In September, the ISRC welcomed Dr. John Sviokla to discuss his emerging vision of 6th Generation Computing. Dr. Sviokla discussed the general disappointment with 5th generation computing and then presented his thoughts on both the possibilities and existing practical applications of sensor based computing. He concluded with a brief discussion on global outsourcing.

Background
The generations of computing are generally considered to be:

Generation	Dates	Description
1	1945-1954	• Machine and assembler language • Single user at a time
2	1955-1964	• High level languages
3	1965-1974	• Multiprogramming operating • Multi-user applications
4	1975-1990	• Multiprocessor operating systems • Parallel software tools
5	1990- Present	• Scalable architectures • Massive parallel processing

The focus of improvements has been to bring the mind and machine closer together. Yet, the 5th generation of computing failed to deliver on this promise. Artificial Intelligence (AI) was overly optimistic and did not deliver on its promises. However, some remanents of AI have made it to everyday use. For example, the grammar checker in MS Word came from AI thinking. Voice recognition software to support dictation had its origin in AI. However, it has not worked as well as expected.

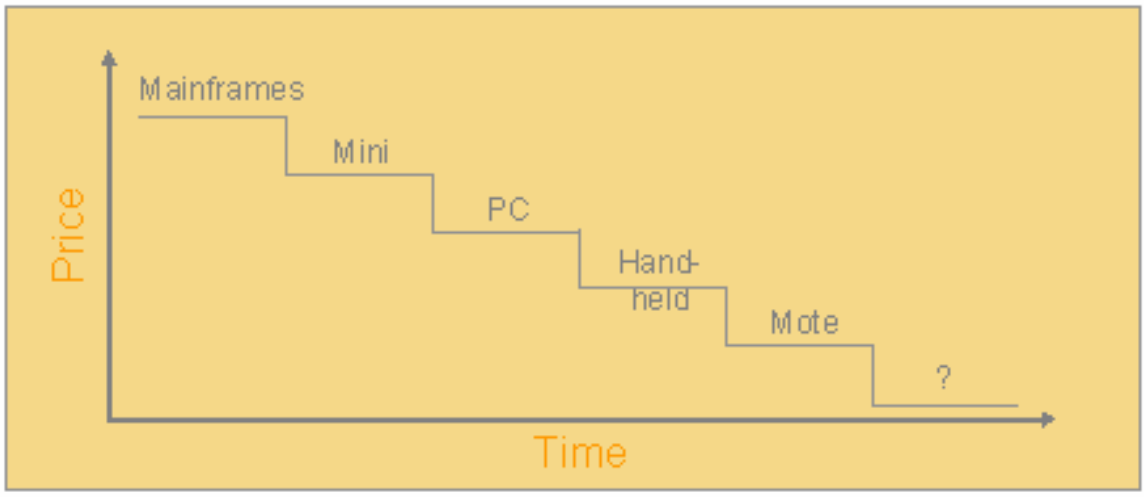
Even PDA's (Personal Digital Assistants) are not personal. The promise of new technology is often greater than what is delivered. Other technology that has been deployed is not what is wanted. There are lots of limitations to technology. How many times a day does one have to use Ctrl+Alt+Del? Is that a desirable characteristic of a technology?

The current level of understanding of how the mind works is still very primitive. There is a lack of understanding as to how the same stimulus can lead to different thoughts and different chemical responses in the brain through the emotional strata. For example, if a table cloth moves at an ISRC meeting, one might think that it is the air conditioner coming on. However, if a rustling sound is heard on the floor in a kitchen, one might think it's a rat and react in a frightened way.

Science is now developing a better understanding of how the brain works. For example, marketers are looking at changes in brain activity with exposure to different Coke advertisements. However, this is not the next step. This is may be 15th generation computing, not 6th generation.

6th Generation Computing

Every new architecture enables new capabilities, networks, and business models. New capabilities eventually force tuning of existing business models or allow for new ones. Gordon Bell, Chief Architect at Microsoft, believes that motes are the next big architecture. A mote is a very small computing device consisting of a power source, a transceiver and some sort of sensor. There are several factors that will make motes viable. First, the transceiver and sensor components of a mote have to operate on very little power. Fortunately, MIPS per watt have improved by an order of magnitude every 5 years.



Second, for motes to be viable, the production cost must be under one dollar. This will be made possible by a combination of the ongoing reduction in the cost of computing power and the use of existing transceivers and sensor components.

Motes are currently in commercial use. A Canadian company is using motes to overcome a problem that occurred when it deployed RFID capability throughout its warehouse. The problem was that 3% of the orders represented 80% of the exceptions. These exceptions were not handled efficiently by the RFID based process. The company deployed mote technology to address this problem. The motes wake up every hour to determine whether or not they have a full package. If they do, they communicate this to a central control function. The control function is then able to place the package in the normal RFID process.

Companies are leveraging similar sensing capabilities to create platforms for growth based on connected feedback. Consider three examples:

- **BODYMEDIA**
  Currently, between 1% and 2% of our GDP is consumed treating diabetes. If the disease is caught early and the patient stays on a prescribe protocol, diabetes can be treated in a cost effective manner. However, if a patient goes off of the protocol then related illnesses such as blindness and amputation may occur. This is what makes diabetes expensive to treat. BODYMEDIA is deploying a sensor based application that enables the monitoring of a person's body functions on an ongoing basis. This technology could be used to make sure that a person stays on their protocol to treat the disease. This could drastically reduce the overall cost of treating diabetes and its related illnesses.

- **General Electric Aircraft Engines**
  GE has already deployed a sensor based application that has given them a competitive advantage in aircraft engine maintenance. They have built approximately 100 sensors into the engines that are used on Boeing 737-500's. The sensors monitor the engine's performance on a real time basis and send the information via satellite to an earth station that analyzes the data and compares it against an experience data base. They use this information to identify current problems, predict future problems and schedule maintenance. GE staff on the ground has better information than does the pilot. As a result of this capability, GE can sell power by the hour versus selling engines. They are also able to run the fleet with 60% less assets. Their service revenue has gone from $600 million to well over a billion dollars. While an airline could force GE to send its sensor data to competitors, only GE has the analytical tools to make the system work. GE's revenues and profit margins have both gone up and they now own the service market.

- **Microsoft**
  Microsoft's XP operating system now asks you whether or not you would like to send an error message back to Microsoft. They use this information to fine tune their maintenance efforts. Approximately 85% of the errors in XP are in 5% of the code. With the feedback information, they can pinpoint where to best focus their maintenance activities. In the future, more and more products will have feedback mechanisms similar to XP.

Businesses are going to increasingly be outwardly focused. As Peter Drucker said at a DiamondCluster International Exchange, "The problem with most companies is that 90% of the information they look at is internal. A better information system is not going to solve that problem." Using sensor or other feedback capabilities, leading firms will grow through connected feedback. By mastering feed back, companies will be able to evolve product offerings, transform their businesses, and dominate markets. Early adopters of these capabilities will be able to change their relationship with customers and lock out the competition.

Global Outsourcing
It is very inexpensive to do business in India. For example, in Bangalore, one can rent a beautiful building in a campus like setting for $ 0.75/sq. ft. India has a lower class of 600 million people that earn on average $100/year. The 200 million people in the middle class are highly motivated to stay ahead.

Richard Mason developed the following model which is useful when thinking about outsourcing offshore.

	Unstructured	**Semi-structured**	**Structured**
Strategic Control	R&D and related activities.		
Managerial Control			
Operational Control			Items in this box move offshore first.

Items in the structured/operational box (bottom right) are moving offshore first. Design work which is managerial or strategic and semi-structured or unstructured depending on the type of design is moving offshore to a much lesser extent. However, there is recent

evidence of a company moving some of its research and development activities to India. This is clearly unstructured/strategic and may mark a dramatic shift in the types of activities that are outsourced to India.

The use of offshore capabilities is changing the economics of software acquisition and enabling companies to develop custom code rather than using off-the-shelf software. All of DiamondCluster's large customers have an Indian component. However, a company cannot outsource offshore if it has bad internal practices.

To view the slides from Dr. Sviokla's presentation on 6th Generation Computing, visit our website at: http://www.uhisrc.com!

For more Information on 6th Generation Computing see the article entitled "Red, Yellow, Green: Reading the Signals of Customer Feedback," by Dr. Sviolka and Audris Wong at www.sviolka.com.

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