

The 'third wave' of computing is upon us. Pervasive or ubiquitous computing aims to push the computer to the background where it remains almost invisible, but simultaneously all-knowing, interconnected, and powerful. This is a departure from the preceding waves of mainframe and personal computing, where the end-units were essentially synonymous with the computing waves they represented. Mark Weiser's original work at Xerox PARC (Palo Alto Research Center) contained the seeds of this novel idea of an invisible and all-enveloping computing infrastructure, and we see increasing evidence of practical applications derived from it. Mobile computing and commerce are precursors to a phase of ambient computing that is always on, personalized, context-sensitive and highly interactive. Some key features of such an environment will include: a) a portfolio of end-user devices and applications that will deliver a range of information and services; b) the use of the Internet as a backbone to create a massively distributed information system through an inner core of databases and servers; and c) an outer edge of devices and sensors ranging from passive and active RFID tags, to autonomous and self-updating hardware systems.

Pervasive computing has major implications for business strategy and the electronic markets landscape going forward. As tiny connected devices proliferate, so do the opportunities of linking them to business processes, and modes of value addition at multiple levels. At the business level, the competitive edge of firms and industries can be sharpened by streamlining supply-chains, re-engineering business processes around pervasive and networked sensor-based technologies, and

Preface to the Focus Theme Section 'Pervasive Computing/ Ambient Intelligence'

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developing new service opportunities powered by pervasive devices and analytics. There exists a broad opportunity for creating an interoperable, integrated and economically efficient business infrastructure. Already, a range of industries including retailing, healthcare, transportation and logistics, manufacturing, and financial services (to name a few) are implementing novel solutions that incorporate these concepts and technologies. At the consumer level, there are a myriad of application areas, ranging from the redesign of living spaces and home networking, more intuitive and personalized shopping tools and alerts, and seamless interconnections between work, life and play. Going forward, businesses need to tap into these opportunity areas, even as they become more sensitive to privacy abuse concerns that will inevitably come to the forefront. Security, trust and customer assurance will emerge as key critical variables for future competitiveness.

While the dimensions and impact of pervasive technology and

applications have been studied extensively from technical and engineering perspectives, there is a gap in the scholarly discussion addressing the business issues related to it, and the role of pervasive computing in driving business innovation. The managerial impact needs to be examined in greater detail, with quantifiable studies of process improvements, ROI, and improved incentives. From a research point of view, there is a need for better mapping of the key stakeholders, conceptual and empirical models of deployment and effectiveness, and strong theoretical linkages to strategy formulation and execution. In summary, pervasive computing and ambient intelligence offer a stimulating set of questions for managers and researchers, and represents a broad opportunity for future work.

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