

evidenced in these some examples: Siebel & IBM, Peoplesoft & Vantive, Nortell & Clarify, HP & Oracle. Systems Integrators (e.g., KPMG, E & Y) are offering their services to integrate CRM with other enterprise applications. The hardware and networking infrastructure, particularly in the area of extranets, mobilized such companies as CTI, Cisco, HP, IBM, Lucenet, Nortell, Geneysis, and Quintus towards the development of solutions for CRM.

WFS-WORKFLOW SYSTEMS

Workflow systems have evolved to integrate the applications and tools being used in workgroup environments on networked enterprise information infrastructures. Their purpose is to speed up a task's completion through the collaboration of several workers. A workflow system is composed of:

- business processes; e.g., loan approval,
- cases; e.g., a customer application for a car loan,
- folders; e.g., a customer's e-folder, containing documents from different sources, including text and images,
- rules; e.g., about size of collateral for a loan,
- definitions; e.g., descriptions of participants in terms of locations, job function, supervisor, and security level,
- routing; e.g., sequential, parallel (with rendezvous point), or dynamic/conditional, depending upon dynamically occurring conditions.

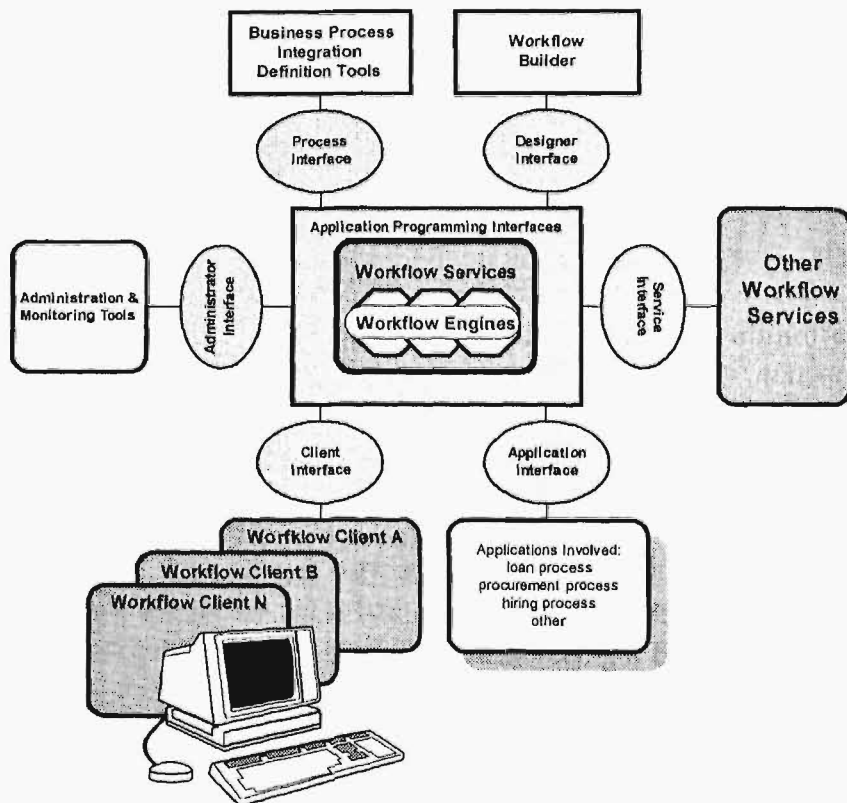
The core component of a WFS is the workflow engine. It is a software responsible for process creation and control of the activity scheduling in an operational process and interaction with tools or human resources. WFS very often operates across many computer platforms and applications over wide geographic areas. The workflow engine exchanges controls among different applications via COBRA, Dynamic Data Exchange (DDE), OLE, or R/3's Business Application Programming Interfaces (BAPI's) standards. A good example of WFS is Lotus Notes for a groupware environment.

On the rise are Web-enabled workflow systems to support inter-enterprise activities, such as those occurring in SCM systems and inter-trading systems. Of course, e-Document Management Systems expand the potential of WFS. The next step in this system development is the inclusion of mobile workers into the workflow process.

The architecture of a WFS is provided in Figure 4-21. The WFS contains workflow engines, administration and monitoring tools, business process integration tools, client subset of WFS, and interfaces to other workflow services, applications, API, and others.

The WFS' are applied mostly in financial institutions, hospitals, public administration, college admission offices, SCM environments, and so forth, and everywhere the process is well defined and time-sensitive.

Figure 4-21: The Architecture of a Workflow System



m-MOBILE APPLICATIONS

Mobile business nowadays is driven by the applications of wireless communications. The Wireless Application Protocol (WAP) has emerged, which allows workers on the road to have immediate access to information and transactional services in such areas as e-mail, customer care, call management, information services, e-commerce, online address book and directory services, as well as corporate intranet applications.

m-Mobile access is necessary, not only for sales “road warriors,” but also for executives, field support staff, knowledge workers, and potentially, all workers. This is driven by the need for organizations to create a workforce that is more productive, responsive, and connected, with improved support for virtual teams, and the ability of management to have their finger on the pulse of the business at all times. New sources of competitive advantage will be created for visionary enterprises prepared to take advantage of the merging opportunities (www.magic.com). The common goal of this application is to keep employees out of the office, yet connected to needed information.

FedEx, the global delivery giant increased productivity 30% in the early 1980's when it launched its Digital Assisted Dispatch System. The company was able to more efficiently route pick up and deliveries, keeping couriers on the road instead of back at the water cooler. Coupled with the SuperTracker, a handheld device that communicates location, shipping, and other information about deliveries to customers and the FedEx headquarters, the company was able to pick up and deliver packages in real time after 1986. Its wireless system eliminated the need to write down a million addresses a day, saving time, money, and a lot of ink.

Office Depot teamed with Aether Systems to develop a way to track the retailer's vehicle fleet and to capture customer signatures via a Palm or Pocket PC-based handheld from Symbol Technologies. Office Depot cannot charge a customer until a signed bill is logged in the system. With the mobile device, the signature and bill are shipped to the Web and delivered, in real time, back to the customer. By speeding billing delivery, the company accelerates cash flow and brings an additional value to its business.

Networkcar sells a plug-in device that connects to computer diagnostic ports that are standard-issue in cars made after 1996. The device beams vital signs to a dealer, who can remotely diagnose or spot trouble. In such a manner, dealerships can achieve competitive advantage by maintaining a closer bond with their customers.

California utility firm Sempra Energy's engineers had to return to an office to enter data about heating, ventilation, and air conditioning units run by big

users such as hotels. The mobile computers allow engineers to transmit and receive data and to make necessary equipment adjustments without leaving rooftops. This application should save a lot of time and cost.

iMeritikus allows doctors and patients wireless-online access to medical records. Patients can report any medical problems and update their health-care provider on what type and quantity of drugs they are taking, information that physicians can routinely monitor. For example, a patient can check his blood-sugar level as many as eight times a day, regularly uploading results onto the Web so his health-care provider can monitor his status. That patient complained about the trouble he has maintaining a virtual link to his physician when on the road--a link that grows more tenuous the deeper he goes into the back roads. With the wireless connection the patient solved his problem.

Research survey (www.indiqu.com) shows that 40% of the Fortune 2,500 businesses in the United States have equipped or are equipping their work forces with wireless tools. Another 30% "are considering" rolling out wireless systems.

So-called third-generation or 3G wireless networks promise super-fast mobile Internet-connectivity, real-time video, and streaming audio. This technology will support the development of m-commerce (mobile commerce for consumers).

Table 4-3: Types of Wireless Access Requirements for Mobile Workers

USERS	APPLICATIONS & CONTENT	USAGE PATTERNS
Mobile professionals	<ul style="list-style-type: none"> E-mail and Personal Information Manager (PIM) Corporate intranet Real-time access to information (such as inventory numbers and sales) 	<ul style="list-style-type: none"> Significant travel and time in airports, taxis, and meetings Outside of office more than 50 percent of time
Customer-facing employees	<ul style="list-style-type: none"> E-mail Corporate intranet 	Outside office more than 20 percent of time
Sales forces	<ul style="list-style-type: none"> E-mail and PIM Corporate intranet CRN ERP for status and fulfillment 	<ul style="list-style-type: none"> Significant travel and time in airports, taxis and meetings Outside of office more than 50 percent of time
Field service technicians	<ul style="list-style-type: none"> Access to job dispatcher services Access to parts database 	<ul style="list-style-type: none"> Varied locations, not always within wireless network coverage May require ruggedized mobile device

Source: PriceWaterhouseCoopers, Technology Forecast: 2001-2003, Melno Park, CA 2001

Table 4-3 identifies mobile applications.

The following strategies can facilitate the company's transition to wireless applications (www.stellcom.com):

1. Keep it simple – begin with e-mail and later with the Web applications,
2. Customization is key – keep the information targeted, concise, and easy to access, eliminate multiple screens,
3. Find partners – to help the company in the correct implementation process,
4. Cater to customers – not just employees – provide information for customer and later for employees to achieve a new value for the business,
5. Become device-agnostic – find a right e-mobile application for a particular device, such as PC's, laptops, PDA's, pagers, cell phones, and voice mail. You won't ever book your flights on a cell phone. You'll book either by a phone or online. But when a flight is delayed, you expect to get a message on a cell phone.

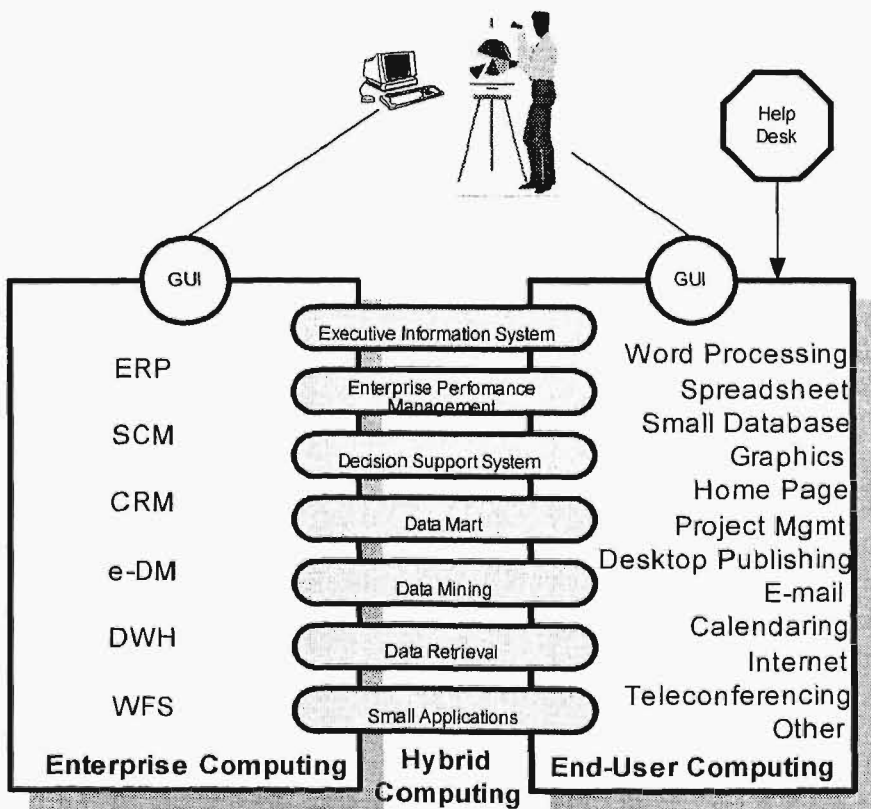
EUC-END-USER COMPUTING

The end-user computing is a result of the rapid explosion of personal computers and the information centers in the 1980's when the latter supported that type of computing. From the 1960's to the 1980's computers were applied by the users of enterprise computing (ERC) which was composed of data processing applications. In the 1990's-2000's these applications evolved into a complex of ERP, SCM, CRM, e-DM, and WFS systems with very user-friendly Graphic User Interfaces (GUI). Those users were mostly engineers and "leading edge" managers and professionals. Nowadays, computers are applied by the majority of office workers under the form of end-user computing. Even workers at the shop level use computers either as a part of enterprise computing (e.g., Computer-Aided Manufacturing) or at home, just to send e-mail or browse through the Internet. Figure 4-22 illustrates the relationship among enterprise computing, hybrid computing, and end-user computing.

The end-user applications fall into two major categories:

1. Hybrid applications (HBA) that interface between (ERC) and EUC, such as EIS, EPM, DSS, Data Mart, Data Mining, Data Retrieval from databases through a common language—SQL, and small applications that are written in the user-friendly languages of 4th generation (e.g., Visual Basic). Those applications are equipped with a GUI that is very user-friendly.
2. End-user computing that steadily expands its scope from office automation (word processing, spreadsheet, small database, e-mail) to graphics, desktop publishing (e.g., newsletters), calendaring, project management, home page design, browsing of the Internet, and so forth.

Figure 4-22: The Relationship of End-User Computing (EUC) with Enterprise Computing (EC)



The end-users in the 2000's are recruited from:

- Managers, who on average constitute 28% of the office workforce and who spend 50% of their time in face-to-face communication. In general they are involved in analysis, searching for information, and managing activities (controlling and communicating). Hence, managers will mostly apply office automation and project management tools along with hybrid applications (EIS and EPM) on top of enterprise computing applications.
- Professionals (engineers, accountants, marketing and sales representatives, planners, etc.) must have a high degree of product/service knowledge. They spend about 30% of their day in face-to-face communication and about 40% of their day in problem-solving activities. They apply all types of end-user applications and more analytical hybrid applications along with enterprise computing applications. These types of users are very demanding and they lead other users in computer applications.
- Secretaries are very important workers of the enterprise and with the advent of computers they become even critical. The lead secretary in an office is rapidly becoming an office manager who is handling electronic files and all-office e-communications.

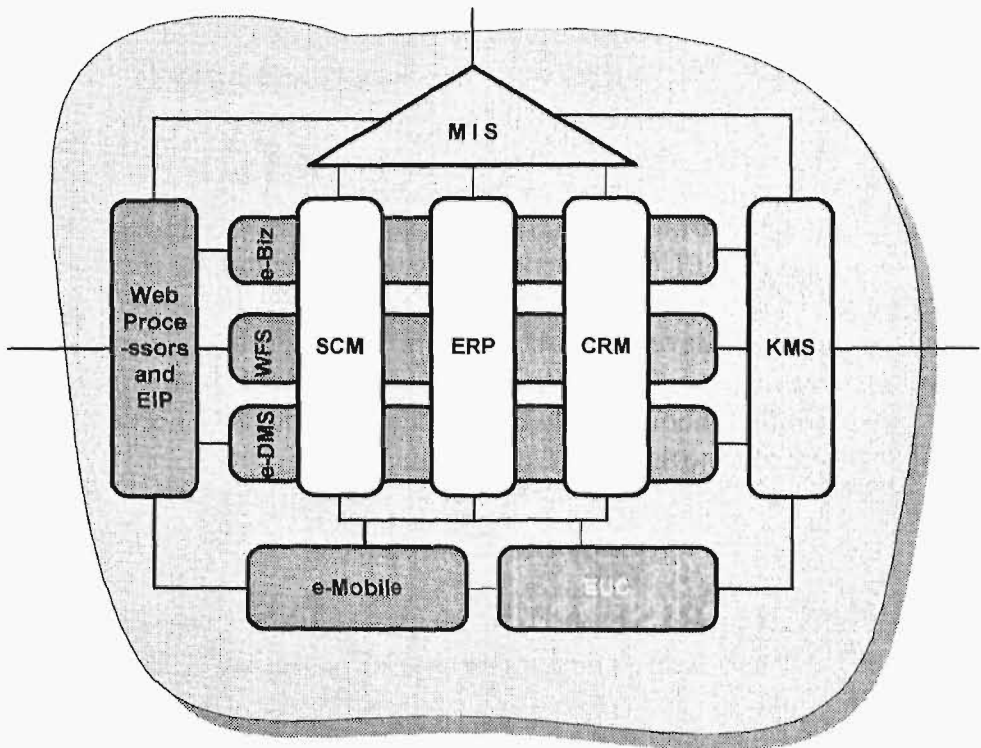
The EUC activities are supported by an information center (a term coined by IBM in the 1980's) which in the 2000's transformed into a help desk. Very often companies treat EUC as a tactical issue, while it should be treated as a strategic one. If end-users are at a competent level of computing skills they will strongly support the development of enterprise computing and make the business more effective. On the other hand, EUC cannot be a substitute for ERC, but just reflects about 10% to 20% of the enterprise's whole needs for computing, according to the author's estimation.

ENTERPRISE APPLICATIONS GRID

Figure 4-23 identifies a complex of enterprise applications. The enterprise application complex is characterized by the following system interactions:

- **Supervising Systems** such as MIS (Management Information System) and KMS (Knowledge Management System) help management in big-picture managing of the whole enterprise,
- **Integrating Systems** such as those which are operating via Web. These systems are mostly operational “processors” that facilitate handling components, queries, GUI, and security and include an Enterprise Information Portal too,
- **Fulfillment Systems** such as SCM (Supply Chain Management), ERP (Enterprise Resource Planning), and CRM (Customer Relationship Management) take care of mission-critical information processing of the enterprise,

Figure 4-23: The Architecture of e-Enterprise's Applications



- **Electronizing Systems** such as e-DMS (e-Document Management System), WFS (Workflow System), e-Biz, and e-Mobil support the above systems in fulfilling their missions (in shadowed area),
- **Independent System** such as EUC (End User Computing).

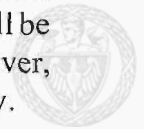
FURTHER TRENDS

The further development of enterprise computing, at the Application Layer, will lead to steady growth of applications integration (EAI) within the framework of Business Process Integration (BPI), which is described in Chapter 7.

One of the forms of the application integration will be the evolution from e-business to m-business based on total mobility (look at Chapter 5).

The future of end-user computing is in improvements of application sophistication (e.g., use of intelligent agents) and in desk-top conferencing, perhaps with broader applications of telecommuting.

EUC becomes the second “driver’s license” in human civilization that has entered the Information Wave phase. Those who neglect this license will be victims of human development, at least in terms of monetary values. However, monetary values may not necessarily be the most important to everybody.



CONCLUSION

The Application Layer becomes a very complex set of system federations at the level of business, product, operation, inter-organizational, and management processes. For example, the SAP ERP software package contains 0.5 billion lines of code, and the package does not include all business processes of an enterprise, it takes care of just 800 business processes.

Every year brings new applications and new ways of integrating them. The smooth integration of applications and technological solutions coming from different vendors requires their better standardization and electronization to facilitate development and operations of IT-driven enterprise. This issue will be discussed in Chapter 5.

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ENDNOTES

- ¹ Other 5 layers of EII have been presented in Chapter 3.
- ² Depending on a type of industry.
- ³ In the past RMS stored and retrieved archived documents, which is now a subject of DMS.
- ⁴ In the SAP environment there is the EIS, which belongs to Financial Accounting – Controlling. Its mission is to control cost and revenue; as such it is an equivalent of the tactical EPM system.
- ⁵ One can mention a concept of an Enterprise Application Portal (EAP), which includes EIP and Application Integration via application servers and middleware.
- ⁶ Source: A student project at Western Michigan University, 2000.
- ⁷ It is necessary to notice that these data about improvements come from a vendor of CRM software.