MEDICAL OFFICE AUTOMATION USING
MULTIFUNCTION DISTRIBUTED INTELLIGENCE COMPUTER SYSTEMS

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Abstract

Medical industry focus will soon dramatically shift away from <personal computers> towards <cluster> and <network>-oriented <multi-function workstations>.

<Distributed Intelligence> computers are presently available at microcomputer prices, with a performance level, flexibility, and sophistication which far outstrips that of <personal> and <shared-logic> computer systems being touted today for automating medical office activities.

Continued investment in <personal> and <shared-logic> computer systems for medical office automation appears shortsighted in light of clear trends in both the medical and computer industries toward systems which must accommodate advanced communications, graphics, and integrated diagnostic equipment capabilities.

Terminology

Before proceeding further, let me clarify further some of the important terminology that has been introduced:

<Cluster>

A group of co-located <multi-function workstations> which are interconnected via a local, high-speed communications interface (at 300,000+ baud) to share such common peripheral resources as printers and disk storage.

<Distributed Intelligence>

In distributed processing systems, as they are sometimes called, the CPU's (central processing units) are decentralized. Each user's access to the processing power of the <cluster> or <network> system is no longer through a terminal, instead through a <multi-function work-station>. When <workstations> are clustered together with a high-speed local network, on-line user's then share expensive peripherals and data bases, but not processing power. The addition of <workstations> to a distributed processing system, unlike the addition of terminals to a <shared-logic> system, contribute additional processing power, accommodate new user requirements for additional functions and provide additional system reliability through CPU redundancy.

<Multi-function Workstations>

A complete desktop computer with <network> memory, character and graphic video display, local disk storage, powerful communications, and medical diagnostic equipment interfacing capabilities. Typically, each <workstation> would have memory addressability up to 1MB, local disk storage up to 40MB, and a variety of communications protocols supporting local clustering and external access via TTY, SNA, X.25 etc.

<Network>

At least two <clusters> which are interconnected to provide common access to peripheral devices such as printers and disk storage by all <network> users. Communication is typically implemented via a dial-up telephone line whose communications speed is limited, by among other factors, the modems selected (typically 1200 to 4800 baud).

<Personal Computers>

This broad category of computer equipment is perhaps best described as operating in a standalone fashion with rather limited processing, storage and communications capabilities. A current rule-of-thumb would be memory addressability up to 64KB, disk storage of 5MB or less and simple TTY communications for file transfer at 300-1200 baud.
The main reason for shared-logic is to distribute input/output (I/O) capability to more users while sharing processing power, on the premise that the cost of terminals is relatively minor compared to the cost of computing power. However, with the introduction of low-cost and powerful microprocessors, the argument behind cost saving through shared-logic is no longer valid. The cost of processing power (the aggregate of CPU, RAM and I/O electronics) will comprise less than 25% of the total equipment cost by 1985, while the "carcass" cost (for plastic, glass and metals) will comprise over 30% of the total cost. In shared-logic systems, processing power is centralized. As terminals are added to the system, the CPU is strained not only by the additional processing demands, but also by the need to handle all communications, housekeeping, program storage and loading operations, resulting in slower response time for each on-line user. (shared-logic) systems also result in system down-time for all users when the CPU fails. Because all application functions for on-line users reside in the single CPU, as new functions are added to the system, additional memory is required, and the CPU's performance is further degraded.

Introduction

Historically, medical office automation has been hampered by the high cost and inflexibility of the computer hardware and software products available in the marketplace. The options available in the past were limited to choices between service bureaux and rather large and costly shared-logic minicomputers.

With the advent and availability of personal computers at attractive prices, considerable interest and focus on how they could function as office automation systems has been generated in the last few years - as evidenced by recent SCAMC Proceedings and Software Exchange activities.

Unfortunately, most microcomputer-based medical office computer systems being promoted today frankly are not office automation products, but rather fragmented application programs. The processing, storage and communication limitations of current stand-alone and most shared-logic microcomputer products today severely hamper their ability to effectively address the need to process and communicate data, text, and graphic information within group practice office settings and between increasingly complex networks of multi-location practices, much less accommodate the vision of a fully-integrated diagnostic medical facility.

Cluster and network-oriented workstation computer technology is relatively new. Naturally with innovation comes misunderstanding, skepticism, and market resistance; however, this technology holds the solution to medical office automation, and is presently available at microcomputer prices, with a performance level, flexibility and sophistication which far outstrips that of the Personal and Shared-Logic computer systems being touted today.

As Physicians gain a greater appreciation for the complexity of the medical office automation issue and a better understanding of the trend in the computer industry away from shared-logic computer systems, medical industry focus will shift dramatically towards multi-function workstations in a distributed processing environment.

According to John Cunningham, the President of WANG Laboratories, Inc. "the low cost of Personal Computers has led many users to buy first and later think about how to use them" ... "current stand-alone personal computers will be obsolete by 1990 because ... it will be recognized that a multi-function workstation is needed more than a personal computer"... "today's stand-alone personal computers will turn out to be a shortsighted investment" ... "the multi-function workstation will supersede the standalone micro."

This view is further supported by a comprehensive study prepared by International Resources Development, Inc. It is clear that projections for the 1980's show that both Data Terminal, Personal Computer and Word Processor Sales drop-off, whereas Multi-function Workstation Sales are expected to skyrocket! (See Figure 1, The Growing Multi-function Workstation Market.)

Trends in Group Medical Practice

Statistically, there is an increasing trend in the medical community towards group medical practice. While there is controversy over the dominant factors responsible for this trend, it is clearly occurring.

A recent study by Freshnock examines the most recent data available concerning
Investment in a personal or shared-logic computer system at this time appears unwise in light of the clear trends emerging in both the medical and computer industries.

The performance characteristics, flexibility and sophistication of multifunction workstations, coupled with their attractive price, make them a strong candidate for consideration when evaluating medical office automation systems.

![Growing Multi-function Workstation Market](image)

**Figure 1**
Growing Multi-function Workstation Market

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Conclusions

The decade of the 1980’s marks a new era in medical office automation, witnessed by trends developing within both the medical and computer industries.

Medical office management needs are increasing as no other time in Medical History, in parallel with the overall trend towards group medical practice. At the same time, powerful multi-function workstations for use in distributed processing environments are becoming available at microcomputer prices in the computer industry.

Physicians considering a computer system for their medical practice, whether presently a sole practitioner or not, should carefully consider the purchase of a Multi-function Workstation, Distributed Processing System.

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References

