It’s not the technical problems...

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ABSTRACT

The important issues concerning operating environments are not technical issues. They are managerial, business, marketing, integration, and application issues that are shaped primarily by the changes in how we develop and implement software systems. Fortunately, hardware, software, and communications technology will keep advancing to meet these development needs. The big problem is for vendors to package and deliver the operating environment technology in a way that business, academia, and government, can use it. The other problem is for those of us who are users to exploit it to the fullest.

INTRODUCTION

My perspective at General Electric (GE) is that of a Software Development Program Manager. My job is to understand and direct trends in the use of software development methods, tools, and management approaches throughout GE. As a member of the Corporate Information Technology Staff and as a Software Engineer, I help GE’s (very) independent businesses exploit the best computer hardware, software, and communications to develop GE’s products and support systems.

With over 15,000 software developers at GE, even a five percent improvement in productivity means millions of dollars on the bottom line. For that reason, my perspective is also that of a businessperson. I see dramatically increasing demands for software and systems in every part of GE, as well as in many other United States businesses. Yet, neither GE nor most other United States businesses are going to be able to increase the number of software developers in proportion to the increase in demands. Developers of software systems simply must start using new approaches that increase productivity by orders of magnitude. Fortunately, new software tools, more disciplined methodologies, and new management approaches that can make dramatic improvements in productivity, are available and are being adopted.

So, what do these software development trends have to do with operating environments? The answer is: everything! The approaches we use to develop and implement software are changing so fast (thank goodness) that they are the major forces in shaping new needs for operating environments. In addition, these forces are too strong for anyone to change.

Fortunately, hardware, software, and communications technology will keep advancing to meet these development needs. If there’s a market, technology can meet its requirements. In most cases, the technology already exists. I am not worried about it. Where it needs to advance, it will advance quickly. The big problem is for vendors to package and deliver the operating environment technology in a way that business, academia, and government, can use it. The other problem is for those of us who are users to exploit it to the fullest.

My position is that the really important issues concerning operating environments are not technical issues. They are managerial, business, marketing, integration, and application issues that are shaped primarily by the changes in how we develop and implement software systems. The key issue is that both vendors and users need to focus on the forces of change in software development in order to understand how to deliver and use operating environment technology.

The forces of change are rapid expansion of end user computing, development using individual PC workstations, and information resource development for distributed processing.

Rapid Expansion of End User Computing

End user computing, that is systems development and implementation by non-professional system developers, is the information systems success story of the 1980’s. In many of GE’s businesses and in other United States businesses, end users far outnumber professional system developers. End users use non-procedural Fourth Generation Languages to develop and implement rudimentary systems. Many end users use personal computers while others work solely on mainframes. A growing percentage work on both.

GE now has 26 information centers. They are staffed by three to ten information systems professionals especially assigned to support and promote end user computing. As end users become more experienced, they expand their horizons and frequently install local area networks so they can share data and programs. They quickly outgrow stand-alone applications and want ready access to corporate databases and external databases.
Most of these end users do not know the meaning of the words “boot,” “crash,” “operating system,” or “data flow diagram.” They do not want to design systems. They want to start implementing systems immediately and to easily change them later. Since they are the people who originate the system requirements, they do not need “traceability” between requirements, design, and code. They do not want to have to refer to user manuals. They want easy access to corporate data bases and outside databases that are administered by others. They definitely do not want the system to crash and do not know what to do if one does. They want complete fault tolerance. They want a seamless development, implementation, and operation environment in which the operation system is invisible and development can be accomplished using only screens, menus, screen pointers, and other non-procedural interfaces.

**Development Using Individual PC Workstations**

The hottest topic among software developers in GE these days concerns software development on Personal Computers (PCs). Managers want to use PCs to develop systems that will run on the mainframe. They want to offload as much mainframe development work as possible to take advantage of the significantly lower costs on the PC. They want to use the PC to develop systems for multiple types of mainframe computers. Developers of PC applications want to be able to have the functionality of mainframe tools available on PCs at PC software prices.

A big disadvantage of systems development on PCs is the difficulty of defining and accessing common data from multiple PCs. In addition, integration test and systems test of mainframe applications is almost impossible in most PC operating environments.

Developers want PC operating environments that provide all the comforts of a centralized mainframe at PC prices. Obviously developers want operating environments where linked PCs have common and concurrent access to databases under development. They want mainframe development tools that work on PCs to develop applications that can run on different target mainframes. They want operating environments that enable systems integration and test on the PCs as well as easy transfer to mainframes. They want to be able to change database structures in a transparent mode without effecting the applications in any way.

**Information Resource Development for Distributed Processing**

The third force of change is the realization by many organizations that data and information need to be developed and managed as a distinct and integrated resource separate from the processing systems that support and use them. Organizations encounter their Information Resource Management (IRM) problems as smaller subproblems such as data base integration needs or availability of distributed data for relational access by end users. They quickly realize, though, that they need solutions that encompass the entire enterprise. Often, the data and information is controlled by distributed organizations using a mix of incompatible communication and processing facilities.

IRM developers want enterprise-wide active data dictionaries and data repositories that can be used by developers operating in a distributed environment. They want an operating environment that handles the communication and control, making the data appear as if it resides locally. They want to be able to change the physical characteristics of the data without impacting the applications. In short, they want to be able to develop and manage information resources in a way that is transparent to developers and users.

**SUMMARY**

The operating environment characteristics that I have said we need are: invisibility, fault tolerance, non-procedural fourth generation interfaces, seamless interfaces between development and operation facilities, global information resource development and management, PC development for mainframes execution, application portability, and data independence.

All of these technological capabilities exist today in one system or another. The three forces of change are demanding that they be integrated under one operating environment for each major computer and software system vendor. As soon as vendors understand this and see the market potential, they will provide the capabilities. We as users must understand how to exploit the new capabilities. Since the technology already exists, it is almost certain that the major operating environments of the late 1980's will include them.