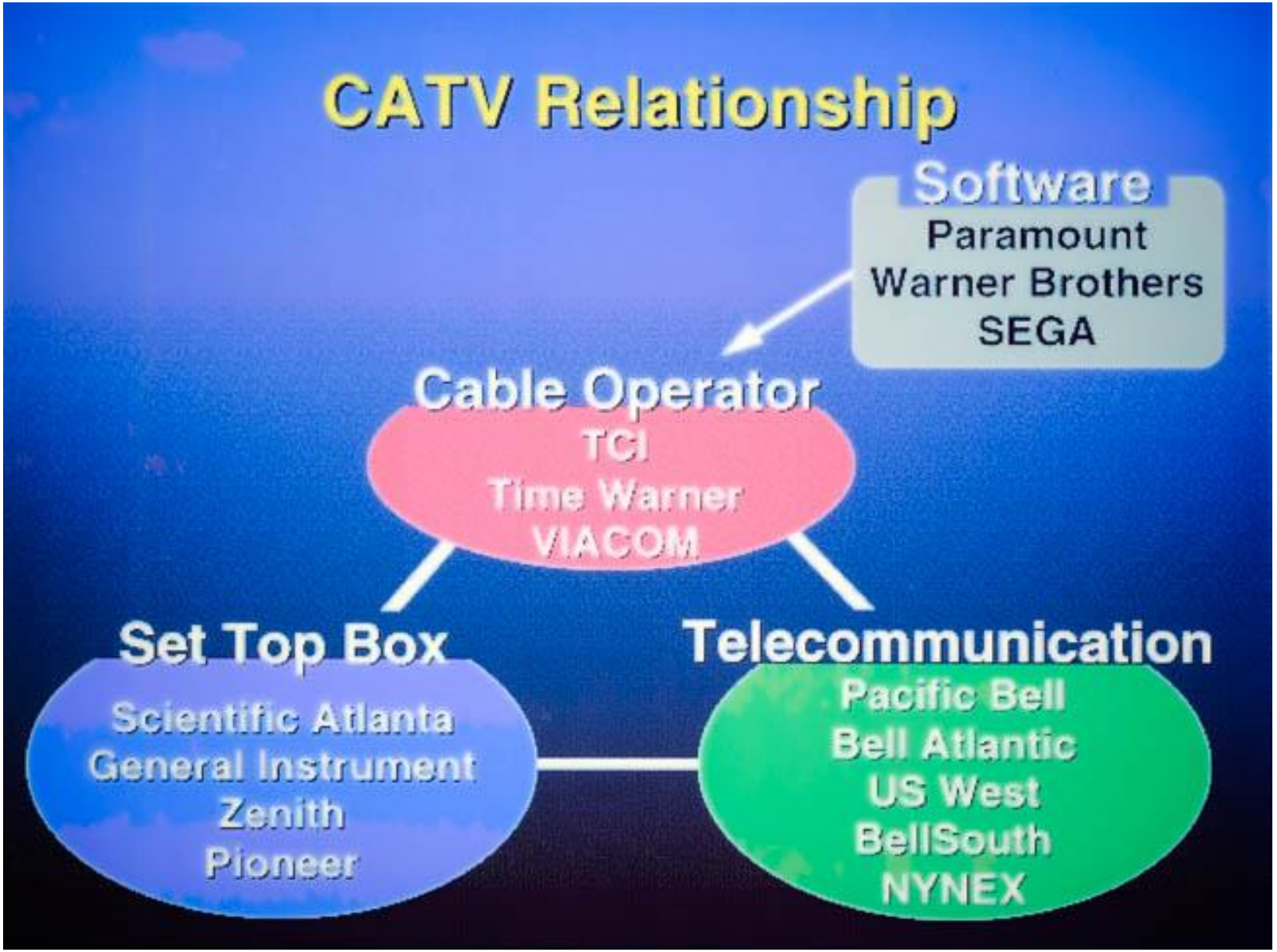


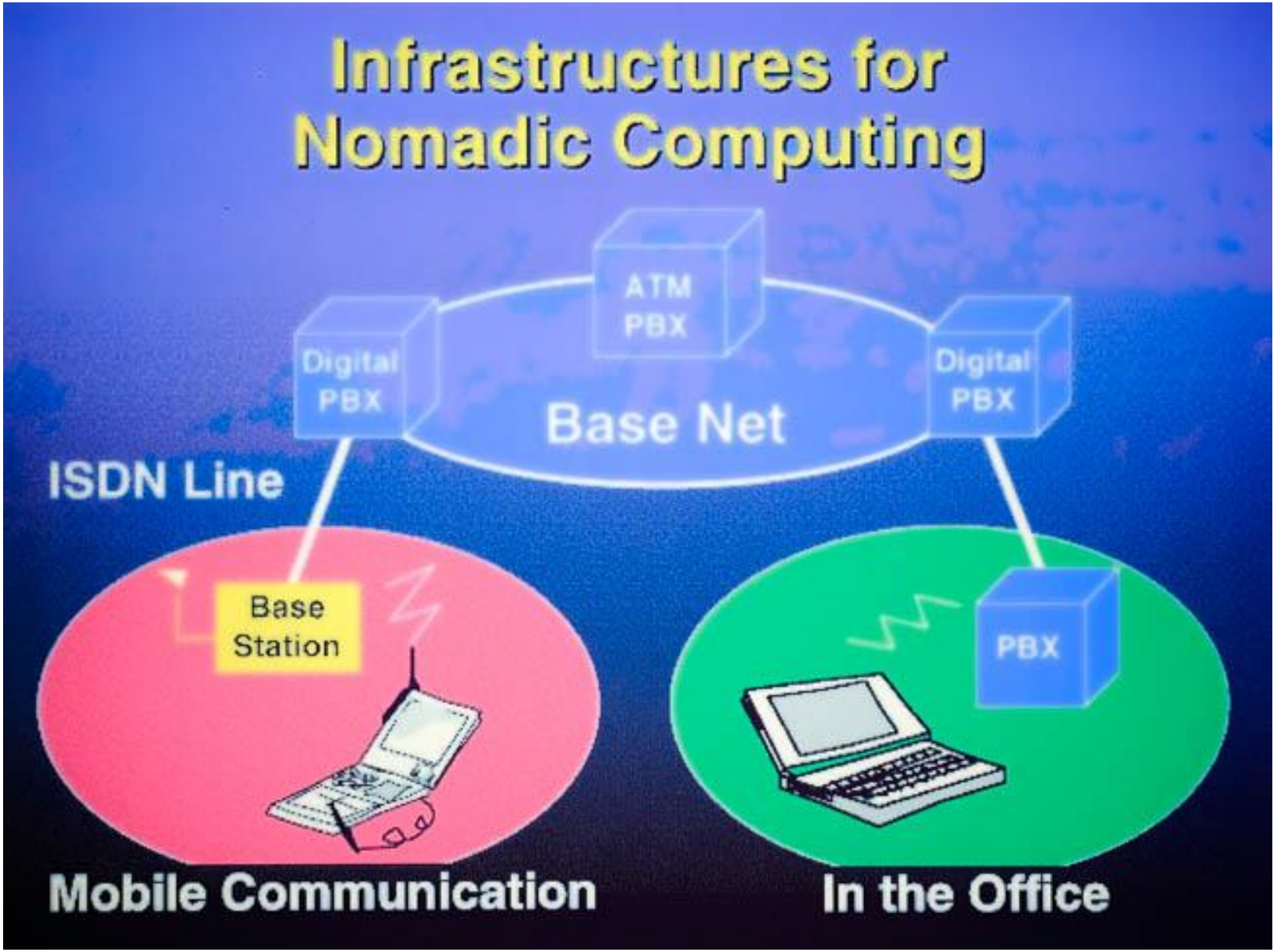
New things and activities are shown which are happening in the multimedia / Nomadic Environment : new products, new standards, new services, and new alliances.



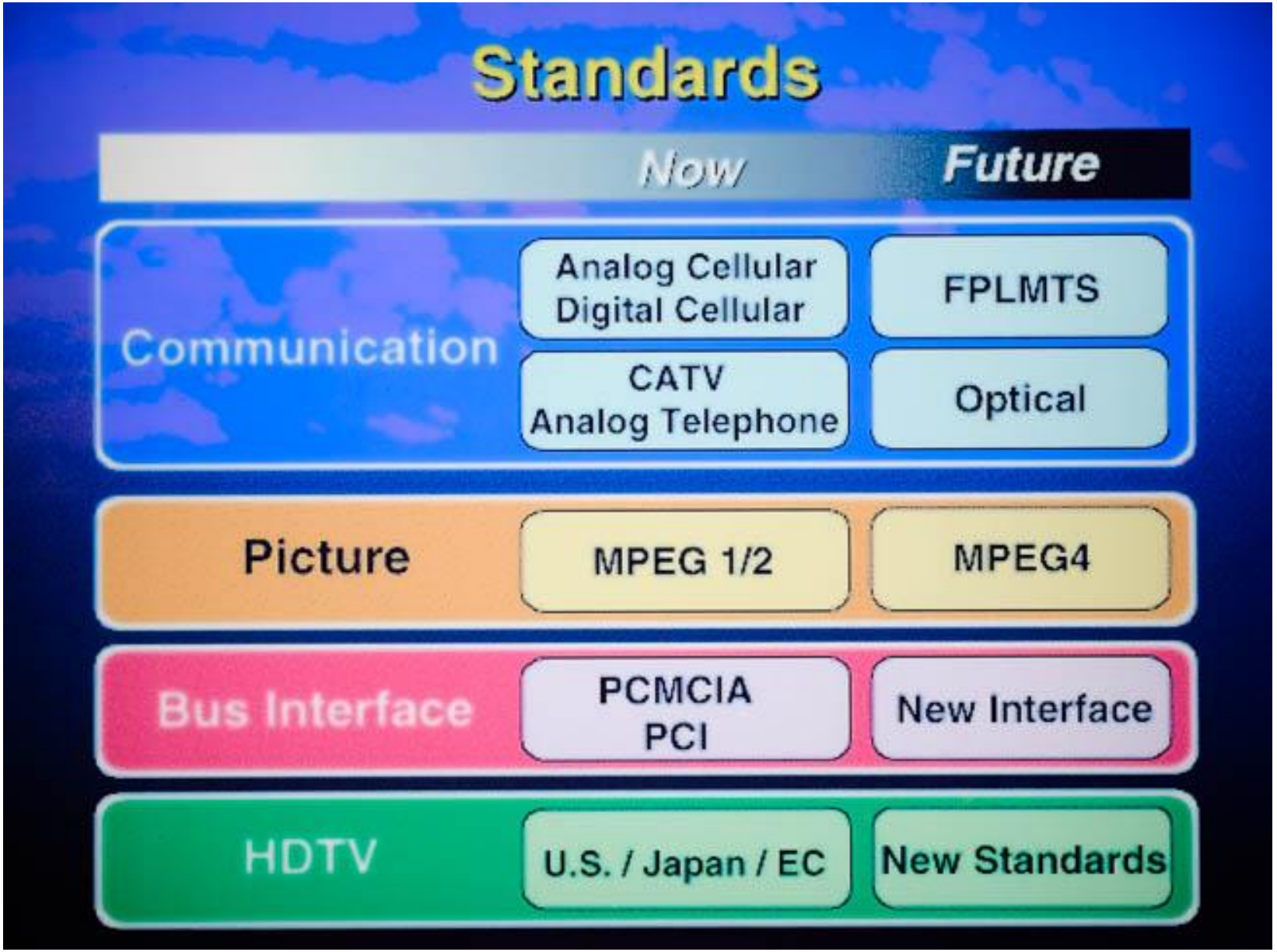
The figure shows new services in the case of digital CATV products. Contents such as video, shopping, and game are stored in the server, and are distributed to set-top-box at home through the cable. End users can access to the contents through TV, PC, PDA, FAX, and/or telephone.



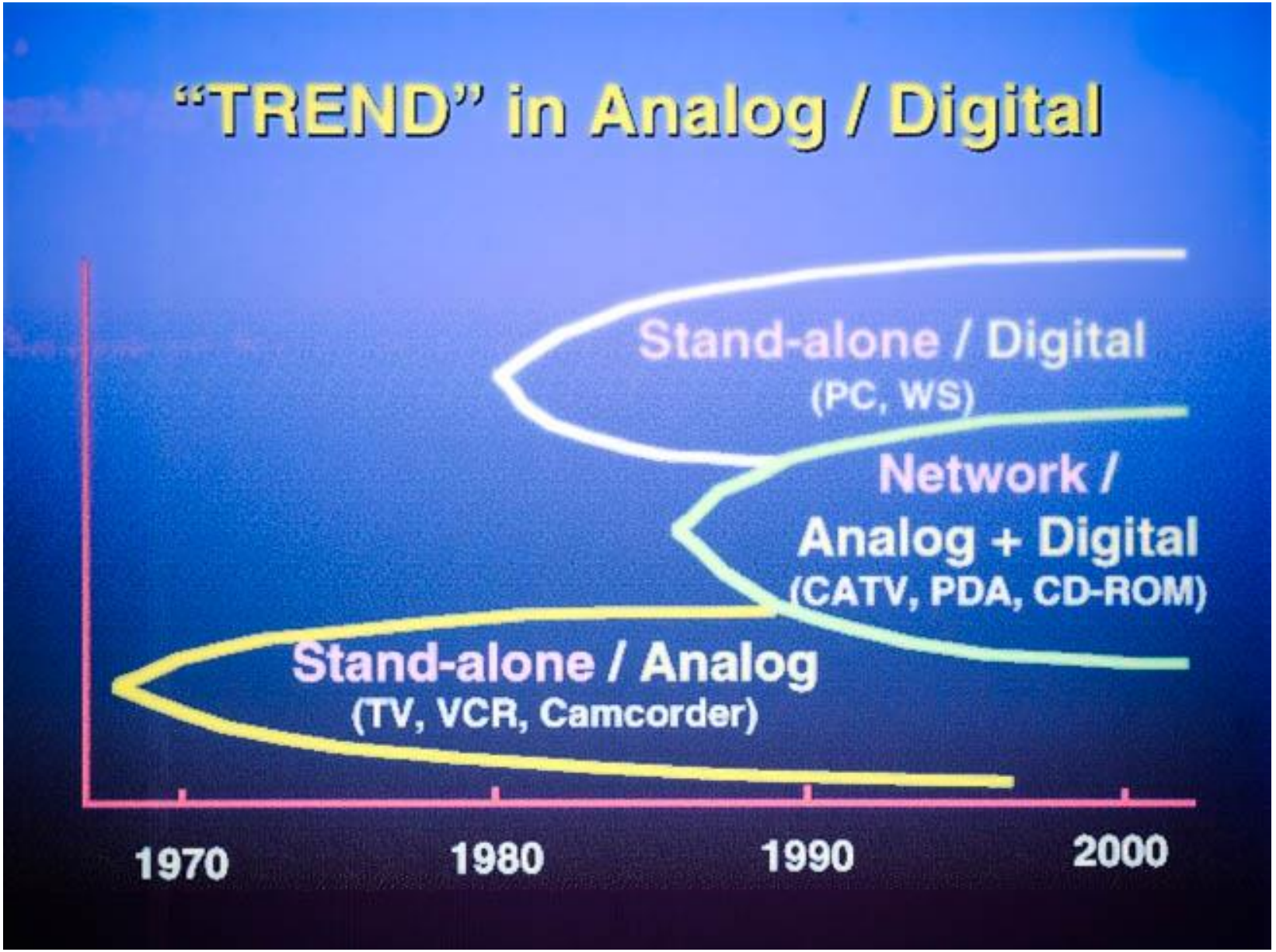
This figure shows players related to CATV. Cable operators (TCI, Time Warner, and VIACOM) are in the central position surrounded by Set Top Box suppliers (Scientific Atlanta, Zenith, and Pioneer, etc.), and Telecommunication Companies (Pacific Bell, Bell Atlantic, NYNEX, and US West, etc.). The contents are supplied by Paramount, Warner Brothers, and SEGA.



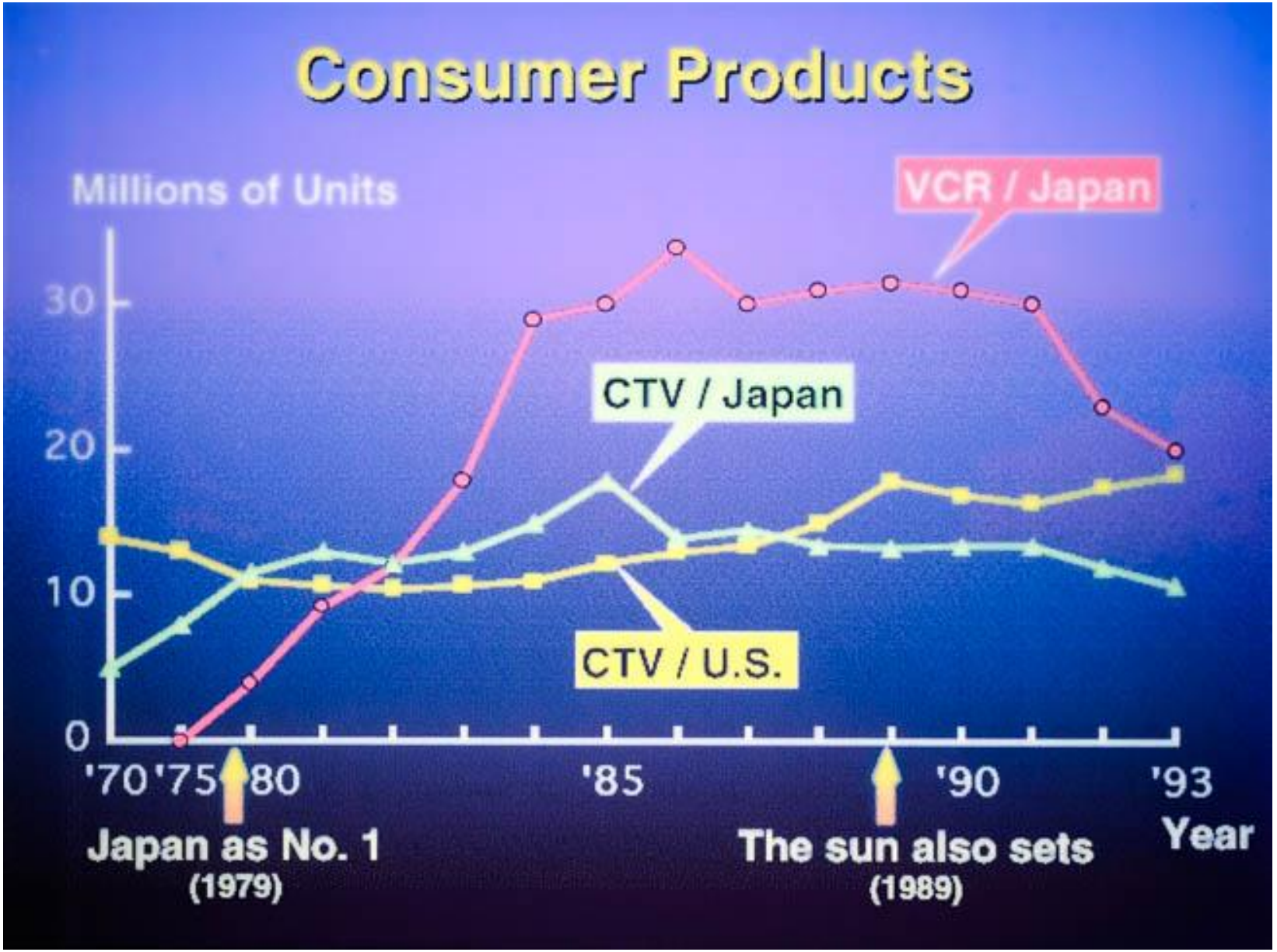
This figure shows the infrastructure for nomadic computing. Base net is connected to mobile communication tools through ISDN line and to PC and other equipment in the office through digital PBX. In the Nomadic Age, highly sophisticated communication systems are indispensable.



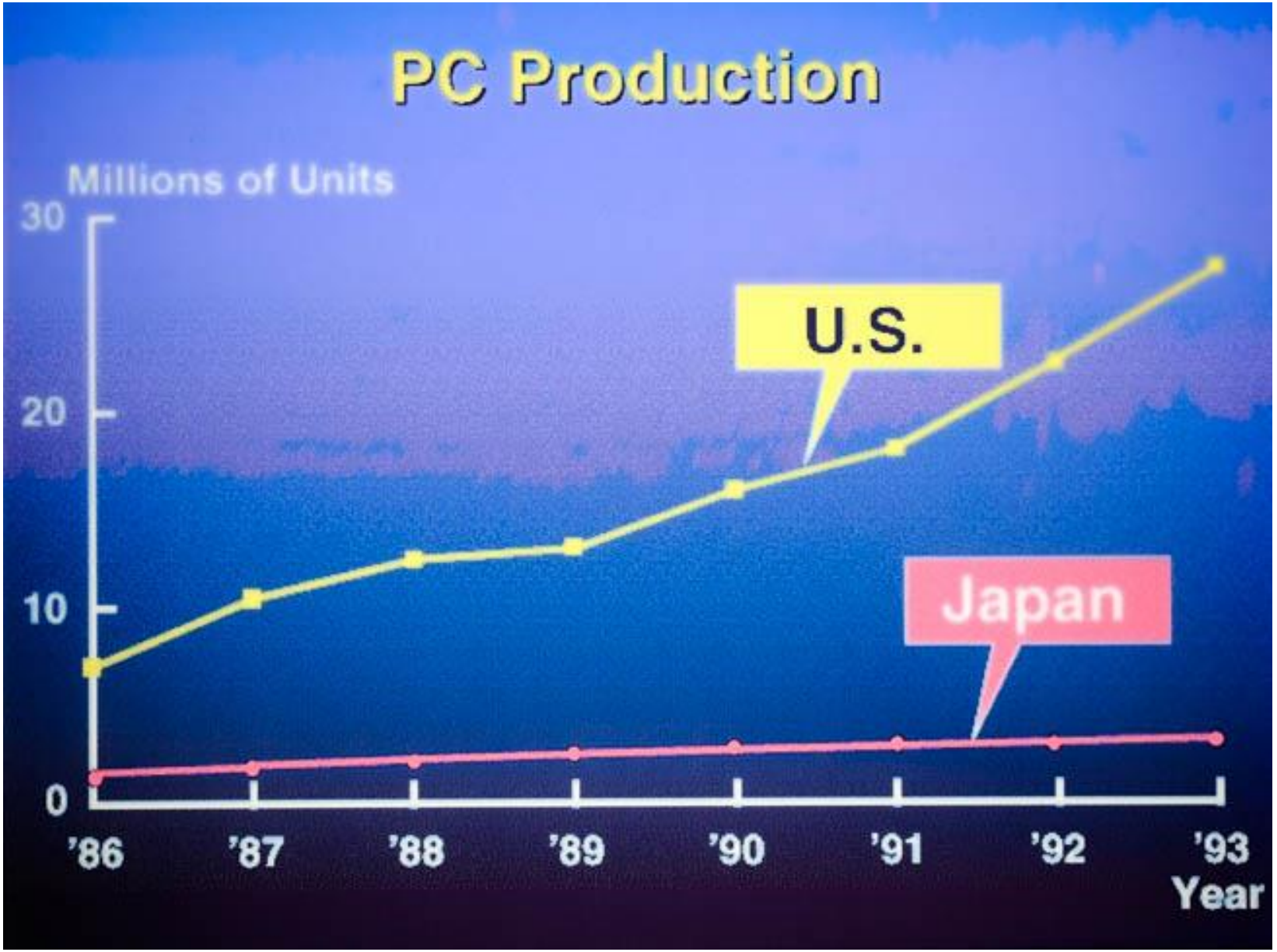
For the nomadic style to widely spread, it is very important to establish global standards in various fields; wireless and wired communications, pictures, Bus Interfaces, and HDTV. Currently, HDTV standards are all different in US, Japan, and Europe. It is highly desirable to establish global standard in the new generation.



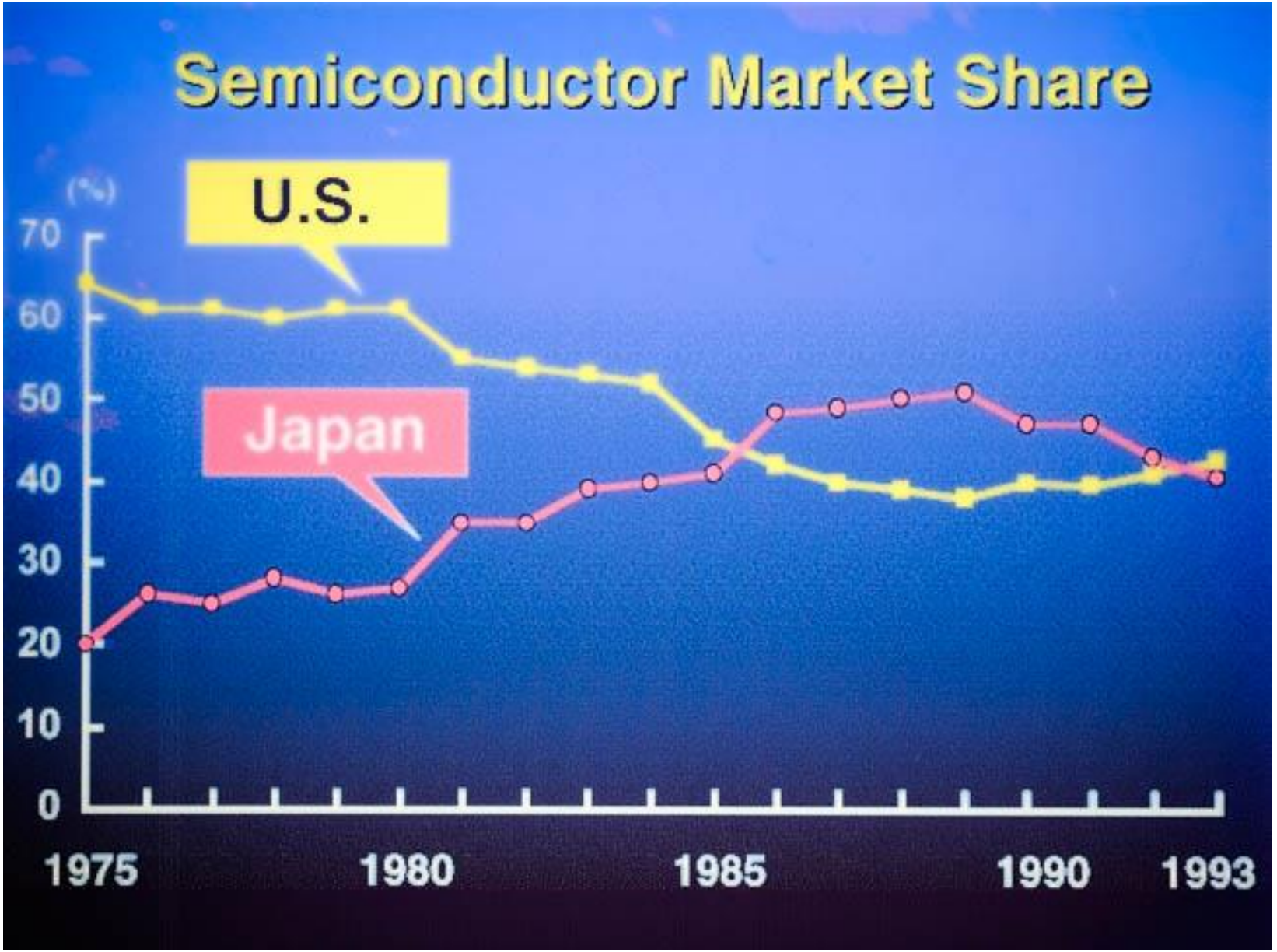
In 1970s, stand-alone analog equipment became popular, such as TV, VCR, and Camcorder. In 1980s, stand alone digital equipment, such as PC and work station, was widely spread. From now on, digital and analog equipment will coexist and will be connected with each other through network.



This figure shows production trend of consumer products. US took the lead in the case of Color TV, but Japan overtook US in early 1980s. However, US overtook Japan again in late 1980s, partly because of trade conflict between the two. In Japan, VCR production took off in around 1975, hit the peak in 1985, and the production was shifted to Asian countries later on.



This figure shows the production of PC in US and Japan. US was far ahead of Japan from the beginning, and the rate of increase was much higher. Although Japan was the leader in the analog era, US became the decisive leader in the digital age.



US had the overwhelming market share of semiconductor in 1970s. Japan became No.1 in 1986 thanks to consumer market and memories for computers. US became No.1 again in 1993 by focusing on logic devices such as microprocessors. The market share of Japan was partly affected by the conclusion of US-Japan Semiconductor Agreement in 1986.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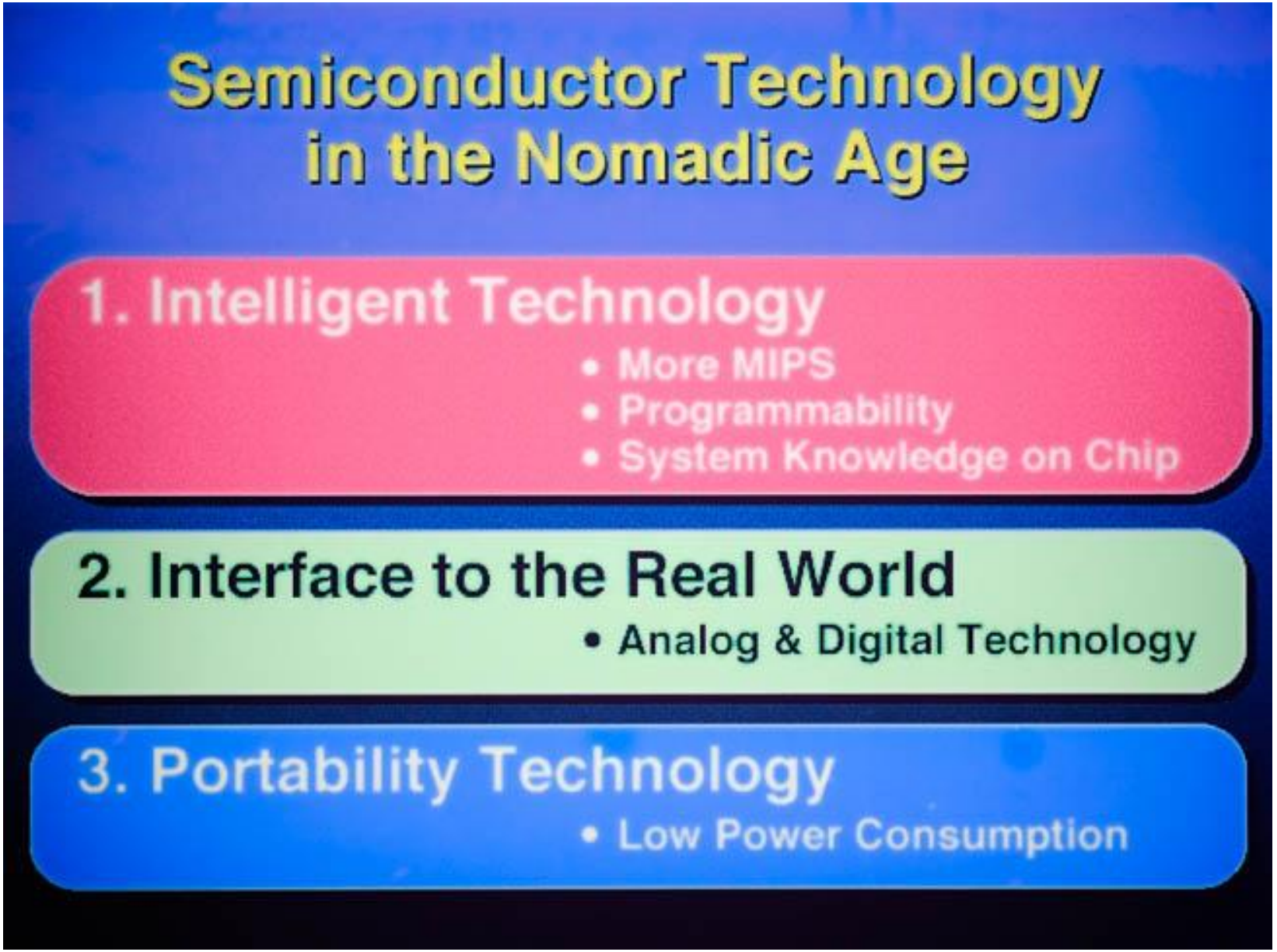
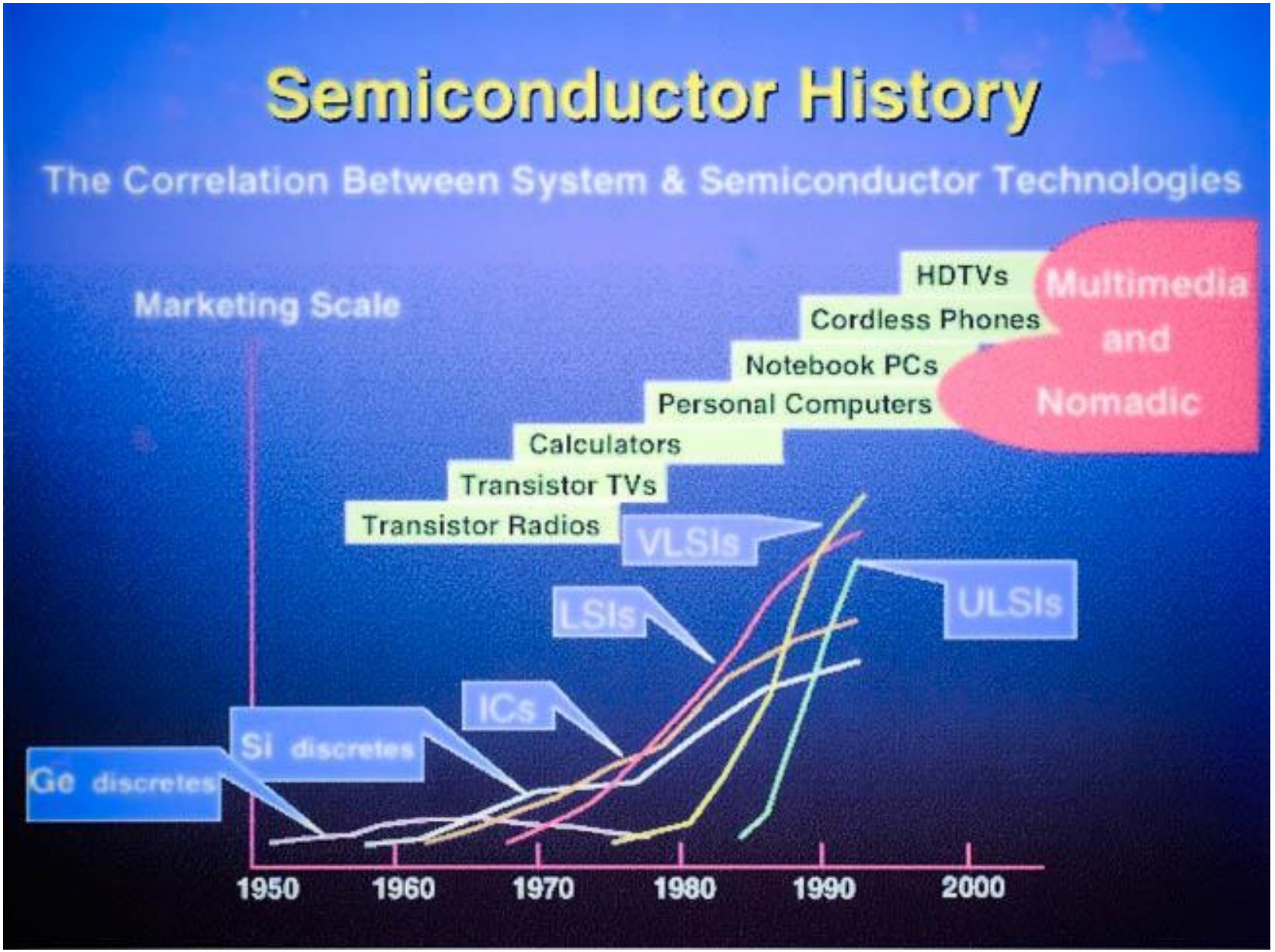
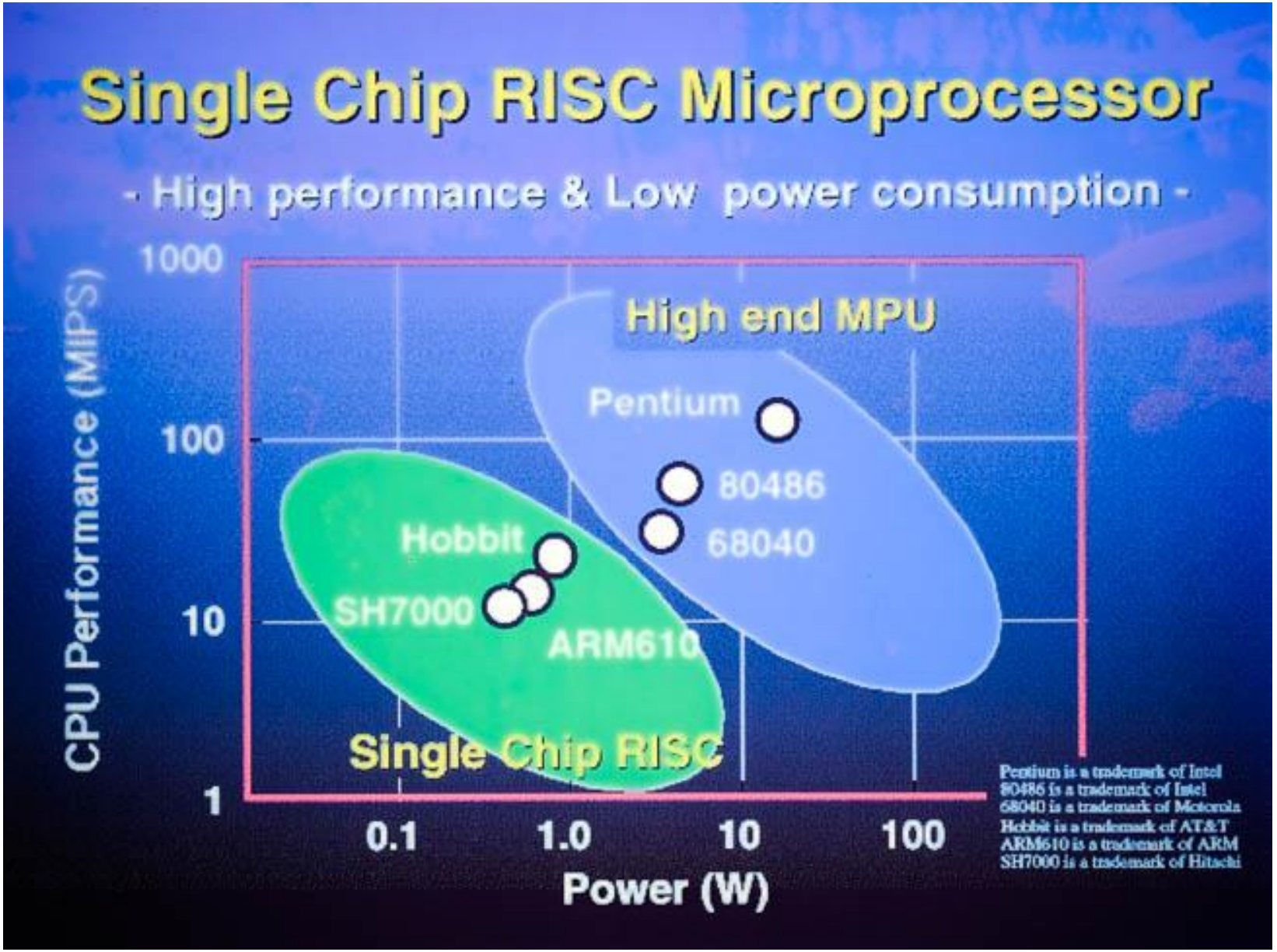


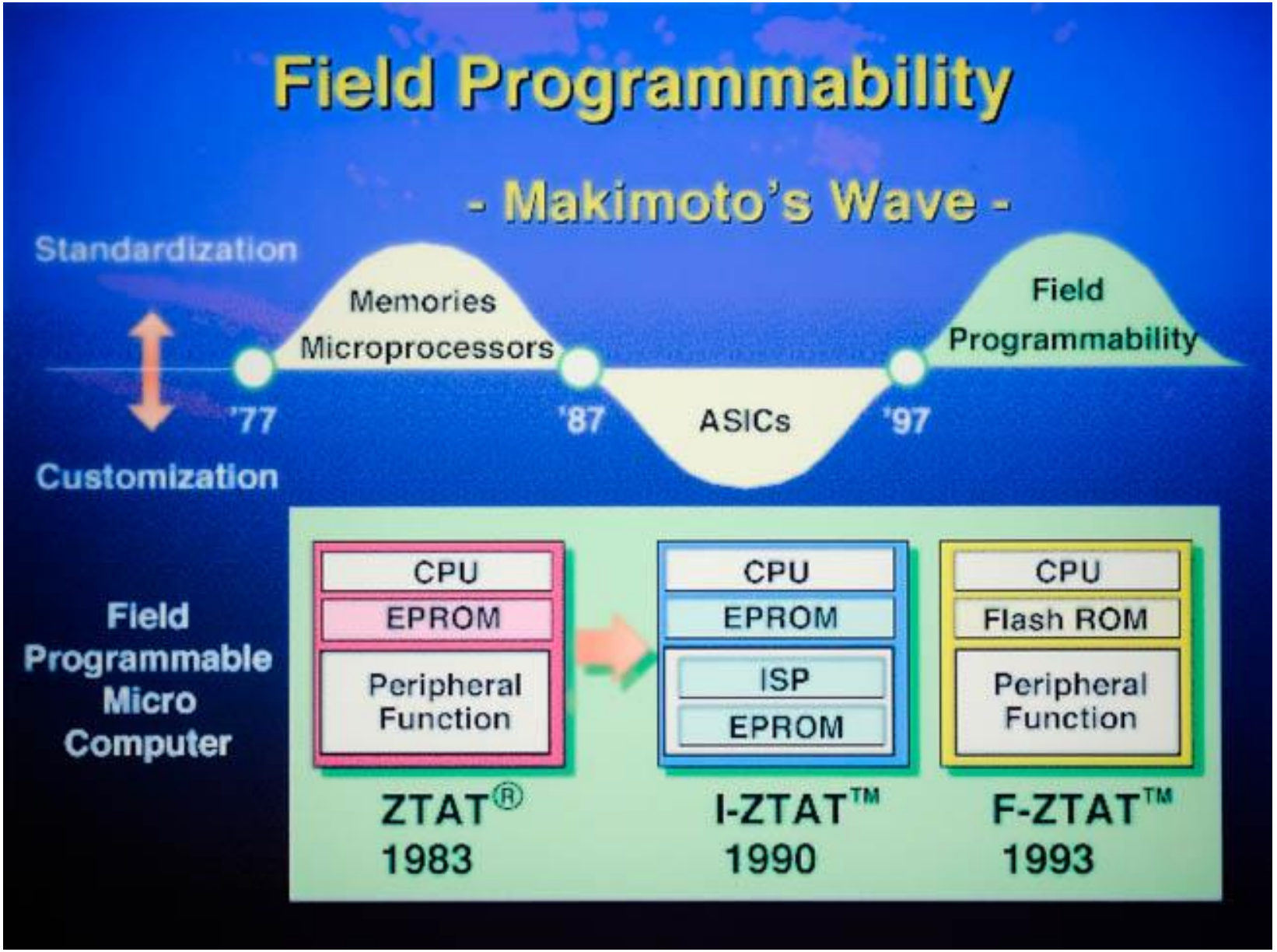
Three essential technologies required in the Nomadic Age are shown here. 1) Technology for intelligent tools, 2) Interface technology to the real world, and 3) Technology for portability of terminal devices, especially the low power technology.



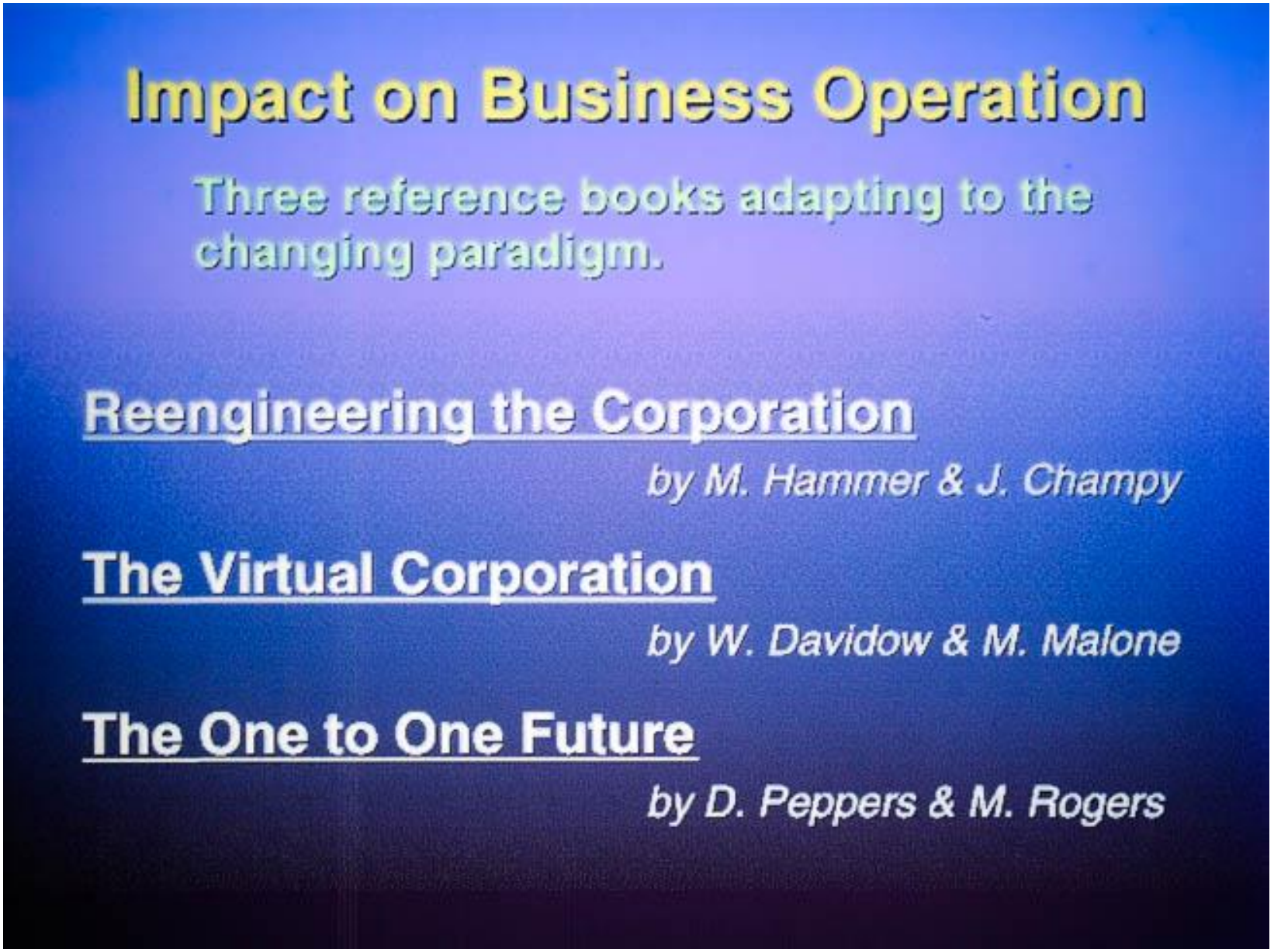
Synergistic progress of semiconductor and electronic equipment is shown here. Portable radios and TVs were realized by transistors; PCs, cordless telephones, and HDTVs were realized thanks to IC/LSI. With the emergence of VLSI, new equipment in the multimedia / Nomadic Age will be realized.



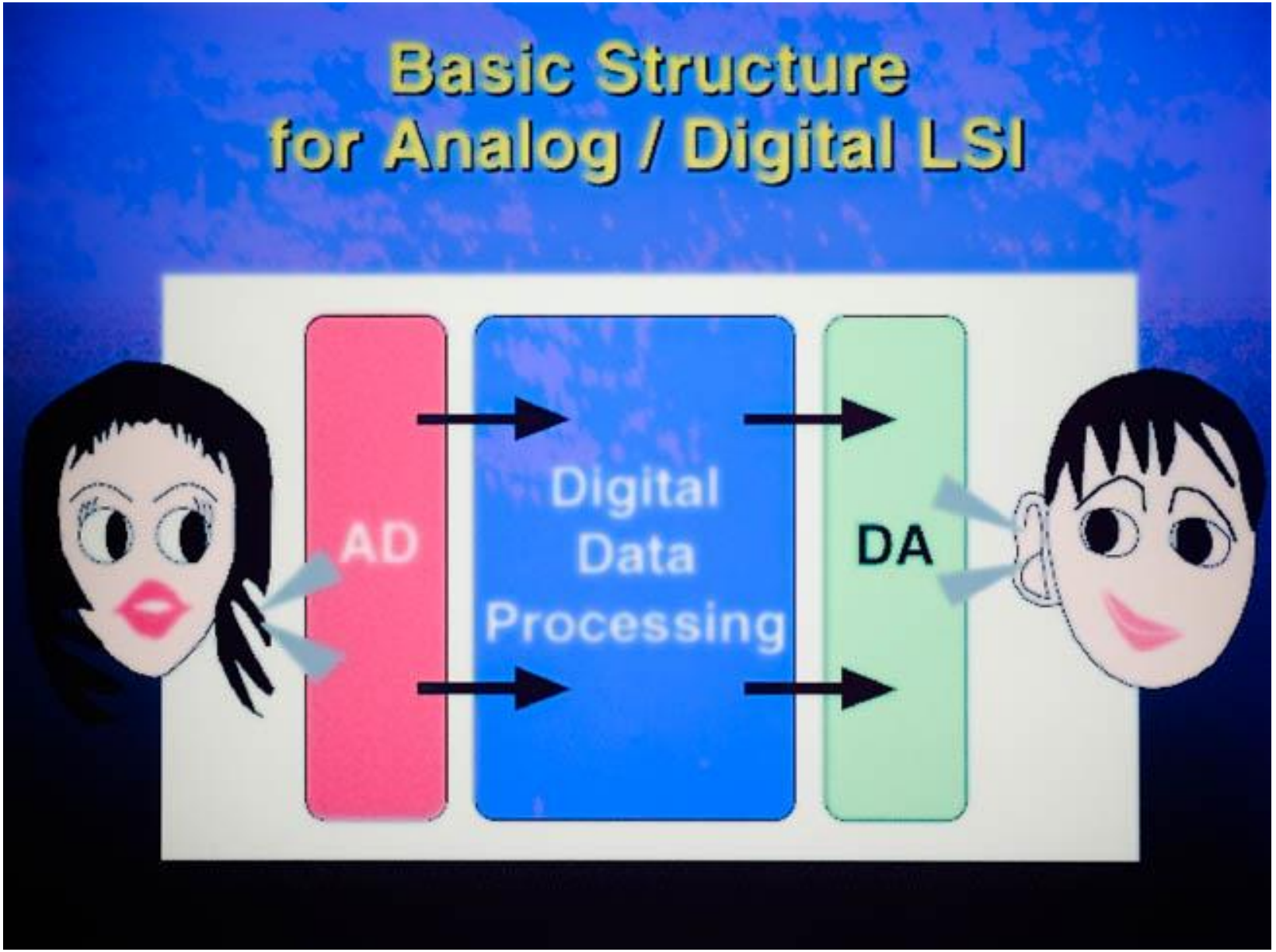
CISC type microprocessor was targeted at higher and higher performance. In the Nomadic Age, however, “high performance and low power” are both needed, and single chip RISC microprocessor is aiming at this goal. SH7000 is an example of new product from Hitachi.



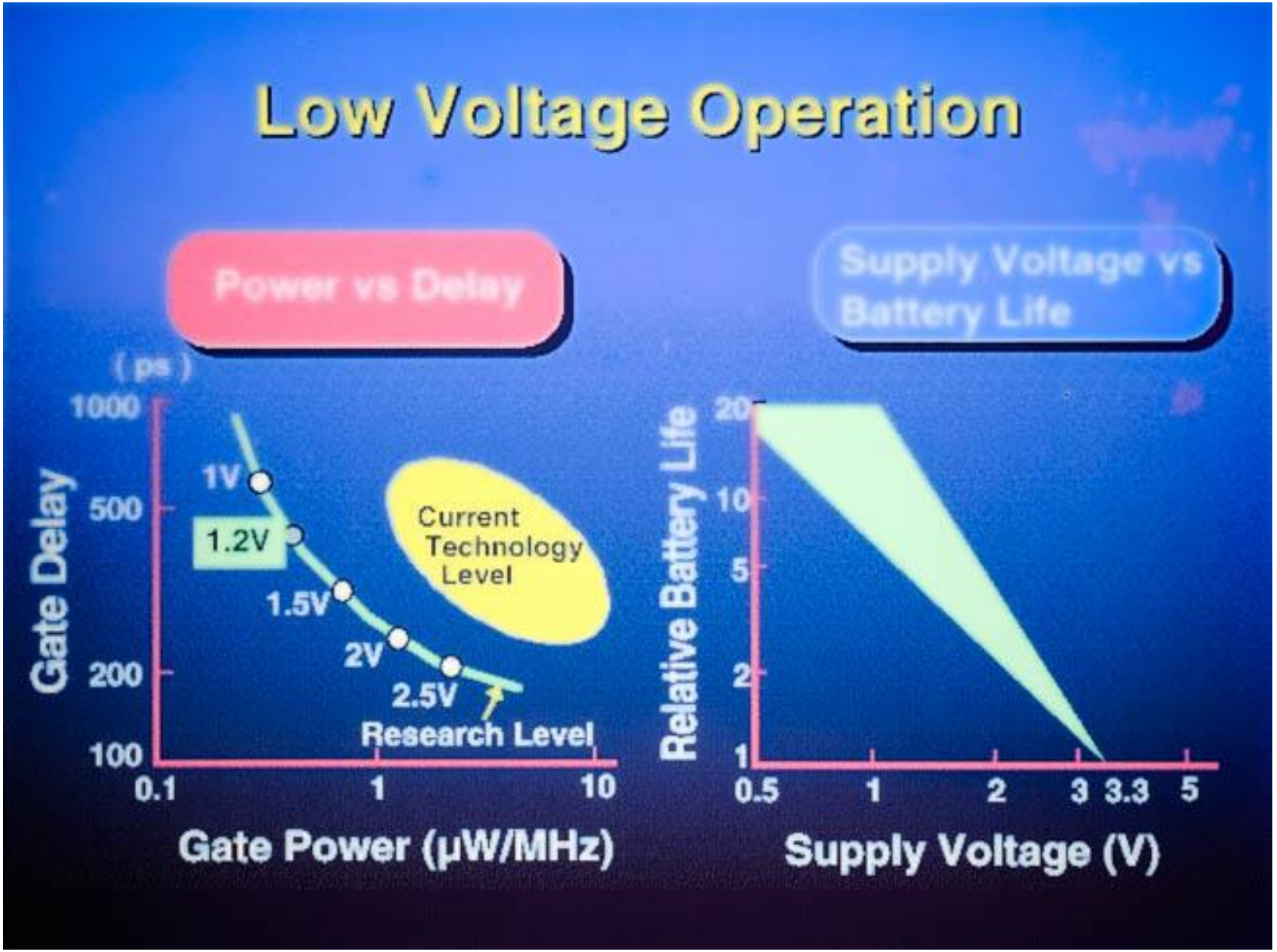
Makimoto's Wave predicts that field-programmable devices will take off in late 1990s. In accordance with this prediction, Hitachi introduced ZTAT MCU in 1983, I-ZTAT MCU in 1990, and F-ZTAT MCU in 1993 which has on-chip flash memory. F-ZTAT MCU will provide great deal of benefits to users, and high growth is expected.



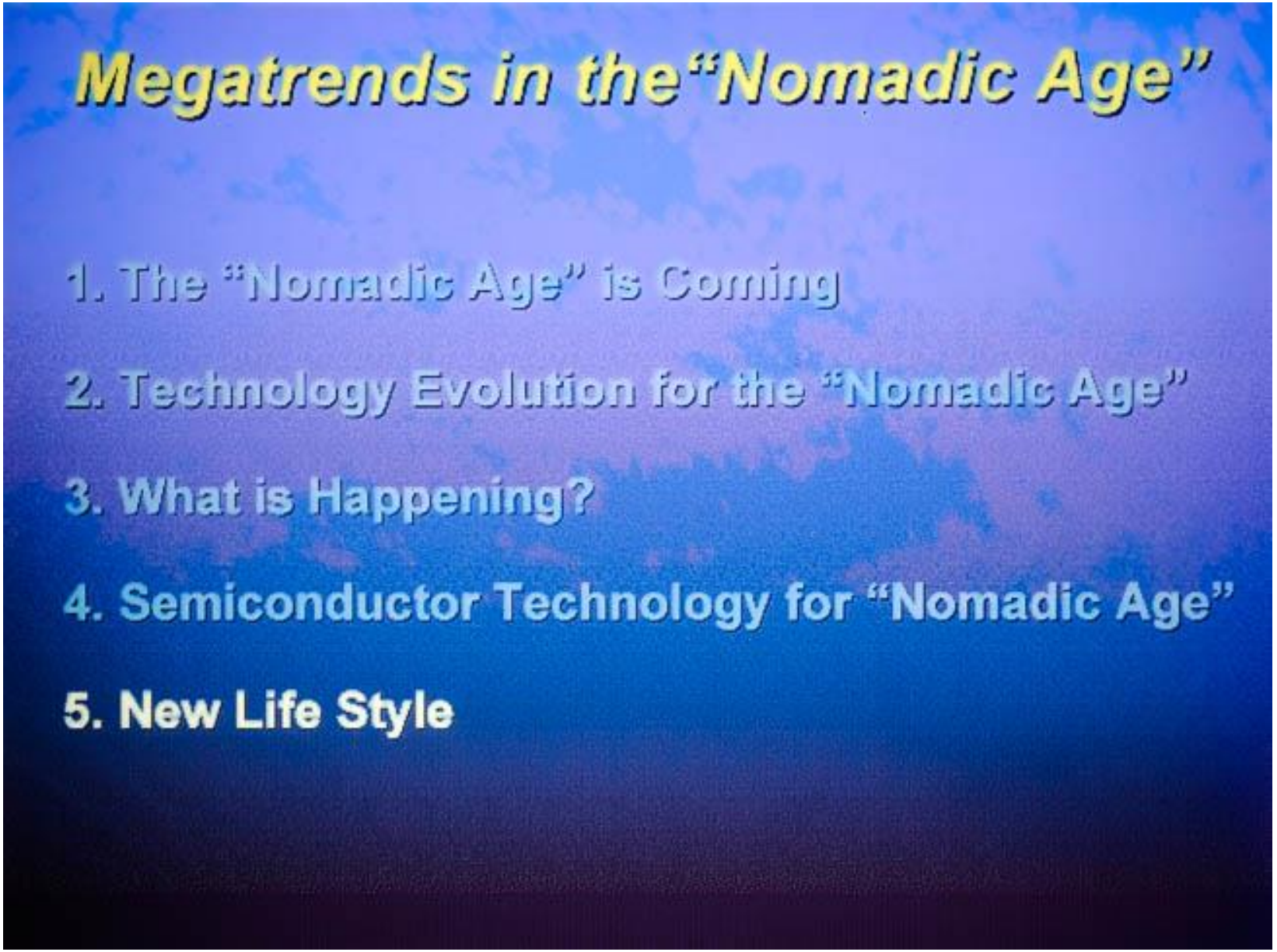
Three references are introduced here which provide excellent guides to the changing paradigm. These books are recommended since now is the time of paradigm change.



Basic structure for analog/digital LSI is shown. As we are in the analog world, analog to digital conversion is done in the beginning, then the digital signal processing follows. At the end, digital to analog conversion is done so that we can recognize the signal.



The figure at right side shows a relationship between supply voltage and battery life; The lower the supply voltage, the longer the battery life. However, gate delay increases as the gate power decreases as shown in the left side figure. Current technology level is shown by the Yellow area. Much progress is expected as shown by the line of research level.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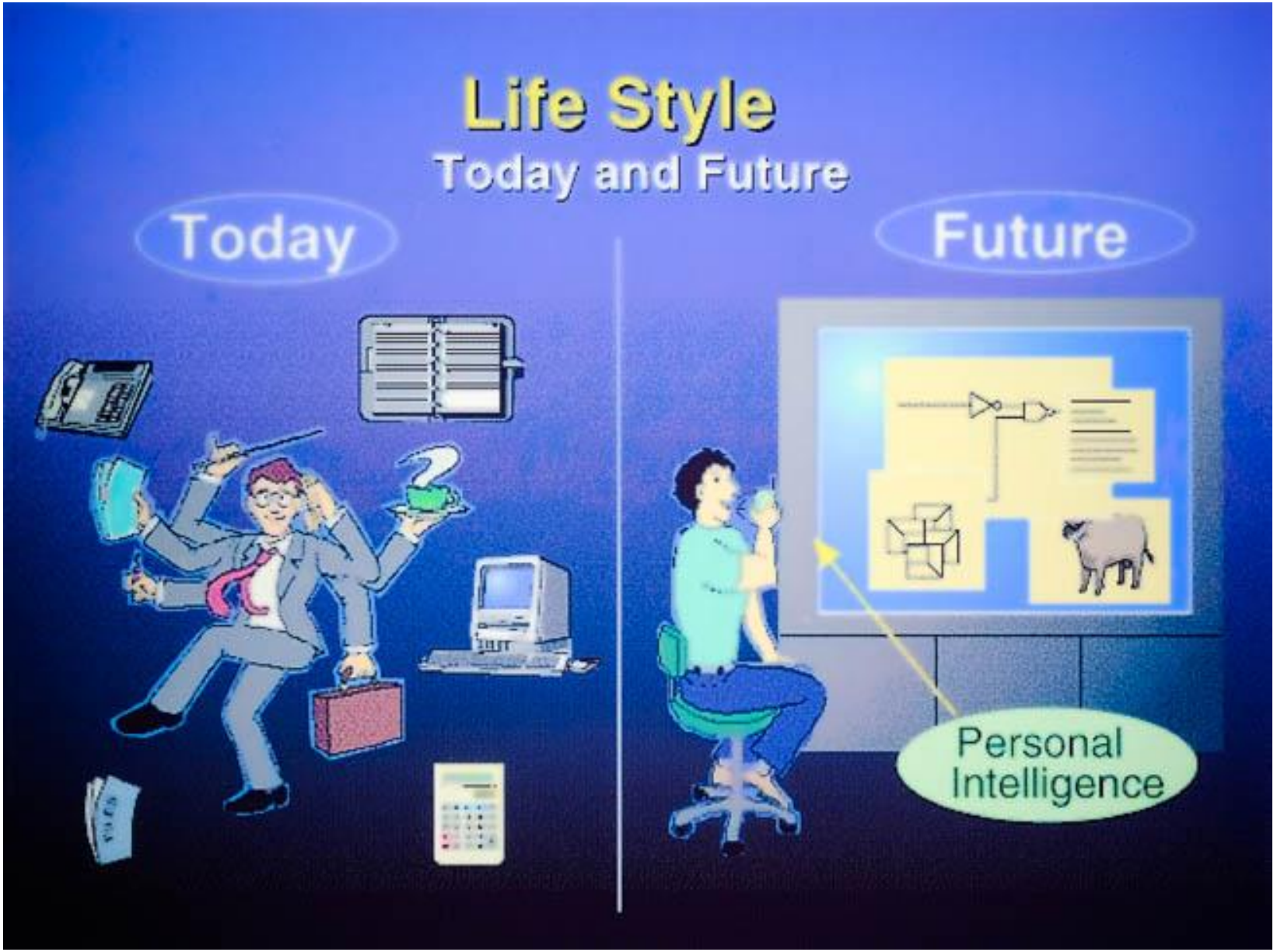
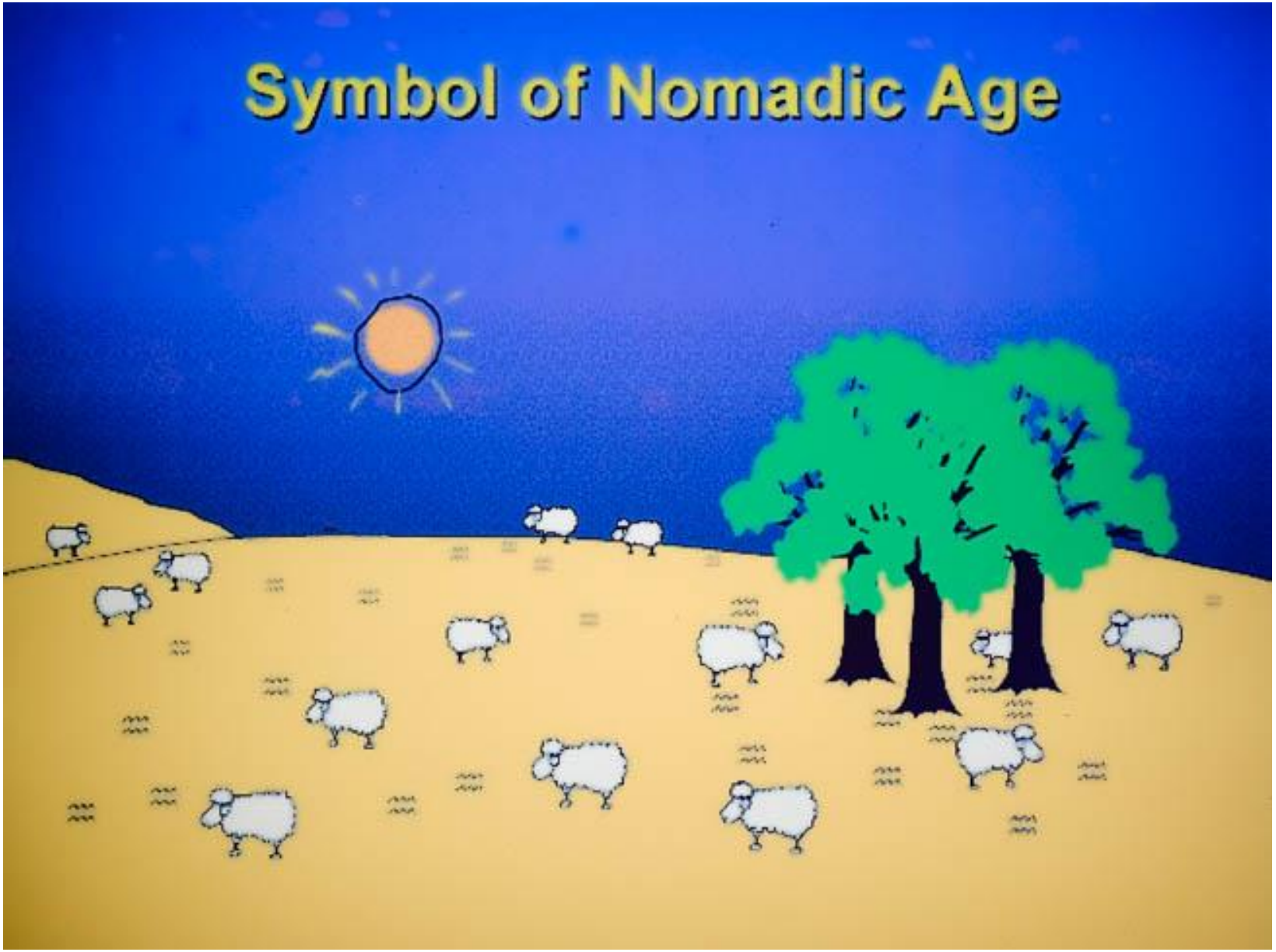
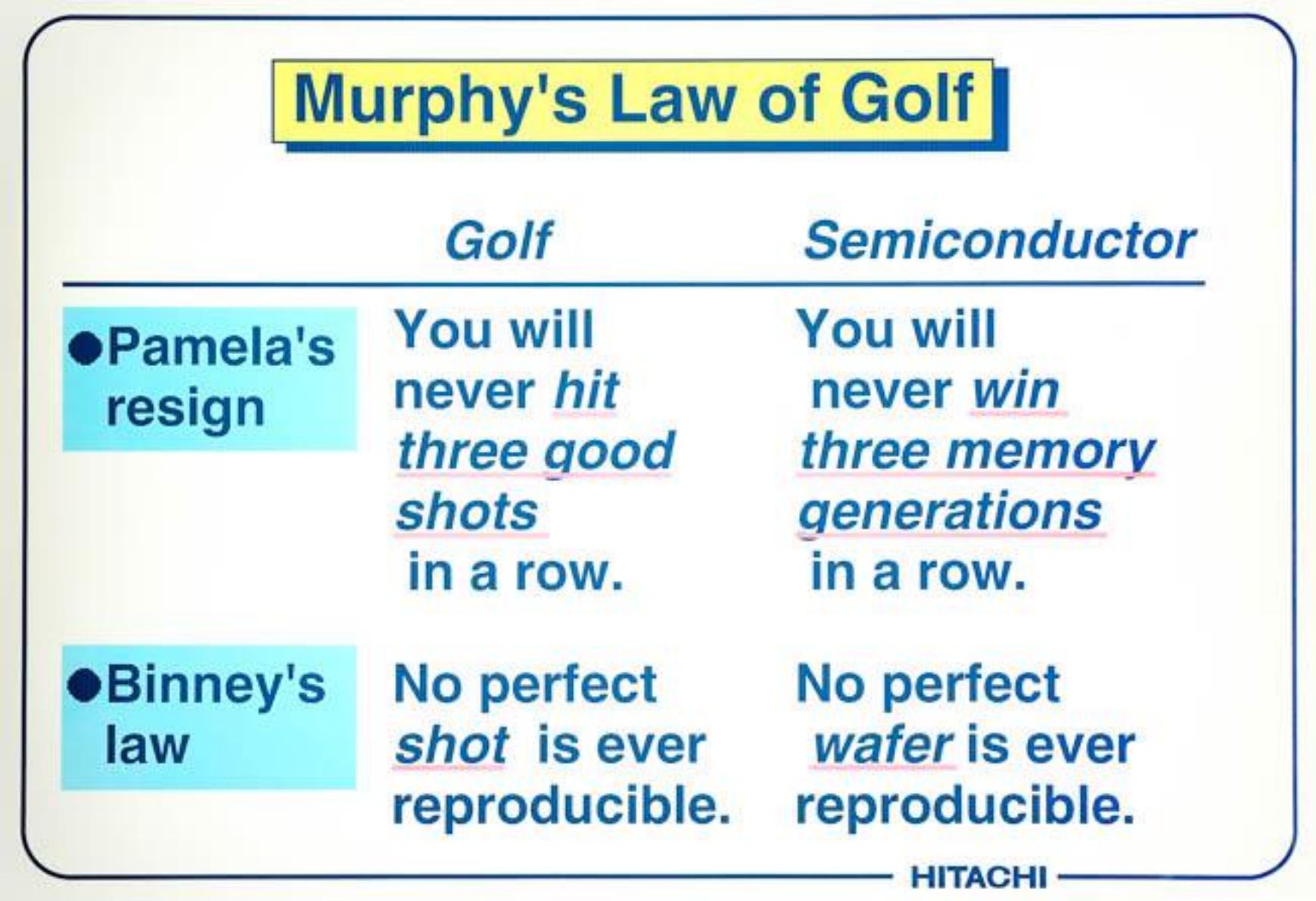


At the time of this speech, people were surrounded by many electronic devices, such as telephone, TV, calculator, camera, and PC. In the future, a personal intelligence terminal will be able to perform most of those functions. If necessary, a large screen will be used for showing contents. As of 2018, a smartphone does these functions as forecasted.



At the time of this speech, people commuted to the center of cities in the midst of congestion. In the Nomadic Age, people will be freed from constraints of time and location; they can work and live wherever they like. This is to conclude my speech.
As of 2018, Nomadic Age is already with us as the word “nomadic life” symbolizes..

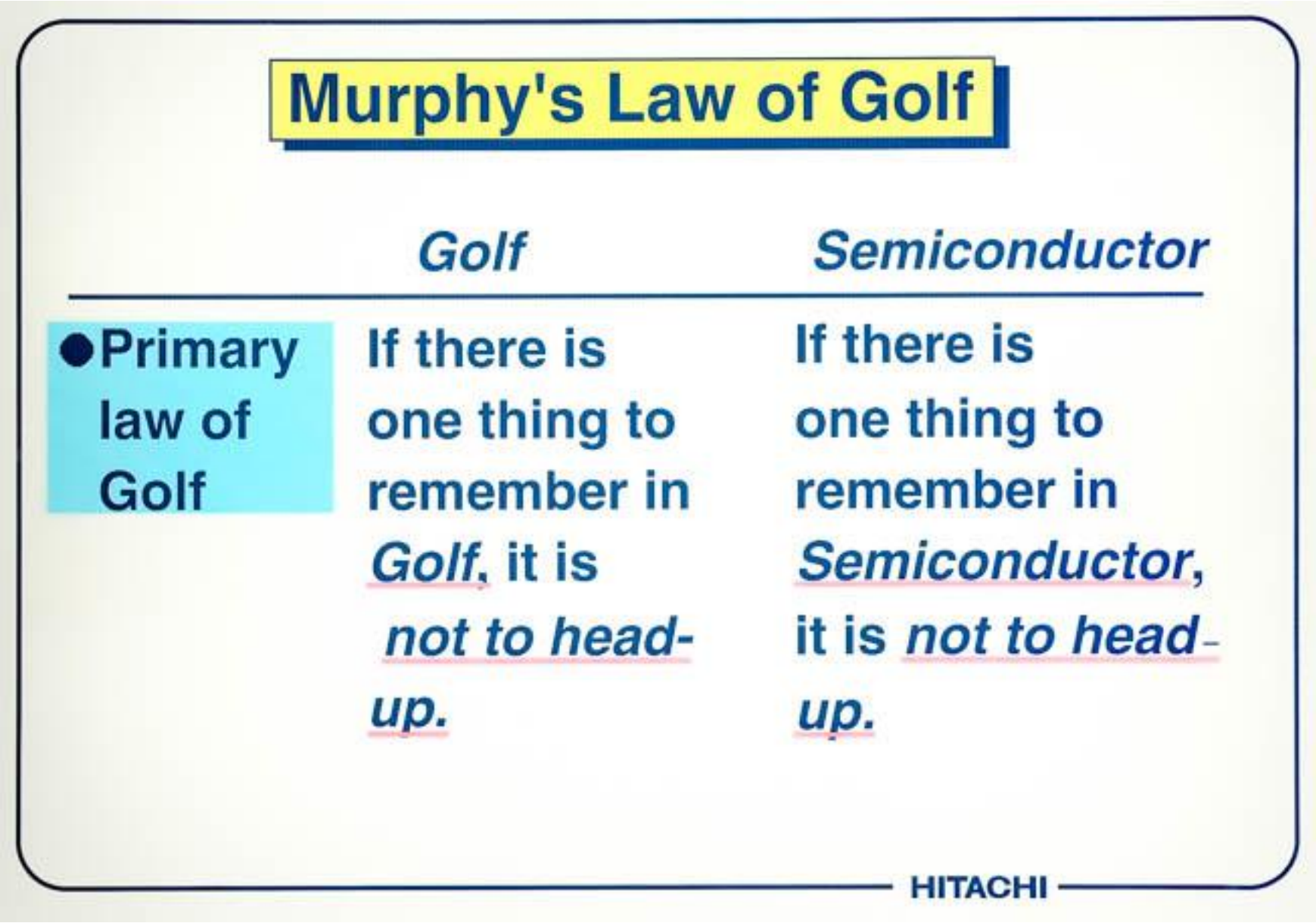


"Murphy's Law of Golf" was published in 1993, and it was very popular. I wrote modified version for semiconductor, and it was introduced to entertain the audience, as an appendix. I learned, after the speech, that this portion was very popular and well accepted. Sometimes, it was more talked about than the main portion of the speech.

Murphy's Law of Golf

	Golf	*Semiconductor*
●Darryl's comment	If we learn from our mistakes, then *golfers* are the most learned people on earth.	If we learn from our mistakes, then *semiconductor people* are the most learned people on earth.
●Weight of one stroke	*Driver* for show, *putting* for money.	*ISSCC* for show, *yield* for money.

HITACHI



"This is the end of my speech today, thank you for your attention". After my last words, the hall resounded with the applause of the audience.