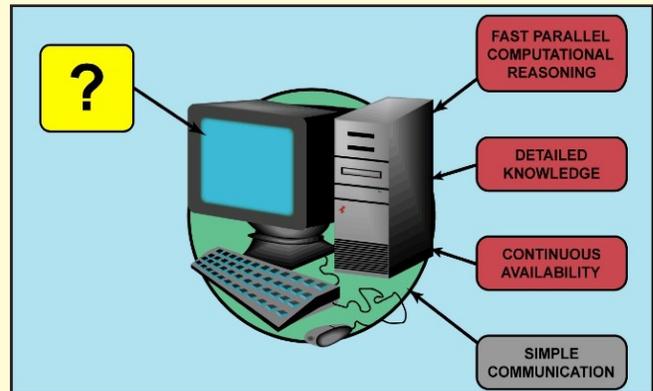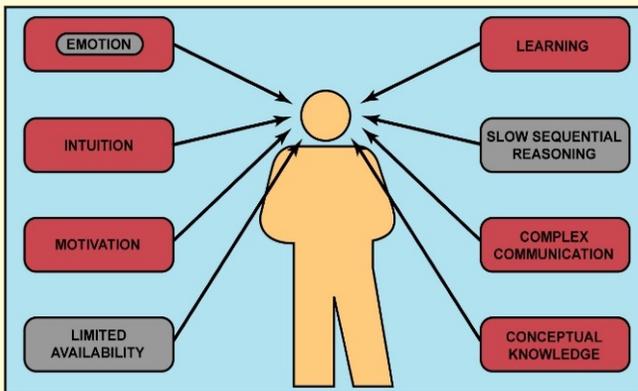# Why software with embedded intelligence?

There are essentially two compelling incentives for computer software to increasingly incorporate more intelligent capabilities. The first incentive relates to the current data-processing bottleneck. Advances in computer technology over the past several decades have made it possible to store vast amounts of data in electronic form. Based on past manual information handling practices and implicit acceptance of the principle that the interpretation of data into information and knowledge is the responsibility of the human operators of the computer-based data storage devices, emphasis was placed on storage efficiency rather than processing effectiveness. Typically, data file and database management methodologies focused on the storage, retrieval and manipulation of data transactions, rather than the context within which the collected data would later become useful in planning, monitoring, assessment, and decision-making tasks.

The continued expansion of networks (e.g., the Internet) has provided seamless connectivity among countless nodes on a global scale. While the collection of data has already increased enormously over the past decade, the availability of such a global network will increase the volume of data by several orders of magnitude. Such a volume of raw data is likely to choke the global network regardless of any advances in communication and computer hardware technology. To overcome this very real problem there is a need to collect data in context so that only the data that are relevant and useful are collected and transmitted within the networked environment. Most (if not all) of the necessary filtering must be achieved automatically for at least three reasons. First, organizations cannot afford to utilize human resources for repetitive tasks that are tedious and require few human intellectual skills. Second, even if an organization could afford to waste its human resources in this manner it would soon exhaust its resources under an ever-increasing data load. Third, it does not make sense for an organization to 'burn-out' its skilled human resources on low-level tasks and then not have them available for the higher-level exploitation of the information and knowledge generated by the lower-level tasks.

The second incentive is somewhat different in nature. It relates to the complexity of networked computer and communication systems, and the increased reliance of organizations on the reliability of such information technology environments as the key enabler of their effectiveness, profitability and continued existence. This reliance on computer-based information systems mandates a level of reliability and security that cannot be achieved through manual means alone. The alternative, an autonomic computing capability, requires the software that controls the operation of the system to have some understanding of system components and their interaction. In other words, autonomic computing software demands a similar internal information-centric representation of context that is required in support of the knowledge management activities in an organization. In both cases the availability of data in context is a prerequisite for the automatic interpretation of information by the computer.