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VLSI and Artificial Intelligence
Problems in the 80s the Computer Industry will Face

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Since the end of World War II, dramatic advances in information processing technology have made this area a prime moving force for changing the industrial infrastructure in the direction of knowledge-intensive industry and energy saving, both of which contribute to the welfare of society as a whole.

The heart of information processing technology is the computer, and the heart of computer hardware is without doubt the semiconductor device. Since the invention of the transistor and the birth of the concept of device integration, the pace of integration has been repid as is evidenced by SSI, MSI, and LSI development. Now we face the 1980s, which has been called the decade of VLSI. The main benefits of LSI or VSLI use as applied to computers are not only their very high speed and low cost, but their high reliability as well. By "reliability" we do not here mean only a low malfunction rate, but reliability in both computer design and manufacture, the importance of which cannot be overemphasized.

A second point is that the rate of progress in VLSI technology has been so high that it now seemingly surpasses the increasing demand for VLSI itself. What is to be done in such a situation? Before proceeding to further develop and commercialize these products, we should perhaps be more cautious in projecting future needs and demands, or create a number of new and beneficial applications. Advanced VLSI development will inevitably spread computer use in daily life. In line with this trend, we will have to do our utmost to develop computers which can be easily handled by anyone who may want to use them. One of the directions in which this development is moving is in the use of Japanese as an I/O language. Speech synthesis, speech recognition, pattern recognition, and related processing are now under intensive development.

A third problem is how many activities in the sphere of human intelligence can be done by the computer. It is a very challenging subject which requires at least, in addition to the recognition capabilities mentioned above, new functions like association, deduction, and learning. In an attempt to realize such new functions, study is now being undertaken in the area of computers structured along lines which do not follow those of the von Neuman machine--parallel, data flow, associative, and list computers, for example. Conceivably the combination of these new functions--when developed to their full capacity--together with the great capacity of the data base can produce a computer which can be called an "artificial intelligence" in the original sense.

The last problem which I would like to mention here is perhaps the single greatest problem the computer industry must face in the 80s--that of "software." Although we greatly respect the intellectual product which software as such represents, we in Japan in particular have no tradition of paying money for "intellectual products," which we consider a sort of natural benefit derived from the pure process of human intellectual activity. Hopefully, however, it may be said that the tremendous advances in VLSl technology will have such a great impact on society in the 80s that people finally will begin to evaluate and pay the price for human intellectual activities more fairly than before. At the same time, we on the side of industry must do our utmost to improve software productivity, however much of an uphill battle it may be.