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STRATEGY

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16.12.2002 / Ubiquitous Computing:

Shelves that Call for Supplies

Everyday items enhanced with some intelligence can optimize numerous business processes, especially in supply chain management or customer relationship management.



Development Trends

The infusion of IT into ordinary objects turns products into smart items, items capable of independently collecting information from their environment, processing data, and communicating over mobile networks. A tire becomes a smart tire that monitors its own pressure and knows when it needs to be replaced. The basis for this development is **Ubiquitous Computing**. Familiar physical objects are enhanced with IT components that can be networked just like processes and information systems. Smart items don't need human beings to serve as intermediaries between the real and virtual worlds;

information flows without media breaks. Such new processes can be realized now thanks to the increasing miniaturization of high-performance computer chips and sensors and the progress made with mobile data-transmission.

A Goods Receipt Posts Itself

Radio frequency identification (**RFID**) is one of the technologies that enables ubiquitous computing. Products with RFID tags can be automatically identified, localized, and monitored. The chips work as mobile data-storage devices, so that the information they contain can be transmitted and read without visual contact. In the future, smart items will also be able to interact with each other and even send and receive messages depending upon the business logic they contain.

The business benefits of ubiquitous computing are obvious. Smart items allow events in the real world to be automatically recorded and displayed in the virtual world. For example, smart items entering and leaving a warehouse automatically update the warehouse management system. Time is saved, and errors from manual entry and misread barcodes are avoided. Further inconsistencies caused by theft or improper storage are also prevented.



Avoiding Media Breaks



M-Lab

"Intelligent" products offer huge potentials for inter- and intra-business processes. A study by the Mobile and Ubiquitous Computing Lab (M-Lab) examined 80 existing ubiquitous-computing applications and found that the majority of solutions are in the area of supply chain management (SCM). These applications are widely used in the automobile industry as well as in logistics and transportation. They are increasingly

being used in the retail and pharmaceutical industries. Additional applications are found in customer relationship management (CRM) and in the development of new products and services.

The Smart Warehouse Recognizes Theft

Automatic identification improves numerous SCM processes by creating the ability to economically track the exact movement of products and production equipment in real time. Critical resources, such as transportation containers, can be localized and used optimally. In addition, sensors enable products and production equipment to monitor themselves and send a signal when key criteria (temperature or durability level) are met or exceeded. Automatic identification also saves manual posting and monitoring of goods receipts and issues. Smart warehouses perform real-time inventories, and companies learn of thefts more quickly.



Process Improvement with Ubiquitous Computing

Smart items can assist in liability issues concerning the lifecycle of a product. The products store their own history. Information from the time of development to the time of recycling or disposal can be accessed at any time, and the information can also support maintenance, repair, and recalls.

A Vending Machine Calls a Service Technician

Several application scenarios for ubiquitous computing are no longer visions of the future. Consider the following real-life examples.

A retail store needs to keep track of the products in stock. If a store sells out of a particular item, it runs the risk of creating dissatisfied customers and a consequential loss of revenue. A smart shelf can be used to avoid this problem because it can keep track of inventory automatically. SAP has developed an early warning agent that

monitors products containing RFID chips. The agent triggers a re-supply notification in **mySAP Supply Chain Management** (mySAP SCM) before the last unit is sold.

A chip manufacturer in Dresden buys sensitive photo chemicals from a firm in Amsterdam. During transport, there's always a danger of exposing the chemicals to excessively high temperatures, which ruins the chemicals. Temperature loggers make sure that the ruined materials are not used in production. The temperature loggers are installed in the transportation containers and display the temperature continuously. An infrared interface reads the data, converts it to XML format, and transfers it to mySAP Product Lifecycle Management (mySAP PLM) as soon as the shipment arrives. This process helps a company recognize ruined goods and refuse a delivery.



SAP Corporate Research

SAP has developed a smart vending machine that can do a lot more than dispense beverages. It registers every sale directly with a central SAP system. The information helps optimize the routes that refill the machines, inform suppliers, and adjust supplies to actual consumption. If the machine breaks down, it calls the service technician.



New Services

Products linked automatically to corresponding services constitute an additional source of revenue – to say nothing of the potential process improvements available with SCM services. A smart toolbox, for example, would be able to check if a specific installation tool was missing after a particular assignment. A service technician might have left something behind in a turbine, where it could cause significant damage during operations. The smart toolbox would notice the absence of the equipment and alert its owner.

Products that Update Their Own Home Page

Products that manage themselves require an infrastructure like the one developed by the Auto-ID Center at the Massachusetts Institute of Technology (MIT). It consists of an electronic product code (EPC), a smart tag, physical markup language (PML), object name service (ONS), and middleware.

The electronic product code is a standard that uniquely identifies a product. It uses a 96-bit number that consists of an ID number similar to the universal product code (UPC) and a serial number created by the manufacturer. The smart tag is an RFID tag which attaches to the product and stores the EPC. PML is an XML format to describe product data, which is stored in a database linked to the Internet.

The object name service (ONS) returns for a specific EPC the address where the object data can be found. This function is comparable to a domain name server (DNS) which determines the IP number of a Web address. Finally, the Savant middleware filters the data generated over the infrastructure by reacting to predefined events. It communicates with Web applications or back-end systems over standard interfaces.

As part of the concept of the Auto-ID Center, every product has its own home page that serves as a virtual placeholder for the physical object in the digital world. Accordingly, smart items can automatically download up-to-date information (such as target location, customer, usage instructions, and software upgrades) from its home page. And the home page can update itself automatically with sensor data, such as location or temperature. The infrastructure solution is now being tested in the U.S. at Wal-Mart.

For more information about Ubiquitous Computing @ SAP, please contact the SAP Corporate Research Team. [SAP Corporate Research](#)



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