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The Business Benefits of PC Office Systems and End-user Computing at Glaxo Pharmaceuticals 1984-88

by Martin Wynn

Abstract

Since 1984, Glaxo Pharmaceuticals has seen a dramatic expansion in the use of desktop personal computers. The use of these machines for spreadsheet modelling and data analysis, databases, graphics, word processing, project planning and statistical analysis, computer-based training and expert systems has transformed the nature of computing within the company and provided a platform for significant new co-processing developments. Over 1,300 personal computers have been installed in the company's four sites, providing a range of business benefits in terms of improved efficiency and effectiveness. Case studies of how these benefits have been provided are described, and a number of key issues for managing such change are discussed.

Introduction

Over the past four years, Glaxo Pharmaceuticals has experienced a rapid transition from a situation, where one in five staff had a computer terminal linked to the mainframe and almost nobody had a PC, to today's status quo in which one in three staff are linked to the mainframe, a third of them via terminal and the rest through the use of PCs. This change has paralleled the dramatic growth and improvement in PC-based office systems during this period, and has had significant repercussions on the nature and scope of standard office computing functions. Through the use of detailed examples, this paper examines business benefits gained with PC software and then, in conclusion, focuses on an action list for managing the introduction of PC systems.

The growth of office systems and end-user computing

In 1985 the European shipment of PC workstations overtook shipments of simple terminals (i.e. video display units and keyboards, with very little pro-cessing power, acting as windows into a mainframe or mini environment - see Figure l) and today shipments of PCs outstrip terminal shipments by more than 50 per cent. This general trend has been more than evident in Glaxo Pharmaceuticals, where the number of PCs has increased from under 50 to over 1,300 over the same period, while terminal users have declined from 1,200 to 600.

The growth in PCs at Glaxo can be linked - as part cause, part effect - with a transformation in the scope and sophistication of standard office computing systems and end-user computing tools. In 1984, there were over a thousand users of mainframe office systems in Glaxo, over 600 of these being electronic mail users (see Table 1), with PC-based end-user computing being

restricted to a few spreadsheet users in the sales, marketing and market research areas. By late 1988, one in four staff had a PC or portable; of these, six out of ten had a spreadsheet, four out of ten had a graphics package and a word processor, and three out of ten had a database package. Whilst the use of mainframe graphics modelling and word processing has almost disappeared, there are currently over 2,500 (over half the entire staff) electronic mail users, representing a fourfold increase since 1984.

Databases and spreadsheets

Databases are possibly the most powerful end-user tools of all the functional 'off- the-shelf' packages, while spreadsheets are the most common. A PC survey carried out at Glaxo in July 1988 revealed that for every PC database system written by the company's Information Management Division (IMD), end users had developed three systems for themselves. In the absence of detail on systems developed by end users, the focus will be on those PC systems provided by IMD on direct request from end users. Authorisation for these systems was done on an *ad hoc* basis, and approval for resource allocation from higher management levels was not required. The full list of database systems developed for end users by the End User Support and PC Systems Groups is as follows:

End-user system name	Software	User department
Electronic faces folder	DB3+/Tencore	Allen & Hanburys
Medical records	DataEase	Medical Centres, Ware and Speke
Unpublished journals	DataEase	Allen & Hanburys
Label reconciliation	DataEase	Stores, Barnard Castle
Materials requisition	RBase 5000	Pharmaceuticals Development Group, Barnard Castle
Medical terms dictionary	Pascal	Stats & Data Monitoring, Greenford
Accident records	DataEase	Health & Safety, Ware
Project engineering management	DataEase	Glaxo Production & Engineering Services, Greenford
Piriton	DataEase	Allen & Hanburys
FACT	DB3	Product Development, Greenford
Volmax	Sympathy	Duncan Flockhart
Media scheduling	DataEase	Creative Services, Greenford
Planning & budgeting	DataEase	Duncan Flockhart
Action reporting	DataEase	Health & Safety, Ware

BUSINESS WORKSTATIONS: Market Trends
European Shipments (in units)

TERMINALS ------------------ PCs ▬ ▬ ▬
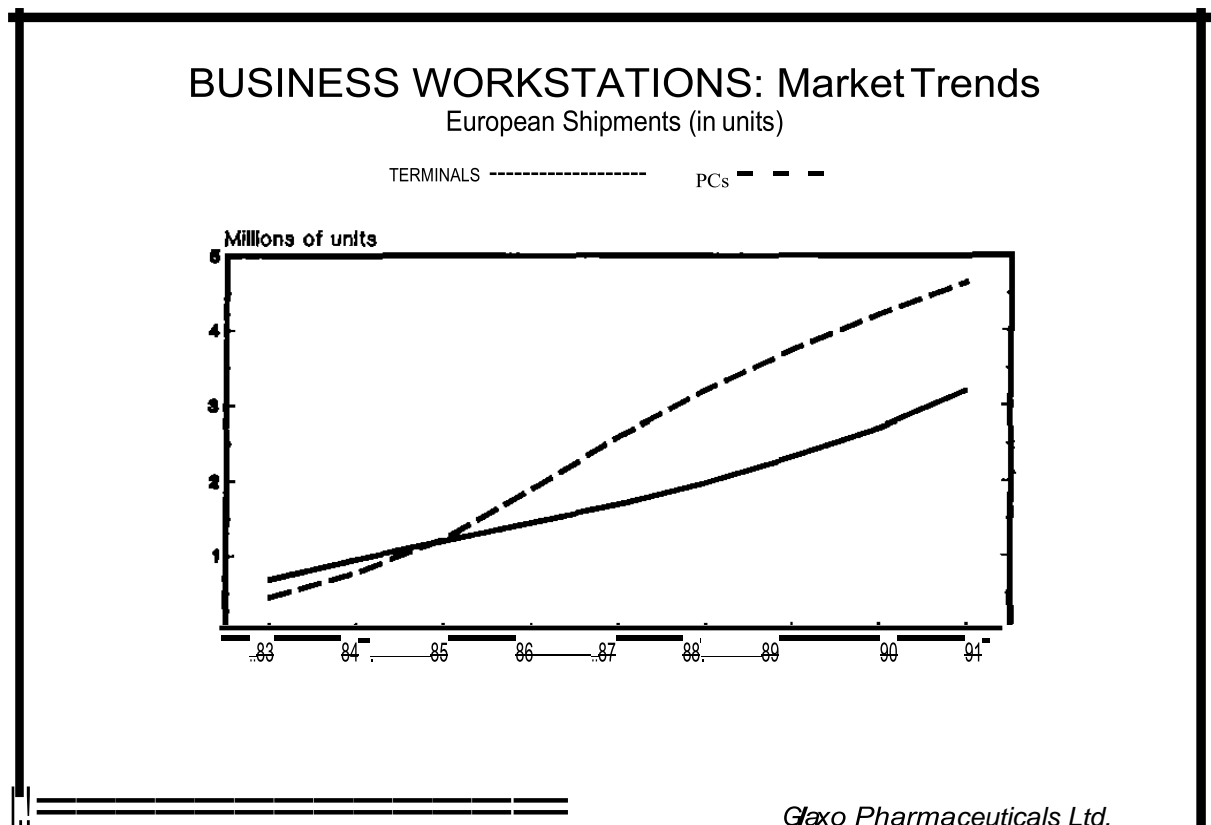
Millions of units

Glaxo Pharmaceuticals Ltd.

Figure 1. Business Workstations: Market Trends

The European shipment of PCs overtook that of terminals in 1985. The projected increases since 1986 have materialised to date. Source: IEE + Dataquest

Example: Medical Records System

Background

After reducing the surgery staff at Glaxo's Speke site to one full-time occupational health nurse and a part-time medical officer, the need for the automation of medical records became more pressing than ever. The amount of time required to maintain the manual records and produce statistics from them was overwhelming. The main requirement then was to replace tedious paper records with an efficient, easy-to-use computer system. An automatic patient recall procedure and improved historical statistics would also give benefits not easily obtainable from the existing manual records.

Why Data Ease?

Although no deadline was imposed for completion of the development of this project, resources in terms of computer staff were limited. Thus, the need was for a database package, which could be programmed to the users' requirements, but with fast development times. The more conventional micro systems development packages such as dBase III+, Rbase 5000, Revelation, etc., were therefore rejected. DataEase provided the solution, as its form creation system and query language can cope with most requirements and, in experienced hands, gives exceptionally fast speeds of development. It is a fully relational database system allowing one-to-many, many-to-one, and one-to-one relationships between any form, on any field within the database.

Although DataEase lacks the ultimate flexibility of a conventional programming language, it has proved appropriate in this and several other systems developed at Glaxo. As a fourth generation programmer productivity tool, it has many advantages, but it is also a very user-friendly system as many users within the Glaxo organisation have discovered.

Functions of the system

As the users' previous contact with computers had been very limited, the central core of the application was handed over to them at an early stage to experiment with using test data, and to help them to refine their ideas and needs. This learning period helped the users to understand the computer and become acquainted with the keyboard, and helped the application developers to define the system specification more tightly.

Following this initial learning period, data on all personnel at the site was downloaded from the HP3000 mini-computer on site. This initial down-load consisted of employees' name and clock number only. It is hoped in future to add further information from the company personnel systems to avoid extensive re-keying of data which already exists.

The first use of the system was for issuing passouts. This has been successful, and the ability of the computer to collect statistical information in this area has been a time saver for the medical staff. To this basic task, others have been added, and the current list is as follows:

- Personnel details
- Change of GP History
- Change of address history
- Change of name/married history
- Employment/leavers history
- Passout issuing and records
- Sickness absence records
- Audiometry examination records
- Smoking history
- Pregnancy records
- Medical examination records
- Occupational illness/injury records
- Significant medical details
- Death register
- Recall system
- Medical restriction issuing and records
- Vaccination records

There is, of course, extensive reporting to cover these records - around 30 reports are currently available. The user also has the ability to produce *ad hoc* reports. The central master file contains basic personal details with a range of other files linked to key data items on this central file (see Figure 2). System development work by end-user support staff has so far required approximately four man months - somewhat more than the average four to six weeks spent on most such systems.
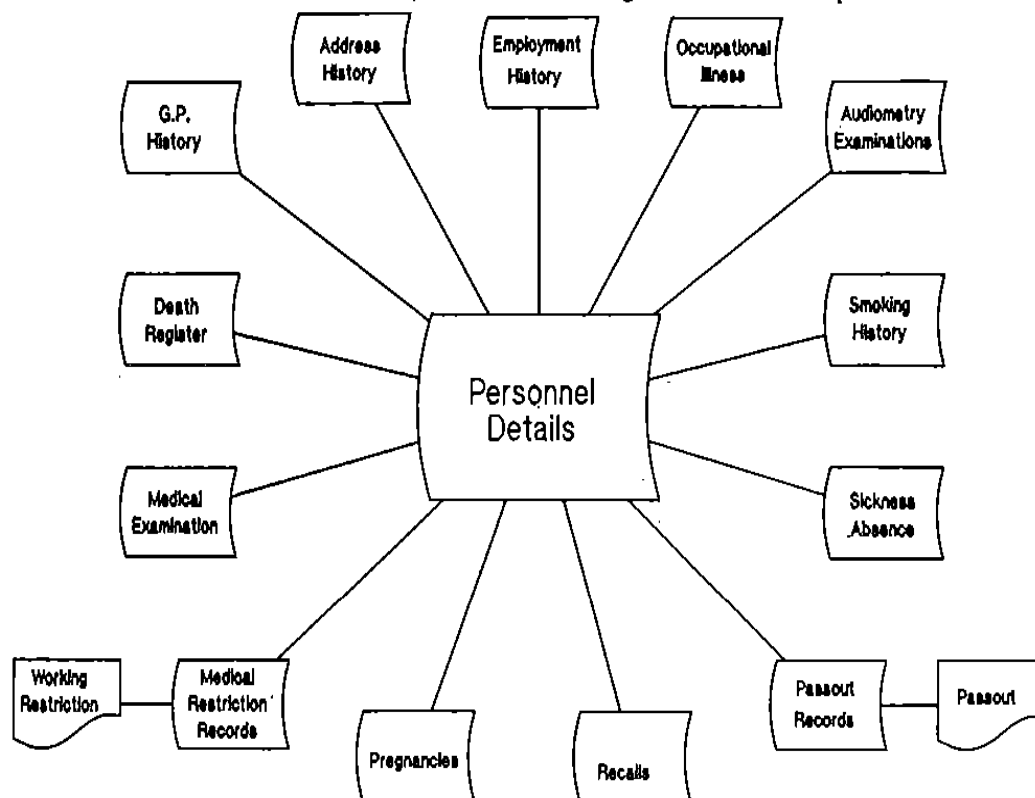
Figure 2. The Medical Records System File Structure.

The system is written in DataEase, which is a fully relational database, allowing one-to-many, many-to-one and one-to-one relationships between any fields on any forms within the database.

Graphics and electronic presentation systems

Graphics packages are now as common as word processors, and the two increasingly go hand in hand as standard secretarial software. They are used mainly for departmental reports and presentations. The data is still input manually for the most part (over 50 per cent), but electronic transfer into graphics packages should increase in the near future as integration with mainframe databases and office systems and other PC packages improves.

Example: Videoshow applications

Background

In 1986, the Videoshow presentation system was marketed through UK distributors for the first time, and by mid-1988, there were eight Videoshow systems in the company. The impact of this technology was enormous. The standard presentation in the boardroom and conference halls has been transformed, while Videoshow add-ons have provided a cost-effective slide-making function that has challenged other more conventional methods.

Presentation Design Software

There is a range of software packages available that are compatible with this system, but the main two are PictureIt and Freelance Plus. They run on IBM PC compatibles. PicureIt enables the user to design bar, pie, line, organization and word charts in a range of predetermined

formats. It is extremely easy to use and contains sufficient variety to facilitate the design of a reasonable presentation.

SYSTEM/LOCATION	Greenford	Barnard Castle	Speke	Ware	Total
DSC - Decision Support Graphics	28	5			33
EPS - Evaluation & Planning System	35				35
FCS - Financial & Corp Planning System	22				22
HP LIST – List Keeper	34	5	6	1	46
HP MAIL – Email System	328	95	82	98	603
HP SLATE – Managers' Word processing	108	33	32	47	220
HP TELEX – Telex System	23	9			32
HP WORD – Full function word processor	54	11	15	16	96
TDP – Text and document processor	2				2
EZCHART – Easy chart preparation	2	4			6
HPDRAW – Presentation aid creation	2				2
TOTAL	639	163	135	162	1099

Table 1. Users of Office Systems on the Glaxo Company Network 1984.

With the exception of electronic mail (HPMAIL) and telex (HPTELEX), these mini-computer based office functions have now been transferred to run on the Company's 1300 PCs.

For more specialised needs, Freelance Plus can be used. This is a freeform drawing package, with a range of icon libraries, and can be coalesced with PictureIt images. Graphs can also be imported from other software packages (including Lotus 1-2-3 and Symphony) or plotted in Freelance Plus, Graph Writer or PictureIt direct from information held in spread-sheets. Standard 80 column 25 line text screens can also be converted to VideoShow format and edited using VIP.

VideoShow Presentation system

Having prepared the presentation with software running on the PC, the PC can now be forgotten (for the time-being at least). Armed with the floppy disc containing the VideoShow images and the VideoShow presentation hardware, the presentation can be given to a large audience via a projector (e.g. Barco Data 3 or Electrohome ECP 2000) or a colour monitor for smaller audiences. The wide range of colours available (1,000), as well as the range of formats available, make this a convenient way to present material suitable for a 35mm slide presentation.

The obvious advantages include the portability of the presentation (one floppy disc can hold as many as 200 images) and the fact that the presentation is always in the correct order, the right way round and there are no focusing problems. (Ease of editing will be dealt with in the following section).

The main disadvantages are that the hardware is not always easily available and that photograph style images cannot be generated. Now, however, with the new VideoShow Professional, photographs can be scanned in, and incorporated in such presentations.

Slide and overhead acetate design and production PhotoMaker allows a VideoShow presentation to be converted to high quality 35mm slide format, using standard colour transparency film (e.g. Ektachrome 200), together with the VideoShow computer and a camera. A new system, Photometric, allows slides of even better quality to be generated direct from the designer PC. Both these systems have the basic disadvantage that only PictureIt-compatible software graphics can be used for slide production. With VideoShow Professional, slides can also be made from scanned-in images or images captured with an RGB video camera.

Other software graphics can be photographed direct from the PC, albeit at lower quality, using the Polaroid Palette camera. Using this equipment, virtually any IBM-compatible software can be used to generate 35mm slides.

Generating in-house 35mm slides has many distinct advantages over going to outside specialists, the most important of which is cost savings. A short case study follows.

372 slides were produced with PhotoMaker

From February to June 1987, the cost of the film used was £78, or 21p per slide, excluding staff time and photographic developing. This compares favourably with a minimum cost of £7 or £8 for producing one 35mm slide through a commercial agency (a cost which excludes artistic design and courier fees). At £8 per slide, the cost would have been £2,976. The cost of the PhotoMaker camera and software is £2,631 (before any corporate discount which might apply), i.e. the system paid for itself within five months through producing just a small proportion of the slides used at Glaxo.

The figures in brackets below include the cost of the IBM CGA card and the monitor required (as Polaroid Palette would not run off the HP multimode card used at Glaxo in 1987, although the new release of Polaroid Palette will now do so). The break-even numbers are calculated using a commercial cost of £8, the actual cost of 21p, and disregard the cost of PC, Video Show, design software, and user time to design slides. These extra costs will be offset by a reduction in expenditures for graphics designers, couriers etc.

Comparative Costs	Photomaker	PhotoMetric	Polaroid Palette
Cost	£2631	£5760	£1685 (£2283)
Slides to break even	338	734	216 (293)

There are some disadvantages to using these systems - there is a slight loss of photographic quality compared to good agency-produced slides, and there are limitations to what the software can produce, but improvements in both hardware and software are reducing these problems. Also, not every PC user has the design skill or taste to produce good-looking colour images.

The advantages other than cost of using this technology outweigh the disadvantages. The average presentation of 20 slides takes about three working days to produce from scratch (we have done it in one) and copies can be produced in less than six hours. The software is very easy to use (especially PictureIt) and takes very little time to master, with non-computer

personnel able to produce excellent results after only four hours' experience. Editing is simple and very rapid, thus allowing managers and trainers to take an active role in the artistic design and editing of their slides. Edits to discs have been executed within ten minutes of presentations starting and during the process of slide shooting. Since the whole process (including photographic developing at Glaxo) takes place on site, sensitive information remains secure.

PrintMaker is a system, which allows paper or overhead acetate hard copy of VideoShow images to be produced using a colour inkjet printer (e.g. Xerox 4020). The quality is very good, but the system is less cost-effective than the PhotoMaker, and the printing is slow with manual paper acetate feed. Technology is advancing, and the newly available PrintMaker C allows auto feed and uses a high-quality printer (Calcomp PlotMaster).

The Document Processing Spectrum

HP Word/PC	Manuscript	Aldus PageMaker
AdvanceWrite	AdvanceWrite +	Ventura Publisher
WordStar	MS Word	

Advanced
Word Processors

Basic
Word Processors
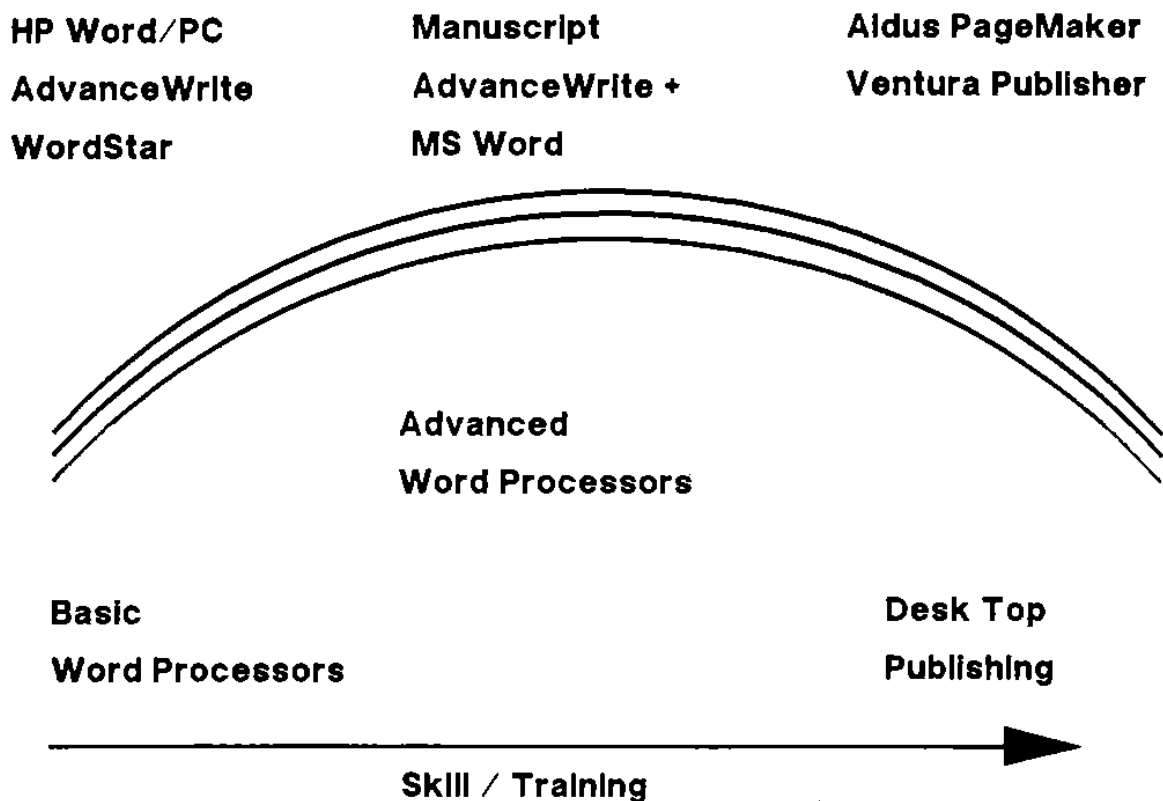
Desk Top
Publishing

Skill / Training

Figure 3. The Document Processing Spectrum.

A new standard for word processors is now emerging that combines the approach of traditional word processors with the features of desktop publishing packages.

Word processing and desktop publishing

Over the past four years, word processing has undergone different forms of growth. In 1984-86, the transfer of our own secretarial/office staff to one common mainframe word processing system (HPWord) was completed. Then, in 1987-88 as the PC became the standard desktop machine rather than the terminal, users were transferred to a PC-based version (PCWord) of the mainframe packages, thus minimising the need for retraining. With this process now almost

complete, the company is about to embark on a further change that will make more sophisticated word processors the standard for secretarial use.

This last move has been driven in part by the well advertised features of desktop publishing packages, which require a skill level normally beyond that of the average secretary, and which also require specialist workstations (a 80386 chip, and a PostScript-compatible printer) if acceptable performance is to be achieved.

This has resulted in the introduction of only two desktop publishing workstations (running PageMaker and/or Ventura), although several more should follow soon. However, it is expected that the standard document processing software available to secretaries will include some DTP functions such as graphics and scanned image importation, winding columns, more downloadable fonts etc. This software needs to run on standard workstations, without a dramatic increase in the skill level and range required to achieve good results. It points to a move to the type of mid-range product in the document processing spectrum (see Figure 3) such as Lotus Manuscript or Advancewrite Plus and a company-wide move to such a product is likely to occur in the near future, possibly to coincide with the adoption of the more user-friendly interfaces now offered by MSWindows, and promised for the future by New Wave and Presentation Manager.

Example: direct mailing to doctors by Customer Information Services (CIS)

Background

The direct mail service to doctors was set up in September 1986 to produce highly personalized letters to support the company's sales and marketing objectives. Some 300,000 letters a year are produced which, until mid-1988, were done exclusively using mainframe word processing software and mailmerge functions, outputting to laser printers on to a variety of pre-printed, headed paper. The operating cost was an estimated £40,000 a year.

Limitations and needs

The system was limited in several ways. The quality of letters was rather poor, creating for doctors a poor company image not commensurate with Glaxo's number one position among pharmaceutical industries in the UK (and No. 2 in the world). The run time for the production of letters, which required setting up and kicking off mainframe 'jobs', reduced the usefulness of the services and restricted the user base. At the same time, the limited capabilities of the software restricted creativity and innovation in the composition of letters. Flexible, sophisticated and easy-to-use software was required that would facilitate the inclusion of scanned signatures, graphics, photos, and conditional mailmerged text items. Equally important was that the system be robust enough to output 500 letters a day in the first instance, and subsequently over 1,000 a day.

A micro-based solution

After extensive testing by Information Management Division's PC Systems Group, the final recommendation was for a system based on the Apple Macintosh computer with a Dest image scanner for signatures and photo input and two Apple LaserWriter printers as output devices. The main advantages over an IBM PC-based solution were the user friendliness of the Apple software (MSWord and MSWorks), and above all the speed of output facilitated by the

PostScript compatible LaserWriter printers and their integral Motorola chips. Even on 80386 Intel chip PCs with added PostScript cards, the speed of output could not be matched. The power of the software is not yet sufficient to enable the conditional mailmerging of text and graphics, but this should be available soon. At the same time, the two printers will be in almost constant use and more robust printers made by Agfa and Texas Instruments may be used in due course. The total cost of the system was £28,500.

Business values

The business value of the direct mailing service undertaken by customer information services is generated by five basic types of letter, and can be calculated in two separate ways:

1. The contacts achieved by direct mailing in 1987-88 are estimated to have been over 6,000, with a further 44,000 contact opportunities created. The enhanced service facilitated by the new system will attract a larger user base and add an estimated £100,000 a year in value of business.

2. Measured against alternative agency services, it is calculated that the Glaxo trading companies saved £338,000 in the last year by using the in-house service.

Computer based training (CBT) and image capture

Since 1985, approximately 30 CBT packages have been developed by Information Management Division using the Tencore authoring language (Wynn, 1988). Most of these have been for sales and marketing training. The full list is as follows:

Computer-based training modules (as at 4 October, 1988)

The Human Body

Anatomy of the Respiratory System; Pathology of the Respiratory System; Anatomy of the Cardiovascular System; The Cardiovascular System - anatomy, physiology, pathology, therapy (incorporating image capture).

Product Knowledge

Becotide; Ventolin; Competitors to Becotide and Ventolin; Allen & Hanburys Minor Products;

Eudemine; Fortum learning.

Factory practice

Good manufacturing practice; Permit to work/Safety at work; .Tablet manufacture at Ware.

Management

The principles of getting results; Guided practice for getting results

Quizzes

Quiz for respiratory care team - questions taken from anatomy of respiratory system, *Becotide* and *Ventolin* training modules.

Glaxo laboratories products *(Zantac, Ceporex,* Topical Steroids); Cephalosporins l (*Ceporex, Fortum, Zinacef* and general); Cephalosporins 2 *(Fortum, Zinacef);* Cephalosporins 3 *(Ceporex* and Topical Steroids); Gastroenterology, antibiotics and dermatology.

Others

Dynamic territory management l; Dynamic territory management 2; Introduction to the Vectra; Introduction to the Vectra ES/12; Have you used a computer today?; Diagnostic Aid for Asthma - Pilot Project; PCC Silver Disc Presentation; PCC June - Case history of CBT in Glaxo presentation.

Example: the cardiovascular system, incorporating image capture

The possible use of interactive video (IV) for training purposes has been constantly reviewed at Glaxo, but has found very limited application because of the higher development and delivery costs. It is estimated that IV development costs four to five times more than standard CBT, while the delivery workstation (laserdisc or tape player, high resolution PC monitor) costs two or three times the standard PC workstation. Characteristically, then, one is faced with the choice between a low-cost/ limited-impact training solution (standard CBT) and a high-cost/high-impact solution (IV), with most users having firmly elected for the former.

In Glaxo Pharmaceuticals, however, for the past two years, we have pursued what might be seen as the best of both worlds - a low-cost/high-impact solution - which incorporates photo-like captured images, digitally stored on magnetic disc (the PC hard disc) and deliverable on standard PC workstations of EGA or VGA standard. This has been achieved only through considerable in-house development effort and constant liaison with relevant software and hardware suppliers.

The fruits of this labour can now be seen in the Cardiovascular System CBT prototype currently being developed for Glaxo Holland. It incorporates animated lifelike images of the heart and lungs, which have been captured from photo originals, with a video camera linked directly to the capture PC workstation. Another example of how this technology has been exploited is the Electronic Faces Folder database of sales representatives being developed for Allen & Hanburys. The key point here is that these packages can be held on standard magnetic media and deliverable at standard workstations, providing a dramatic enhancement for a limited overhead (about £10,000 for a complete development system) on development and no extra cash cost on delivery workstations.

Expert systems

PC-based expert systems have made a significant, if limited, impact in Glaxo Pharmaceuticals over the past 12 months as the costs and resources required have been set against potential benefits and a realistic list of projects has emerged. These projects, unlike the other PC systems discussed to date, have had to compete for resources alongside all other possible system developments in a period where the overall development budget has been cut. This has contributed to a certain 'toning down' of the expert system initiative for the time being, but it is nevertheless clear that they offer enormous potential benefits in the sharing of company knowledge of one sort or another, and are likely to grow in number and significance over the next few years.

Example: Rupert

Within Glaxo Pharmaceuticals, there are several expert systems either in use or under development. The most well known of these is *Rupert* (Resolves Users' Problems Expertly), the expert system used by the operators of the HP3000 network Helpdesk (See Figure 4).

Various expert system tools and shells have been tried. Shells have so far been rejected because of slow response times, inflexibility, lack of graphics capability, and not-very-user-friendly interfaces. While some of these limitations are currently being overcome by new software releases, the major expert system tool used in Glaxo remains the PCL PC-based procedural programming   language, and a fast, flexible shell (CASSANDRA) written in that language in-house.

The Helpdesk used to be manned by a senior network analyst who used his expertise to help solve users' problems. With the increase in network usage throughout the company, it was decided to increase the number of people dealing with users' problems and to assist them by using an expert system.

Rupert has encapsulated some of the experts' knowledge and is able to apply it to users' problems. By asking a series of questions, *Rupert* can home in on a problem. In some situations, it can take action such as aborting a users' session, disconnecting a terminal or asking the user to perform some action such as pressing a key etc. In other cases, where *Rupert* is unable to provide a full solution, the call is passed on to the support group which, in *Rupert's* judgement, will be able to deal with the problem.

In addition to helping to solve problems more quickly, *Rupert* also produces fault statistics, which help IMD to identify problem areas and thus continue to improve the service given to users.

In the first two months, the Helpdesk staff:

- handled nearly 2,500 enquiries;

- solved 70 per cent of all queries themselves;

- found that a number of queries were from users who did not understand the applications (more training courses were arranged);

- discovered that the maintenance support provided by the terminal supplier was unsatisfactory (the company asked its supplier to modify its support system).

The major benefits of *Rupert* to the company are:

- its role as a training aid for new Helpdesk staff;

- the ease with which new knowledge can be added to the system;

- that the time taken to resolve user problems has been halved;

- the improved 'image' that IMD departments now have in the rest of the company;

- the better statistics it provides about problems.

The last two benefits could probably be obtained from any Helpdesk function and fault reporting software. However, *Rupert's* excellent user interface has made this a very successful application of expert system techniques.

At the present time, the expertise within *Rupert* represents only a small proportion of that needed for comprehensive problem solution without recourse to third parties. Work is currently underway, which will markedly increase the level of *Rupert's* knowledge and further reduce the time taken to solve users' problems. It is envisaged that the system will eventually be the focal point of a comprehensive network management system.

Concluding remarks: key issues for PC and office systems management

Over the past few years, the growth of PC-based office systems and end-user computing in Glaxo Pharmaceuticals has been phenomenal. The extent of this growth was not fully envisaged and, indeed, its implications are perhaps neither fully understood nor realised by all in the company today.

The experience of playing a part in managing this growth over the past four years suggests that the following checklist may be of interest and/or value to those working in similar organisational contexts.

1. Establish standard hardware configurations. One supplier who can provide the requisite PC hardware range along with all peripherals, extra memory, extra chips, extra disc drives etc., is clearly desirable. However, in the IBM- compatible area, even the large OEMs are struggling to be fully comprehensive. At Glaxo, for example, Epsom printers were purchased for several years until Hewlett Packard brought out the Quietjet to cover the needs of the spreadsheet/document processor user, and the need for high quality colour printing (c.f. plotting) has only recently been answered by the Paintjet. Other hardware items like 3.5-inch disc drives, T-switches and spooling devices have been or remain third party supplied. An alternative is to source everything from a distributor, some of which provide a full, on-site installation service.

The aim must be to limit the range of hardware suppliers and hardware configurations without unduly limiting the business functionally of the end user. Compatibility of equipment and a sensible limitation in the support load are key considerations, along with the discounts achievable through large volume purchasing. In an IBM compatible environment, this has meant a standard 20 megabyte 640k RAM, 80286 chip machine with choice of output device from Thinkjet, Quietjet, Dotmarix, Laserjet printer (or range of three plotters), with the 'Laserjet quality' Deskjet and colour Paintjet (inkjet technology) printer being recent additions.

2. Support a limited software list. It is very easy to drift into supporting more products than is necessary, with resultant increased overheads on training and support, and likely problems with software integration. What is required to avoid this includes:

- technical competence and market awareness, so that all products can be viewed in an informed global context;

- the confidence of end users to trust one's judgement;

- control over what end users can and cannot purchase.

At Glaxo, despite having the above requisites, the supported software list is still inordinately long. This is partly because PC products have been supported for the best part of four years, during which time new products have been introduced because they are superior to others, which nevertheless remain on the supported list because not all users can justify, or wish to upgrade to, the new product.
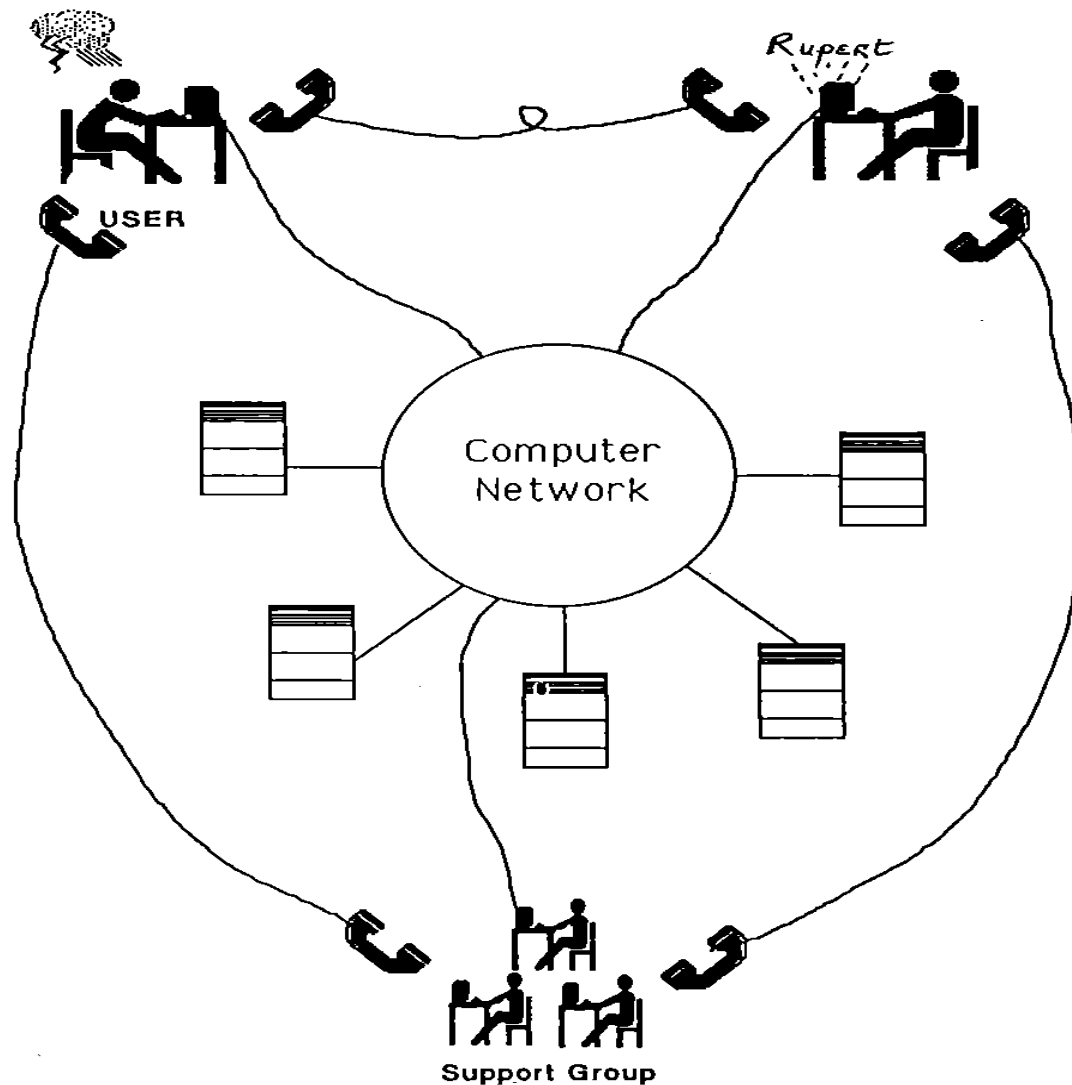
Rupert's Rôle

Figure 4. The Rupert Expert system.

The Helpdesk operators use Rupert to classify user problems for referral to second-line support groups, but also to interact with the live network and take appropriate action (e.g. abort user sessions).

Integration (or the lack of it) between products can also lead to unforeseen expansions to the software list at Glaxo. Hewett Packard's *PC Word* is the established word processor, while *Lotus, Freelance Plus, Graphwriter II* and *Picturelt* have been used extensively for *VideoShow* presentations and general graphics production. A reasonable expectation of users nowadays is that their word processor should be able to incorporate graphics, and that their word processed files can be posted around the network by electronic mail. Yet graphics created with *Freelance*

and *Graphwriter II* cannot be incorporated into *PCWord.* So why not switch to a word processor such as *Lotus Manuscript* that can take these images? Because there is no file conversion and transfer utility available to get Manuscript documents up to the HR3000 networks and into electronic mail in an acceptably user-friendly manner.

It is this lack of integration that can generally be avoided by sticking to a portfolio of products from one software vendor. The difficulty is that the portfolio has not to date been broad enough to satisfy the requirements of all PC users. It must be hoped that integration between products on PCs improves as and when the main independent software vendors produce versions of their software to run under graphics interfaces, be it *Windows, New Wave* or *Presentation Manager.* The business case for site licences for certain strategic products needs examining at an early stage, i.e. before so many copies have been purchased individually that the business case is weakened. The main database, spreadsheet, word processor and graphics packages are the obvious candidates. If site licences prove unworkable (possibly for accounting reasons), then an alternative is bulk volume purchase of all products from one software supplier at high discounts.

3. Watch out for thresholds in PC evolution. Linked to both (1) and (2) above is the need to pick the key advances in the evolution of PCs and amend hardware and software configurations accordingly. In a field in which technology and the marketplace are evolving rapidly, clearly one cannot stick inflexibly to one set of standards forever and a day. Yet, equally, one cannot forever be introducing the newest thing on the market. It is a question of getting the right balance between the two extremes by selecting key 'threshold developments' that set the new standard for an acceptable period. In 1983, it was the 8086 MSDOS HP150 machine, in late 1985 the IBM AT compatible Vectra, and it will likely change again soon with the 80386 chip machine coming down in price and OS/2 and New Wave soon to become realistic options (see Figure 5).

Upward compatibility of hardware is clearly a related issue, particularly with issues such as screen resolution (CGA-EGA-VGA), hard disc capacity (10mb-20mb-40mb) and memory (640k to 16mb). Because of the rapidity of change, leasing rather than outright purchase of hardware has become a viable alternative.

4. Understand the business environment of the end user. No matter how favourable the climate towards PC expenditure, someone has to make and understand the 'business case' for every PC and every peripheral bought by the company. The MIS department are the obvious candidates for taking charge of the PC budget, which is likely to exceed mainframe/mini expenditure in large companies once a PC user base is established. The corollary to the control of expenditure is accountability to the Board for why expenditure was made. This means the MIS department must know and understand the business of their end users sufficiently to contribute to, if not fully determine, whether a PC will enhance the business effectiveness of the recipient.

5. Get the kit in quickly! No matter what it takes, this is essential. There is nothing worse than trying to explain to users why it takes eight weeks to get a piece of software that can be bought for less than £500 in the town centre. If the answer is that it takes nine signatures before the

purchase order can go out of the door, then there is something wrong with the system and it should be changed.

One way of avoiding such delays (not tried at Glaxo) is to use the information centre or end-user support centre as a shop through which software (and possibly hardware) can be purchased. Setting up the unit as a separate profit centre is likely to help facilitate this.
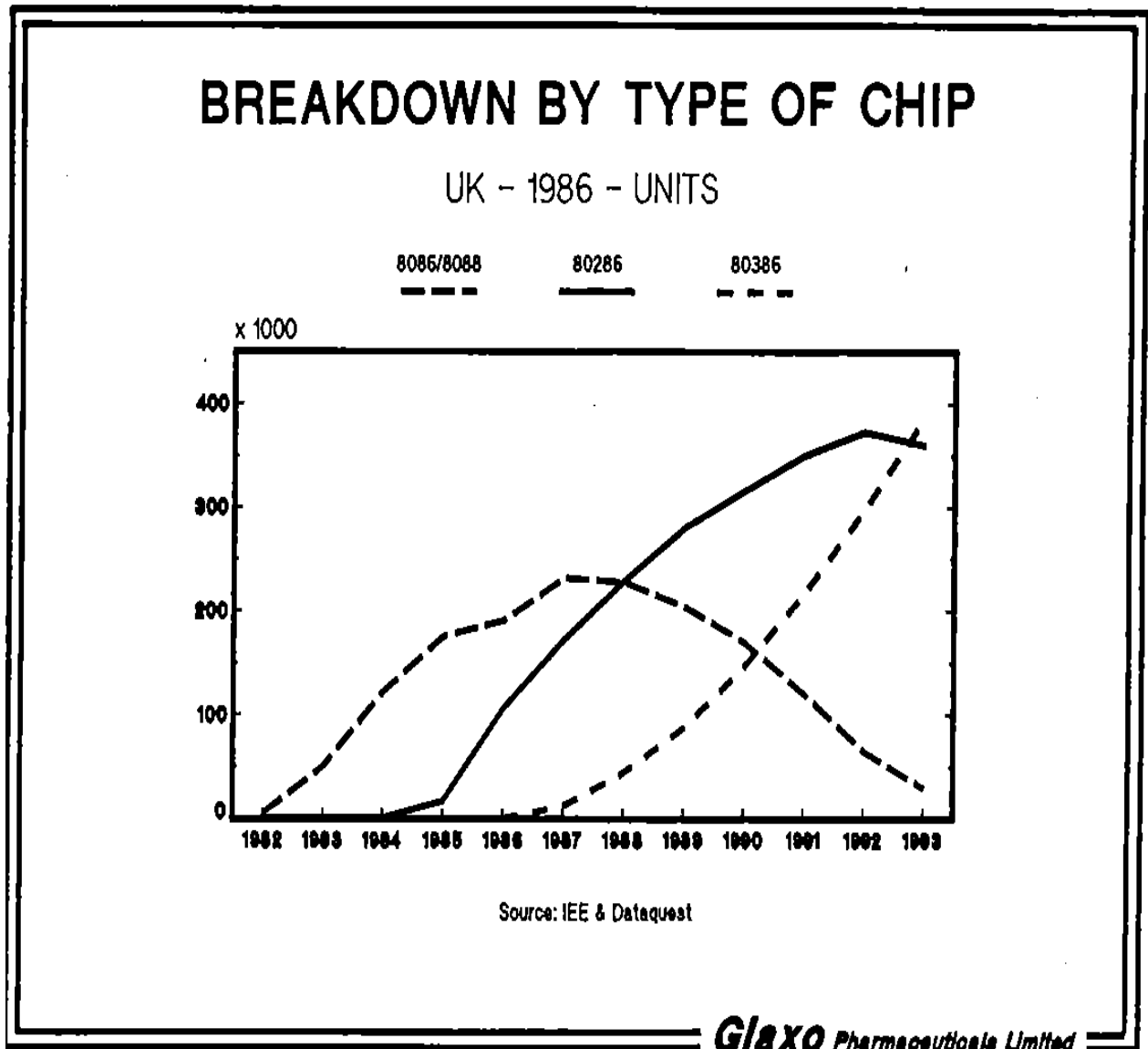
BREAKDOWN BY TYPE OF CHIP
UK – 1986 – UNITS

8086/8088   80286   80386

x 1000

Source: IEE & Dataquest

Glaxo *Pharmaceuticals Limited*

Figure 5. Projected Evolution of PC Sales 1986.
It is important to monitor technological trends and adjust procurement policy accordingly.

6. Sell the IT concept/provide the support and training. The benefit of using PCs and IT in general need to be sold right through the company from the Managing Director and Chairman down. A significant landmark of office automation is to get directors and top management using and exploiting electronic mail, while the quality of word processing, graphics and desktop publishing will always be highly visible at that level. Examples such as those included in this article can be sited whenever appropriate to show how IT is delivering benefits. In-house company newspapers can often be useful means of publicising such benefits to all and sundry.

Training and support are vital in the PC office systems areas. Without them, PC users will not gain the expected benefits, and disillusionment can follow. Some training and support can be provided by outside agencies and hot line facilities, but some in-house expertise is almost certain to be required for installation and support. An efficient central Helpdesk can provide a focus for all user problems.

Perhaps one of the greatest, if less obvious, benefits at Glaxo has been the rapid acceptance of the use of the PC as an integral part of daily business activity. This has thus provided a platform for the introduction of larger, wider-ranging systems that are based on mainframe computers but also exploit the processing power of PCs. The Territory Management System run by sales representatives on portable PCs is one such example, as is the Marketing Decision Support System. It is likely that computing functions that use mainframe and desktop processing functions simultaneously (co-processing) will increase over the next few years, as the power of desktop machines rivals that of their mainframe hosts. This is just one of many added benefits that is likely to emerge in the future as the full implications of the rapid uptake of PC technology in Glaxo Pharmaceuticals over the past few years are realised.

Reference
Wynn, M.G. (1988). Computerised training solutions at Glaxo Pharmaceuticals. *Interactive Learning International, (4)*, 3-4, 73-78.

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