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A STUDY FOR THE
EVALUATION OF THE OFFICE
COMMUNICATIONS SYSTEMS PROGRAM

Background Study

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This is one of seven Background Studies that form part of the evaluation of the Office Communications Systems Program.

The Study was prepared by William G. Hutchison & Company Limited for the Program Evaluation Division of the Department of Communications, Canada.

The views expressed herein are those of the author and do not necessarily represent the views or policies of the Department of Communications.

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EXECUTIVE SUMMARY

This report summarizes the results of interviews held with five European office automation experts to obtain their opinions regarding:

- the technical competitiveness of four Canadian office automation products developed and installed under the OCS field trial program, and
- the appropriateness of the field trial program as a method of assisting with the development of Canadian products capable of competing in worldwide markets.

The interviews were conducted by William G. Hutchison and Co. Ltd. (WGH) and its associates in Europe, on behalf of the Program Evaluation Branch of the Department of Communications. WGH produced video films of system demonstrations given by the designers of each of the Canadian products. The films, along with currently available technical information, were reviewed by each expert during the evaluation interviews. Further details of the evaluation methodology are provided in Appendix A.

In summary, the experts agreed that the products demonstrated under the OCS field trial program are all technically competitive with present office automation technology. With the exception of Comterm, the products were seen to be somewhat weaker than currently available products with respect to their marketing oriented features. The experts deemed marketing features to be more important than technical competitiveness for the eventual success of the product.

The Comterm product stood out because:

1. It adopted a strategy of building on existing technology rather than trying to "reinvent the wheel".
2. It is based on widely accepted industry standards in both hardware and software.
3. It is developed as a series of functional blocks, providing the user maximum flexibility in selecting a system.

The field trial process was applauded as a method of industrial stimulation because it enables both the developer and the marketer to remain in touch with the user's needs throughout the development and installation. On the other hand, based on information available for their evaluation, the experts felt that the products evaluated might not be particularly successful in international markets because of the apparent absence of focus on marketability in the initial stages of product design. If the experts' view becomes reality, then the field trials in their present form will not have been successful as a method of stimulating increased exports of Canadian products.

The experts suggested two recommendations for DOC regarding the field trials:

1. Now that the investment is made in supporting the products to their present level, follow-up investment is required for the marketing push to include the incorporation of improved market oriented features. One expert estimated that over 50 percent of the cost to develop a new product is marketing cost.

2. Before launching future field trial programs, commission independent marketing experts to enhance the definition of and focus on target markets. With an understanding of market requirements and the relevant industry and government regulations that must be met, the product designer's team will have a better opportunity to develop a product with international market competitiveness.

SOMMAIRE DE DIRECTION

Ce rapport résume sommairement les résultats des entrevues effectuées avec cinq bureaux européens d'experts en automatisation afin d'obtenir leurs opinions en ce qui a trait à:

- la compétitivité technique de quatre bureaux canadiens de produits de bureautique, développés et installés dans le cadre des essais du Programme de la bureautique, et
- l'efficacité de ce programme d'essai en tant que méthode d'assistance pour le développement des produits canadiens capables de concurrencer sur les marchés internationaux.

Les entrevues ont été menées par William G. Hutchison et Co. Ltée (WGH) et par ses associés en Europe au nom de la division du programme d'évaluation du service des communications. WGH a présenté des films vidéo de démonstrations soumis par les créateurs de chaque produit canadien. Les films, suivis d'informations techniques actuellement disponibles, ont été revus par chaque expert au cours des entrevues d'évaluation. De plus amples détails de la méthodologie d'évaluation sont donnés à l'annexe A.

En conclusion, les experts ont convenu que les produits développés dans le cadre des essais du Programme de la bureautique sont tous techniquement compétitifs avec le bureau technologique de bureautique actuel. A l'exception de Comterm, les produits ont dénoté une certaine faiblesse en ce qui concerne l'orientation de la commercialisation. Les experts croient qu'il est nécessaire que l'accent soit mis sur la commercialisation plutôt que sur la compétitivité technique pour un éventuel succès du produit.

Le produit Comterm a résisté car:

1. Une stratégie en rapport avec la technologie existante a été adoptée plutôt que d'essayer de "reinventer le monde".
2. Tant le logiciel que le matériel sont basés sur les standards industriels largement acceptés.
3. Il est développé comme une série de blocs fonctionnels, permettant ainsi à l'utilisateur un maximum de flexibilité dans la sélection d'un système.

Le projet pilote a été approuvée en tant que méthode de stimulation industrielle car il permet au créateur et au vendeur de rester en contact avec l'utilisateur, et ses besoins, par l'intermédiaire du développement et de l'installation. D'un autre côté, basé sur des informations disponibles pour leur évaluation, les experts pensent que les produits n'auront pas un grand succès sur le marché international à cause du manque apparent d'accent sur la commercialisation. Si l'idée des experts devient une réalité, il est évident que les essais du Programme, dans sa formule actuelle, ne seront pas d'un grand succès en tant que méthode de stimulation pour l'augmentation des produits canadiens à l'exportation.

Les experts suggèrent deux recommandations sur le Programme de la bureautique en ce qui concerne les projets pilotes du Programme:

1. Etant donné que la mise de fonds est déjà effectuée pour le développement, à leur niveau initial, des produits, il est nécessaire de poursuivre l'investissement dans la commercialisation et d'améliorer l'orientation de la mise en marché. Un expert a estimé que plus de 50 pour cent du coût pour le développement d'un nouveau produit est le prix de la mise en marché.
2. Avant de lancer d'autres projets pilotes du Programme, des experts indépendants de mise en marché doivent se charger de la commercialisation afin de mettre en valeur la définition et l'accent sur les marchés-cibles. Avec une compréhension de ce que le marché désire et avec une connaissance de la réglementation industrielle et gouvernementale, les créateurs de produits auront une meilleure occasion de développer un produit compétitif pour le marché.

INTRODUCTION

In 1980 the Canadian government launched its Office Communications System initiative, administered by the Department of Communications. In part, the initiative was intended to study how communications technology can increase Canadian office productivity and also increase the office workers' awareness of the operation and advantages of such technology. The program also had two commercial objectives:

1. To enable the Canadian Office Automation Industry to put itself in a position to satisfy the huge potential market in Canada and abroad.
2. To develop technically competitive office automation products, the export of which would partially offset Canada's growing trade deficit in electronic office equipment.

To address these needs, the \$10 million OCS program supported a series of field trials to enable Canadian office automation companies to design and install solutions in selected government departments. Under the program, three companies, Bell Northern Research (BNR), XIOS (Systemhouse), and Office Communication Research Associates (OCRA, who subsequently were acquired by Gandalf) received \$3 million each for product development and field trials. Two companies, Officesmith and Comterm, received an average of \$600,000 each for their field trials.

Throughout the field trial program, Site Impact Assessment Teams have been responsible for trial assessment studies measuring system performance, user acceptance, human/social and organizational factors, and productivity impact. As the initiative was concluded in 1985, the Program Evaluation Branch of the Department of Communications was required by Cabinet to evaluate the field trial program's achievement of its objectives.

As part of that evaluation, William G. Hutchison and Co. Ltd. was retained to assess the attractiveness of field trials as a government strategy for supporting the development of competitive office automation products for worldwide markets. In addition, WGH was asked to assess the technical competitiveness of the systems that had received support under the program.

In order to obtain an objective assessment of the Canadian products in relation to current international technology, it was decided to work with OCS experts from outside Canada. Recognizing the budget constraints on the study, it was further decided to solicit opinions from experts in European countries with a high level of OCS activity. In this way it was felt that the study would benefit from experience with all of the major U.S. products on international markets, as

well as the current European technology. Therefore, several European experts in office automation were retained to judge the technical competitiveness of the Canadian systems. Their feedback was unanimous in its praise for the field trial process as a method of industrial stimulation. The experts' comments about the competitiveness of the Canadian products touched on several issues which can be roughly divided into technical and market oriented considerations.

This report summarizes the results of detailed interviews with OCS experts in France, Germany, Great Britain and Sweden. It discusses, in separate sections, the experts' feedback on the technical competitiveness of the products, market factors that will affect their competitiveness in Europe, future trends in OCS technology in Europe, and recommendations for follow-up action to the field trial program for both DOC and the field trial participants.

This is followed by a summary of Hutchison & Company's own analysis of the U.S. offerings and how they compare to the Canadian products. Finally, a description of the study methodology is provided in Appendix A.

TECHNICAL OVERVIEW

The concensus of opinion among the European experts was that the technology that was developed and is embodied in the field trial products is technically competitive with current European state of the art. That is to say, the Canadian industry, as a result of the field trial program, now has a nucleus of skilled OCS personnel, experienced in the design and installation of commercial scale systems. In addition, the industry has four products which display features, functions and performance capabilities that appear to be comparable to European products, which, it is important to note, are in the same early stages of development and introduction to the marketplace as are the Canadian products.

What the industry does not yet have, however, will strongly influence the overall competitive opportunities of the Canadian technology. Firstly, it lacks the "maturity" apparent in the technology of the four major American OCS products, which have been refined and debugged over several years of commercial installation experience. Secondly, the Canadian technology displays nothing that is technically new, that might give it a technical edge over the older,

more established OCS suppliers. And thirdly, for a number of reasons which will be discussed in some detail later in this report, the Canadian products lack market competitiveness, without which even the most sophisticated technology will fail. One British participant summarized the general feeling of the European experts as follows:

"What the Canadian office automation industry has now is not out of step with state of the art technology; however, these companies need to quickly build on their foundation by adding further technical features and marketing 'sizzle' or they'll fast disappear."

As newly developed products on the office automation market, the Canadian products do not 'move the world forward'. One reason cited was that the companies, with the exception of Comterm, all appear to have attempted to 'reinvent the wheel' at a time when the market is attempting to standardize on a small number of established product designs. Those companies that did start from scratch may have technically comparable products, but they now face a host of market barriers that may prevent them from actually establishing a place in international markets. The most competitive products or features, in the view of the study participants, are those that build on accepted hardware and software standards.

While the response to the products as presented indicated technical competitiveness with existing products, there was some question as to the true state of development in several of them. Specifically, the participants doubted that the products claiming to have voice annotation, optical reading, and database capabilities have sufficiently powerful memory and computing capacity to support these functions at a commercially useable level.

A critical element of technology development for long term competitiveness in an industry that is evolving as rapidly as the OCS industry, is anticipation of future user and product requirements. The most obvious deficiency in the group of Canadian products as a whole in this regard, is in the area of sophisticated communication links, which the experts feel will be a requirement of all OCS products in as little as six months from now. Again, a British participant summed up by saying,

"The four products as a set have amazing similarities in where the developers put their emphasis -- on word processing, windows, and interfaces -- ie. on the development of a local product. There was not much emphasis on network communications, document standards, graphics, and external communications, which is the direction in which the market is now moving."

Those products that focussed on compatibility with IBM hardware were noted to have a strong marketing advantage. Other advantages of some of the Canadian products include the portability inherent in software based on the UNIX operating system, and the capability to operate in languages other than, or in addition to, English.

The range of products currently available in Europe, and against which the Canadian products were measured, is dominated by the 'big four' American products: IBM's Profs and DISOS systems, Data General's CEO and DEC's All-in-One. European based companies all have office automation solutions in the early stages of development. BULL, Nixdorf, Siemens, Olivetti, and Philips will all be introducing new products within the next 1-2 years. On the word processing front, the range is from dedicated packages such as the Wang and AES systems, to micro-based software for the IBM and Apple computers.

Many specific comments were made regarding the technical performance of each of the four products, and these will be summarized in the pages that follow. However, the participants all pointed out that a full technical assessment of any office automation product requires a one day, hands-on session to benchmark the system. It was also noted that the competitiveness of an office automation system is closely integrated with the training, support and system maintenance capabilities of the companies in Europe, about which little is known.

Renaissance by XIOS

The XIOS system was acknowledged to be the most sophisticated in design of the four products, although it met with a certain amount of technical skepticism from the European experts. The French participant pointed out that while both voice annotation and compound messaging with digitized images have been tried before, neither is expected to be developed to the point of commercial acceptance for another 5-10 years. The English experts agreed, noting it was doubtful that the Renaissance system has sufficient power or memory to support the functions beyond what was shown in the demonstration. Hutchison and Company's own view is that XIOS will be able to provide the capability as it becomes useful and beneficial. A further comment from the English participants suggested that the emphasis in the demonstration on the very low level of person support required to run the system is a bit "suspicious". All participants agreed that they would require a "hands-on" demonstration and technical discussion with the developers of Renaissance in order to confirm or modify their initial views of the product.

Although one participant suggested that, in the end, it will be difficult to differentiate between OA products because the work flows in offices around the world are essentially the same, all agreed that Renaissance is ahead of current state of the art in terms of the number of functions it proposes to integrate into one system. Reaction to the ambitious scale of the product however, was mixed. In Germany, the system was met with considerable enthusiasm as being well ahead of its time, thereby affording the user the opportunity to "grow into" the range of built-in functions, and affording the vendor the opportunity to remain one step ahead of the competition while improving the technical performance of the system.

In England, the multi-media document (incorporating text, graphics, voice etc.) has not been seen before and was felt to be an excellent feature. However, the system was judged on its performance in the traditional OA functions, in part because that is what the market is looking for, and in part because there is a question as to the level of technical development in the more sophisticated of the product's functions. The French and Swedish experts suggested that the Renaissance development team had "compiled a shopping list of all the office automation functions currently popular in

the media", with little apparent thought for what users are ready to accept, or what the technology is capable of supporting. According to the French participant, "there is a difference here between what is promoted, that this is a big, grandiose, world-scale system, and what is demonstrated, which is pretty basic".

Several comments were made concerning the performance of specific functions, as follows:

- the word processing function is acceptable for casual use, but would not support the heavy requirements of major report writing. The ability to support an outside, and more powerful word processing package, comparable to Wang or AES, would improve the Renaissance.
- the mechanics of going outside the main system to access spreadsheet and graphics capabilities were awkward, but the flexibility to continue with packages on which the user has already standardized is excellent.

- the ability to access outside information sources, retrieve data and incorporate it into a document is excellent. The autolog feature required too many key strokes and could be improved with built-in sign-on capabilities.
- bilingualism (French/English) is an excellent feature for the French market. It was unclear whether the system can really integrate different character sets for other languages, or for communications between languages.
- it was unclear whether certain workstations can perform only a limited range of functions, and if so, which ones.*
- the optical reading capability was a concern. A major hardware investment would be required in high resolution screens, laser printers, and storage capacity, adding to the already high cost of Renaissance. Although XIOS mentioned the capability in its presentation of the product, it was not clear how well it is developed or how it can be integrated into the rest of the system functions.

* Without performing a full benchmark of each system, the experts were unable to define the limits of the systems' capabilities in several areas. They chose, therefore, to flag their uncertainty where the feature was felt to be important to the overall competitiveness of the system.

- the electronic mail system was found to be fairly standard. It was not clear whether the system can support external mailboxes, but this would be a plus.
- UNIX portability is excellent.

A major concern with the system, expressed repeatedly by all participants, was its complexity and the resultant requirement for extensive user training. Although its demonstration emphasized the product's intuitive user interfaces, the experts disagreed, saying it is much too complex for the average manager to use. The high level of training involved implies several disadvantages for the user; exceedingly high staff training costs, loss of flexibility in staff hiring and mobility decisions, and the insidious need for a departmental structure to support the office automation system. Lamented one participant, "what we need are simple solutions".

Finally, the cost of the system itself was seen as too high to be competitive, and this cost was largely attributed to the product's unnecessary functional complexity. The participant from Sweden summarized the group's view when he

said, "Yes, the voice integration appears to perform adequately at the level demonstrated in the video. But if a user wants to add the personal touch of his or her comments to a document, there are easier and cheaper ways of doing it, such as the internal post, electronic mail, or the common telephone". The \$7-10,000 cost per user for Renaissance compares unfavourably to the \$6,500 per user cost of the top-rated CEO system by Data General. Using a simple analogy of the technical and marketing features in the automobile industry, it is possible that XIOS is trying to position Renaissance as the Mercedes of the office automation market. If so, such positioning was neither obvious nor was it accepted by the experts, based on the information available to them during the interviews.

It was in assigning a technical rating to Renaissance that the difference in attitude between Germany and the rest of Europe toward the product's broad range of functions became most apparent. All participants agreed that the system would be classed alongside the fully integrated systems of IBM, DEC and Data General. In Germany, where it was suggested

that managers plan more for future technology than their counterparts in the rest of Europe, Renaissance was rated 7.5 on a scale where the four U.S. products were given a 3. Said the German participant, "This product is more technically advanced than IBM's. Very often people will create multiple functions, then only use 10-20 percent. But from a long term planning point of view, the users know that the functions are available if and when needed."

The other experts disagreed, rating Renaissance only a 5, IBM a 7, and the DEC and DG products both 8.5.* Their reasoning for the difference in the rating was that, for the functions which are important to users at the present time, there is nothing unique about Renaissance, while the big four have been in the market for some years, and worked their technical problems out. It was clearly doubted that XIOS had the more sophisticated functions worked out to a commercially useable level.

*Note - Charts showing the specific ratings assigned by each expert appear in Appendix A to this report.

OFFICESMITH

There was a strong feeling among the European experts that the people responsible for the Officesmith product do not have a clear idea of where they are going in the market. Such an opinion is not the view of WGH consultants who are also familiar with the Officesmith system. However, the video demonstrations by Officesmith personnel did not clearly describe market positioning and direction for the European experts. One participant noted that if the system is intended to be solely a document based management system, it is unclear why additional office automation functions such as electronic mail, calendaring and a spreadsheet have been added. Another participant thought it looked as though it had been developed in slices, with no global overview to keep the flow of operation simple. Yet another commented that the application development facility makes the product look like an unfinished database management system.

The concept of a product that concentrates on technical superiority in one narrowly focussed functional area makes excellent marketing sense. Such a product could become a standard in its field, and be purchased as an add-on to the user's existing systems. However, the study participants did

not judge that the Officesmith had achieved technical superiority. They further pointed out that its value as an add-on package is severely limited by its use of hard function keys which require a non-standard, dedicated workstation.

Technically, the Officesmith was felt to be reasonable. One expert commented, "The problem is that the product is misconceived, rather than it failed. Having decided what they were going to do, the designers did it well enough. Technically, it is adequate." Additional, specific comments on the technical performance are noted below:

- the screen layout was found by two of the experts to be very confusing.
- the hard function key feature makes the system easy to learn, but this advantage was far outweighed by the disadvantages of having a non-standard, dedicated keyboard.
- the system requires too many keystrokes to move from one task to another.

- as with other Canadian products, the use of UNIX was rated as excellent.
- the system is poorly structured for translation into different languages.
- there is no spell check, which would be more useful on this system than the keyword search.
- there must be graphics capability in any document-based system today.
- the Officesmith does not appear to have adopted any of the current industry standards for document presentation.
- the windows, keyword search and user interfaces all look adequate.
- the database capabilities were not clear, but excellence in this area could make the system attractive for archiving applications. In the experience of the English participants, however, neither micro nor mini-based systems have the power to be serious database engines.

- the system is based on classical, old-fashioned typed text; all the new document production systems are now based on a typeset quality of print, using high definition and high graphics capabilities which are now available on personal computers such as the MacIntosh. These sophisticated PC's are also capable of full integration with mainframes, while the Officesmith is not.
- the user is restricted to the Officesmith's word processor, which was rated fairly poor.

The application development feature of the Officesmith was not well received. In France it was felt that it is potentially dangerous to make application development functions available to all system operators in the office. For the protection of the user's operating systems, and to restrict opportunities for the staff to "play" on office time, the participant suggested that the application development function should be an add-on package available for the designated programmer's terminal only. The German expert pointed out that the system is sold as a fully developed package, which, in his view, it is not. The applications development feature is required to allow users to develop the functions which the Officesmith has not

finished building in. In Sweden, it was noted that the 4th generation concept never became the commercial success it was expected to, due to its massive requirements for storage space and an on-site team of software specialists.

In short, while the experts agreed that the Officesmith is a technically "adequate" product, they saw nothing in it that would convince the potential user to buy it over any standard database and/or word processing package to run on a personal computer. The price, at \$5,000, was considered far too high for the functional level of the product.

The experts' perception that the developers of the Officesmith did not have a clear idea of where to take the product, is demonstrated in their inability to agree on the product category in which to rate the system. The French participant selected a BULL system, which he claims is trying to do something similar but is technically less smooth. His rating; BULL - 5, Officesmith - 7. In Germany, the product was deemed to be a database management system, and was given a rating of 2.5 against a 9 given to micro-based database systems. In England, the product was felt to be a "grandiose wordprocessor", and was rated 5.5 on a scale with Samna given a 10 and the Displaywriter, NBI and CPT products all rating 7.5.

"INITIATIVE" BY GANDALF

Gandalf's Initiative was perceived to be an unfinished product. One participant, in fact, was highly indignant that the company has gone to great lengths to print glossy brochures and training manuals when the product is not ready for the market. He cautioned that it is extremely dangerous to "have all the hoopla when the product cannot deliver", pointing out that the market is still skeptical of Wang after it announced a product called Alliance which it was never actually able to supply.

In all four countries the experts asked whether Gandalf had designed this product to create new markets for its hardware. The eight user cluster was felt to be extremely small, and for large organizational installations, compares unfavourably with the IBM, DEC and DG systems which all support a minimum of 20-30 users. Noted one English participant, "Eight people isn't even a small department, it's one manager's sphere of influence. I don't want to have to buy a new Gandalf multiplexor every time I hire a few extra people".

The overall technical assessment of the parts of the system that are fully developed was that it looks slick but offers nothing that is unique. More specific comments follow:

- the system uses a DEC keyboard and word processor, which should make it attractive to users who already have DEC installed in their operations. However, Initiative has nothing that is better, and several things that are not as good as DEC's own office automation product. Why would a DEC user buy Initiative?
- the use of soft function keys is excellent. It allows for the use of standard keyboards, while the labelling of each function set on the screen enables the user to learn the system very quickly. It was not clear whether the use of a set of hard function keys for the edit commands is compatible with all standard keyboards.
- the product is very wordprocessing and electronic mail oriented. There are no graphics, which is a serious drawback.

- the integration of a spreadsheet is good, but not being able to operate on it once it is embedded in a document and sent is poor.
- the experts did not see the database management facility, but doubted that a system which can support only eight users has sufficient power to support an adequate database.
- Initiative is a stand-alone system that does not interface with other word processors or larger database facilities that may already exist within the organization, limiting its attractiveness for users.
- the system has a portability benefit of being UNIX based.
- the screens and user interfaces are attractive and smooth.
- the linking of little clusters requires communications personnel on-site, and implies operational and procedural headaches.

- Initiative did not display a wide enough range of communications facilities, particularly in view of the fact that communications are Gandalf's traditional strength.
- the system does not have a spell check facility.

The price of \$2,500 for the Initiative software was felt to be reasonable, provided that it is for eight users, rather than per workstation. There is a serious question about the additional costs for multiplexors, etc.

To preface his rating of the product, one English participant noted that Initiative falls into a unique generic category of office automation systems. He listed, and rated, the generic categories as follows: big time share systems such as DEC's All-in-One -- 10; local area network systems such as Ethernet and Xionics -- 6; clustered systems such as Initiative -- 2.5. However, within its generic category, he then assigned Initiative a 9 in comparison with a similar type of system by RACAL of the U.K., which rated a 6. In France, Initiative was given a 5 on a scale with DEC rated 9, while the German and Swedish experts gave Initiative a 4 on the same scale.

COMTERM

The Comterm product met with universal enthusiasm. Comments like "The most professional of all the products", "looks like a 'real' product - technically very good", and "commercially very astute", supported the feeling that this product has the most solid opportunity to compete in the European market.

The basis for this enthusiasm was Comterm's developmental strategy of building on industry standards in both hardware and software. This strategy gives the product tremendous portability onto user's installed hardware, as well as software flexibility to add or change functional 'pieces' to suit the user's needs.

The selection of Arcnet as the system's network, met with various responses. One expert pointed out that a problem with Arcnet is its lack of document level protocols. The French expert suggested that Arcnet is not an industry standard, while Ethernet and the new IBM Token Ring are. However, the English expert pointed out that Arcnet currently has the largest installed base in Europe. All agreed, though, that Comterm should work on supporting the IBM Token Ring as quickly as possible.

Both advantages and disadvantages were cited regarding the use of third party software in the Comterm system. From the marketing point of view, the fact that Comterm is a little known company in Europe would be less critical when the software is based on well known standard products. There is a disadvantage, however, in the problem of placing responsibility to the user for the operability and the maintenance of third party packages. Technically, however, it was agreed that Comterm has selected very clean and straightforward packages to integrate into the system.

There were a few more specific technical comments, as follows:

- the memo format should conform to current office standards.
- there are some unnecessary functions in the software design, ie. the ability to move windows on the screen. This type of "designer's toy" uses up memory.
- it is not clear whether the output from the GEM, graphics package can be embedded in a message.

- there was not much networking capability shown.
- the search facility for mail directories is crude, using a scroll rather than a database search technique.
- it is not clear what database capacity the system will support.
- once the spreadsheet is embedded in a document, it cannot be manipulated.

The cost of the Comterm system, at \$6,500 per workstation, was judged to be competitive with other comparable systems.

The technical rating on the product averaged at 5.5. In England, it was given a slightly lower 3.5, with the Datapoint Vista product rating a 6. The French expert, however, expressed concern that Datapoint is experiencing financial difficulties. He gave Comterm a much higher rating of 7.5, with Threecom, a fairly well established product, rating a 9.

Throughout the interviews, the experts expressed reservation at the request that they separate technical competitiveness from market competitiveness in their evaluation of the Canadian products. The concept of competitiveness in itself implies the gaining of market share, usually at the expense of another supplier's product. Such market success would require a combination of technical performance and marketing advantages. Of the two, marketing advantages were deemed by the experts to play a more important role in the overall competitiveness of the product.

The issue was resolved by considering the technical competitiveness of the products on two levels. On the first level, the technical features and performance of the product are considered in isolation of its marketing features or advantages. Products displaying all standard features and performance requirements to an acceptable minimum level are accepted as being technically competitive within the generic classification of office communication system. Minimum level here is defined as the point of technical performance at which the potential user/customer is indifferent between two systems based on a technical rating, and begins to be influenced in his/her purchasing decision by the individual product's marketing features.

Once the product has achieved technical performance within the bounds of what is acceptable (ie., is technically competitive), it is its marketing features and advantages that will sell the product. Those advantages may include technical superiority in one or more specific functions, product simplicity, an extensive product servicing network, product flexibility by making functions available in individual "blocks", lower pricing than the competition, etc.

The European experts felt that, based on what they saw, the four Canadian products fall within the acceptable range of technical performance in the generic classification of office communication systems. On an individual product basis, features were noted as being technically better or worse than on similar American or European systems. What the Canadian products lack at this stage in their development, however, is the marketing features and advantages that will make them competitive.

TECHNICAL COMMENTS AND RATINGS

The experts made several detailed comments about specific technical features of each of the four products. These comments which appear in the following section of this report, reflect the experts' focus on how the technical features of the product will affect its opportunities for competitiveness. The comments at this point are not intended to imply a comparison with any specific competitive products, but are rather focussed on the Canadian products' performance in relation to current and future market trends.

To obtain a comparative assessment, we asked each expert to summarize his comments by assigning the product a numeric value on a 1-10 scale (10 = best overall technical performance). The selected value should reflect his opinion of the overall technical competitiveness of the Canadian product in relation to the American or European products that he felt were in most direct competition. For example, a rating of 5 on a scale with the IBM products rating a 7.5, says that the Canadian product, in the opinion of the experts, is comparable to the IBM products, but is deemed to have less technical advantage in the market.

It was here that the experts had the greatest difficulty separating technical from market competitiveness. Therefore, although they were asked to focus on the technical aspects of the product, their ratings often reflect issues they felt to be of critical significance, such as the number of years the U.S. products have had in the marketplace to establish their reputation and de-bug their systems.

It should also be noted here that while the Canadian products are often deemed to be superior when rated alongside European products, the experts agreed that at the present time, the U.S. products have over 90 percent of the OCS market in Europe.

MARKET ISSUES

Regardless of the technical competence or superiority of a product, its actual competitiveness depends entirely on what the market wants. While the experts in this study acknowledged that the four Canadian products fall within the technical genre of office communication systems, they expressed reservations as to the products' marketability. Said one participant, "Product is not the key issue -- market is. There appears to be too much focussing on technology here and not enough on markets".

To put the European market into perspective, the experts gave statistics on the use of office automation, and the installed base of leading products. One of the English experts has recently completed a survey of the industry, commissioned by ICL. According to his study results, the 1985 sales of office automation products in Europe totalled \$2.5 billion (U.S.). Of this total, \$50 million was for integrated office automation products, with the balance going largely for stand alone keyboards such as PC's. His study also showed that 40 percent of all PC owners will have communications capabilities by the end of 1986. The conclusion, he claims, is that products which do not offer

sophisticated communications capabilities within the next year will be obsolete. This will be even more true of the North American market, he adds, where the economic entities are so vast, and the postal system so poor.

The statistics on actual installations of integrated systems show the market's very slow acceptance of this technology. After 3 years of sales effort in Europe, DEC has 500 installations, and DG only 200. The French expert emphasized the point. "Electronic mail has been on the market for 15 years," he said, "yet today just 1 in 1,000 people in France are using it. The people are slow to accept this technology." Worse still, he claimed, the big four are not yet making profits on their office automation products.

So why are DEC, DG and IBM in the market at all? Again, it was the French expert who summed up, "None of the big vendors is making money now -- they're in it for the future market potential now that the big investment has been made." The investment required to enter today's market and compete with the big four is estimated to be \$500 million (U.S.). Most of that investment is in marketing. "What the (Canadian) government does not understand," said one expert,

"is that product development is not just product. Design and development of the actual product accounts for only 15-20 percent of the total cost of entry into this field. Market research and documentation are another 15 percent or so, while well over 50 percent is marketing -- without it, you have no product".

A more specific discussion of issues in the European market started with an enumeration of what features and functions today's user is looking for. The most important function, all agreed, is electronic mail, although an English participant made a distinction between local and long distance mail. The typical office worker, he said, will pop around the corner or use the telephone to get a message to a colleague in the same building. The real market is in messaging between buildings either across the city or around the world. Users are also demanding, and using, spreadsheets, graphics, word processing, and document storage capabilities.

What is not being used, and will not be in the foreseeable future, is electronic calendaring (except in project control applications), voice annotation, optical character reading, and applications development facilities.

The decision to buy an office automation system, said the experts, is made not by a technical person, but by a senior manager on the user side. The priorities used in selecting a system, in order, are:

1. the reputation, strength, and service network of the vendor. This puts a small Canadian company at an immediate disadvantage when competing head on with the big four. The solution -- the Canadian firms must establish vendor relationships with European firms such as Olivetti, Philips, Nixdorf and Siemens rather than try to sell directly to the European market.
2. the performance of the product, judged mainly from its user interfaces. Although a decision maker may ask specialists for a review of the technical performance of the product, the ultimate decision will be based on how easy the product is to use and train new employees on. It is of critical importance, therefore, that vendors focus on the user's needs and easy interfaces rather than overly complex state of the art functions.

There were also some specific issues noted that will affect the market competitiveness of the four products:

- none of the four products appeared to support the de facto standards for document presentation that are being adopted by all the major system vendors. In order to survive in the market, the Canadian products will have to be DCA/DIA (Document Content Architecture/Document Interchange Architecture) compatible.
- Europe is also moving rapidly to standards in hardware (ie. the IBM PC) and networks (the Xerox Ethernet and IBM Token Ring). This will seriously restrict market opportunities for a product such as Officesmith that requires a dedicated non-standard keyboard.
- there are 13 major languages for doing business in Europe. Office automation systems, unlike the earlier data processing systems, must be fully translated into a local language in order to be competitive in the market. Translation must include the keyboard, all commands and all documentation. It is estimated to take IBM up to one year to adapt to a new language.

- several features in the Canadian products cannot be sold in Europe today. Autodial features, built in modems, and voice annotation across national communications lines must all be approved by the Postal and Telephone (PTT) authorities in each separate country. To date, these features have not been approved anywhere in Europe, with the possible exception of the Scandinavian countries.

- again on the telecommunications issue, the English experts pointed out that even if approval were granted for features using the national communications networks, the market would be exceedingly small. The cost of using the telephone in Europe can be several times what it is in North America, and the service is less efficient. Therefore, people are looking for alternative ways of communicating across distances.

FUTURE TECHNOLOGY TRENDS

The OCS Field Trial projects began in 1980, before the advent of the personal computer. At that time, emphasis in the office automation field was on large, integrated systems. With the advent of the PC, attention started to shift from the integrated system to stand alone applications for the PC. Recently, however, users have begun to experience the limits of the personal computer, and are starting to look to the linking of PC's as the next step to increase their functionality.

The integrated system itself really does not have enough power to run a sophisticated database, and it cannot access the company's main CPU. There is also, therefore, a need growing out of the traditional office automation products for a new sort of communications integration which would allow interfaces to mainframes and other databases.

The future, then, will see integrated systems interfacing more flexibly with PCs to allow users to reach through into a more powerful system of both internal and external communications. Communications, rather than fancy functions, are the key. To date, such a system has not been developed,

even by the major hardware vendors. DEC has not integrated its All-in-One with the Rainbow, nor has IBM integrated its PCs into DISOS or Profs. There is a window of market opportunity in this area, unless or until DEC and IBM do introduce full integration.

To put predictions for trends of the future into an economic context, we can refer back to the 1985 sales figures for office automation products in Europe -- \$2.5 billion (U.S.), of which a mere \$50 million was for integrated systems. The balance was for stand alone keyboards, mostly as personal computers. With this tremendous base of installed PCs in the market, future office automation system vendors must offer solutions to build on the user's investment. The recent development of networks such as Ethernet and IBM's new Token Ring is augmenting the demand for solutions which will improve the ability to share information among PCs and through to mainframes.

To take the trend towards hardware integration one step further, there is a growing need for facilities to allow the interchange of data from sources based on different technologies, ie. different keyboards, different CPUs and different communications lines. The next step in electronic

mail, for instance, will be an E-mail server capable of addressing all standard workstations such as IBM, DEC, and Wang, from one point. Left behind, will be all non-standard equipment.

Flexibility to integrate industry standards and run on the PC environment will be the trend in software development as well. Despite their previous success and technical excellence, for example, the Wang and AES word processing packages will start to see a decline in sales as users turn to PC based word processors that can be integrated with other functions. The architecture of software being designed today must be flexible enough to allow tomorrow's "goodies" to be added on. Functions, such as voice annotation, OCR, graphics, etc. will be purchased separately and 'hung on' to a very sophisticated communications shell.

In terms of specific office automation functions, the following predictions are made by the experts:

- in 5 years, the standard business report will be electronically typeset and laser printed; typewritten or traditional word processing generated reports will be obsolete.

- in 10 years, voice digitization and optical character reading will be technically advanced to the stage of allowing complete reports to be transmitted and laser printed from dictation or a handwritten original.

It was based on their understanding of these trends in the development of office automation that the experts looked for improved communications capabilities, and complete compatibility with industry standards in hardware and software from the Canadian products.

THE FIELD TRIAL PROGRAM

By adopting a field trial format rather than a series of cash grants for research and product development, the Department of Communications took a fairly new approach to industrial stimulation. One question that was put to the European participants in this study, was whether the field trial format is, in their opinion, an effective method of stimulating the development of an indigenous industry in the information technologies field. A secondary question concerned the appropriateness of the OCS field trials as a format to achieve the program's stated objectives.

The response was unanimous in its enthusiasm for field trials as a method of industrial stimulation. It is the nature of the information technologies industry that products are designed largely by technicians, often in isolation from commercial considerations. The field trial process enables both developers and marketers of a new product to get essential feedback from users on the performance of the system in a real office environment.

Field trials help the developers to keep their focus on the actual needs of the target users as they refine the system for commercial sale. For the marketer, too, there is the opportunity to work closely with users of the system and understand their needs, as well as the credibility derived in the marketplace from having an operating installation in an office of the Canadian government.

One expert acknowledged the difficulties of operating a field trial program in office automation, while at the same time emphasizing its importance for the industry. "Field trials of this nature are difficult because you are testing an unproven technology in an office that is not accustomed to using it -- but it must be done. The program gives companies an installation experience -- an opportunity to work out technical bugs, and to demonstrate a capability."

The participants felt that the OCS products tested in the field trials were in line with current office automation development in world markets. But, they cautioned, this is not going to address the deficit problem. What most companies in the program tried to do was re-invent products that DEC, DG and IBM have been installing for several years, and there is no chance for a small Canadian entrant on the field to compete head on with the giants. In the words of

one expert, "You're doomed to always running one step behind state of the art when you insist on reinventing an established technology, especially in this fast moving industry".

The answer to the deficit problem, the experts suggest, is the value added approach, using established standards. Niches can be developed by designing highly specialized office automation functions to 'hang on' to large, fully integrated systems. In this way, the Officesmith concept would have been a superior product if its developers had followed through with a focussed system of technical excellence. XIOS and Gandalf, however, who appear to have tried to compete head on with the big four products, have created marketing headaches for themselves which they may never be able to solve, although XIOS may still be able to position itself as a "Mercedes" in the market. In all cases a second phase of product development and market enhancement is still required.

The \$10 million level of funding for the program was deemed by all the experts to be reasonable for the first phase. On an individual product level, the participants were unanimous in their opinion that the \$3 million awarded to XIOS and the

\$500,000 awarded to Comterm were reasonable levels of support for the work required to test those systems. There were doubts expressed as to whether \$3 million should have been required for the Gandalf product, and a fairly negative response to the results achieved by Officesmith with \$700,000. Asked if they felt that an increased investment in the project by DOC would have led to improved results in terms of technical competitiveness, the participants gave a qualified "NO" for the first phase.

An increase in funds for product development and field trials they agreed, was not what was needed. Instead, in the words of the German participant, "The effectiveness of any field trial program to support the development of an indigenous industry would be greatly improved with the inclusion of a preliminary step. BEFORE supporting the development of a product, the government should commission a survey of the potential markets to find out what is wanted, what standards must be supported, and what approval procedures will be required. Then, when the product is developed, they know it will be competitive".

The experts were mixed in their reaction to a 4 year product development time. The French expert felt that 4 years is normal in this industry. In Germany, the expert thought 2 years was more normal, and cautioned that companies cannot afford long development times any more as the industry becomes increasingly competitive. The English experts also thought 4 years was too long, although it is similar to the experience of the British Department of Trade and Industry Pilots program. Said one English participant, "The trial program is just lucky that an IBM didn't knock things up a couple of points on the ratchet in those 4 years, as they did with the PC."

What Other Governments Are Doing

France

The French government started its SCRIBE program in 1981. The program was, in fact, a large project to develop and install an integrated office solution in a new building designed to house France's Ministry of Finance. The project used a shopping list approach to acquire the latest in technology.

Although the program was launched with the issue of requests for proposal to all interested firms, its real raison d'etre, according to our French expert, was to subsidize French vendors. No bid was accepted unless 100 percent of its proposed technology was to be sourced from French sources.

Two companies won the bid and were to share development of the system -- BULL and ESD (Electronique Serge-Dassault). The budget on the project to date has been 50 million French francs, roughly \$10 million Canadian.

The results, however, have been less than encouraging. After delays of one to two years, the developers have a "poor" word processor connected to an Ethernet type network, with a Multiplan spreadsheet. The client is rumoured to be dissatisfied with the results, and, according to our expert, the product will not be at all competitive on the open market. The reason for the program's apparent failure, he claims, is that the government was trying to reinvent office automation from scratch, rather than build on technology that has already been developed elsewhere in the world.

Germany

Until recently, the German government followed a policy of industrial stimulation similar to the policies of France, England and Canada. With the change in government, however, the policy was terminated due to alleged abuses by large corporations which prevented the funds from getting down to smaller firms "where the real development was taking place". The German government has now adopted a policy of funding basic research in university laboratories, rather than funding individual corporations. There has, therefore, been no program to stimulate the development of an office automation industry.

England

The U.K. government ran a series of office automation field trials under the Department of Trade and Industry. The program was started in 1981, involved 21 systems, and cost a total of \$10-\$12 million Canadian. The goals of the program included the development of a pool of experience in both design and use of office automation, and the creation of an opportunity for vendors to test their products. There were no restrictions preventing non-U.K. owned companies from participating.

According to our English expert who has worked closely with the DTI Pilots program, the major lesson learned by the Department of Trade and Industry is that the office automation industry will develop out of the data processing industry; small, one product companies cannot compete. Asked what DTI will do now that the program is drawing to a close, he said, "What DTI wishes it could do is support market development, particularly for the small companies that have excellent products, but lack marketing clout. Unfortunately, DTI's mandate only allows it to support R&D, or approach industrial stimulation through government procurement. Maybe the Canadian government will be able to do better on the marketing side."

Sweden

The Swedish government has taken the approach of funding computer and office automation education at all levels of the national school system, rather than directly funding the industry. The result is that the Swedes are more advanced than other Europeans and North Americans in computer literacy and adapting to new technologies. There has been no program to stimulate the office automation industry, although the government has recently commissioned a study of what other governments are doing in this area.

WHAT'S NEXT -- EXPERTS' RECOMMENDATIONS

The conclusion of the experts on the effectiveness of the OCS field trials was summed up by one of the English participants. "The program has succeeded in developing a pool of experienced people and technically acceptable products in office automation. Now the real work begins."

The overall recommendation to the four Canadian firms was one of approach to the market. The best, and some said the only, way to penetrate the market as a small Canadian based company is to establish a vendor relationship with one of the European firms. A local firm will have the reputation and service network that the Canadians do not have. The Europeans will also be able to help the Canadians modify their products to suit local requirements.

Another general recommendation was that the designers focus on breaking their products up into functional blocks which can be hung on to an operating shell -- a concept similar to that which Comterm adopted in designing its system. This recommendation was particularly aimed at XIOS, whose product was felt to be functionally top heavy and far too costly. If the voice and optical reading functions could be removed and sold as options, it was felt that the system's competitiveness would improve.

It was thought that a technically improved version of the Officesmith product should be sold to vendors rather than users. A specialized one-function package such as this would find a market with IBM, DEC etc. who do not want to go to the trouble of developing their own package, but do want to make the function available if required.

The recommendation for Comterm was based on the knowledge that IBM has just announced its Token Ring network system, but does not have an integrated office automation package available at the moment. The advice to Comterm was to move fast to take advantage of this window of opportunity, by adapting to the Token Ring and following up on installations of that network system.

The group's recommendation for the Department of Communications was stated clearly by one expert in London; "You've got good value for a \$10 million expenditure, but you can't drop the program now as 'successful'. Next, you must get behind a marketing push".

Ideas as to the mechanics of that push varied:

- three people suggested that it was counter-productive to support four products that have all matched, but not exceeded, current technology. Recognizing that it is politically difficult to implement such a program, they suggested picking one or two of the products for a full marketing push.
- market assistance should include the hiring of outside consultants in Europe to conduct market studies in each target market, and to help work out vendor relationships with European firms.
- one participant suggested that the four Canadian companies should not be eligible to receive additional R&D money unless they file 'good' marketing plans and evidence of fulfilling the plans' objectives.

The final recommendation was for future field trial programs. The effectiveness, the experts said, of any such program in the information technologies industry, can be greatly improved if the government were to commission a market survey of the target markets prior to the program activities. Armed with a clear understanding of what the market wants and what standards and approval procedures a product will be subject to, the program administrator will be in an excellent position to guide development towards a commercially as well as technically competitive product.

ANALYSIS & COMPARISON WITH U.S. OFFICE AUTOMATION OFFERINGS

William G. Hutchison & Company examined the office automation offerings of six U.S. based vendors: Data General, Datapoint, Digital Equipment, Hewlett Packard, IBM and Wang Labs. Of these, Data General has the most reasonably integrated solution. It has mastered integration at the application and file levels.

To further qualify this opinion, Ms. Andria Rossi, a Massachusetts based consultant specializing in office systems was retained to provide her expert opinion on the six. It was agreed that Data General's CEO was the best system available at the time and it was chosen as the U.S. benchmark against which to compare the Canadian products. Note, however that the Officesmith concept is not designed to be directly competitive with CEO and a direct comparison of Initiative with CEO is not appropriate in many of the areas of analysis. Using the areas of analysis developed for the European experts, the following is a summary of the findings.

Architecture

XIOS and Initiative have more network transparency and are more user friendly at the network level than CEO. CEO is an outgrowth of existing products using MS/DOS on the Dasher Terminal at the workstation and connecting clusters back into the MV/Eclipse hardware for host support. Because of the background, CEO does not have as much multi-vendor flexibility in terms of attachment of devices produced by other suppliers. This combination of network transparency for the user and flexibility for foreign device attachment gives XIOS and Initiative top rating ahead of CEO. Comterm also ranks well against CEO by building on industry standard network architecture; it takes advantage of many developments over and above Comterm's. Comterm too has greater flexibility. In summary on the architecture point, Canadian firms have laid a better, more open foundation for future expansion than has CEO.

Operating System

At the operating system level, Comterm and CEO are most similar because of the concept of the PC type product at the terminal. Comterm is more user friendly, CEO does not have multiple windows. CEO uses MS/DOS at the terminal and links it to AOS. CEO is not making use of UNIX other than providing general support for UNIX inside its own operating systems. We believe that in the future, UNIX will provide an ideal operating system foundation for future growth. Thus, we feel the Canadian Unix based products such as XIOS and Officesmiths have an advantage in terms of future operating system development.

Application Areas

There is good word processing flexibility in all systems. They all do the job although some do it in different fashions than others.

In electronic mail applications the Canadian products have more flexibility. CEO must know each node address and the location of all users with respect to their nodes. More user simplicity and network transparency exists in the Canadian systems.

Calendaring and rolodex are best on Initiative followed by CEO. XIOS is weakest. Comterm was not rated because they can use any industry standard package which will give them the advantage of being able to use all future PC standard developments for calendaring and rolodex. If we were to include Comterm and take the best available calendaring and rolodex package in the industry then they would equal Gandalf's Initiative product. Initiative and Comterm would rank at the head of the class for calendaring and rolodex features followed by CEO and then XIOS.

XIOS, however, is the most powerful system for decision support applications. It is also the most difficult to use, but the trade-off may be worthwhile. Initiative is the weakest system in this application. Comterm and CEO are similar because of their architecture and because of the MS/DOS related packages they both use.

Graphics are most powerful on IBM PC-related products which gives Comterm the benefit in this area, followed by CEO and XIOS. Initiative is weak with respect to graphics package capability.

All systems have reasonable capability in the database management area although XIOS and Comterm come out strong. They are followed closely by Initiative, and CEO brings up the rear. Officesmiths is focussed on a particular area and we were unable to compare all the detailed features of their package against the more general aspects of CEO and XIOS.

Critical Integration Areas

In office communication systems, integration needs to be evaluated at four levels:

- The Operating System Level
- Application Systems
- File Systems
- Internal and External Communication Systems

Total integration means compatibility and easy communication at all levels.

Data General's CEO has achieved good integration between the first three levels because of their decision to use the AOs operating system and related file and application systems throughout the product. However, they have limitations at the communications level as indicated by lack of user transparency of their network. XIOS is the winner here because their overall design considered and implemented integration at all levels. Gandalf follows the leaders in integration trailed by Comterm and Officesmiths. Once again, however, it is difficult to rate Comterm and Officesmiths in the same category because their design objectives were different. They have not developed a complete system. Rather they have used lesser funding to develop innovative new products that can play a central role in office systems, building onto developments that others have installed in the field. There is naturally some sacrifice in integration with this approach.

SUMMARY

In summary, the Canadian products rank well against Data General's CEO system. They provide greater user simplicity in network transparency as a result of their architecture.

We believe that the Canadian products are technically competitive with CEO. In fact, some of them will likely be able to add features and provide an even more powerful capability because of the open ended design of their systems. They will have to compete however, against the supplier who offers not only the office communication system but also some powerful super mini computers that tie in with their system. Data General will offer the advantage of a single source while the Canadian firms will have to quickly find ways to work with other suppliers and integrate their systems and allowing other mainframe and major suppliers to sell their hardware as part of an integrated package. The Canadian firms are already adopting this role. In particular, Officesmiths and XIOS have concluded a number of OEM agreements that should provide some positive opportunities.

POST SCRIPT

Hutchison & Company agrees with most of the technical assessment of the European experts but we differ on the emphasis placed on future strategies. Our differing views are a result of our knowledge of the field trial participants; our involvement in the development of Canadian industry; and our awareness of other Canadian research activities. We believe that future support of the office automation venture should include strategies that not only assist the ongoing development of this nucleus of industrial capability but also capitalizes on linkages with research centres and other government and public investments are being made in the office automation industry.

First some specific points with respect to participants and then we will offer some of our own broader strategic comments:

We understand the lack of credibility of the Renaissance product by XIOS yet do not agree. In some respects XIOS is attempting to create the "Mercedes" among the products. It is priced at the top end of the market and it has more features than other products. The Europeans, with the exception of the Germans, tended to discount these extra

features - voice annotation for example - as being of little interest to the market. We are not so quick to discount them. Rather, it may be a valid marketing strategy to position oneself at the high end of the market with extra technical features. We do not have access to whatever market research XIOS may have conducted but feel that research among users would be important before discounting the potential value of these extra features.

A high-end Mercedes strategy is a valid approach for a start-up company provided it establishes some linkages with other large corporations to create credibility in the product offering with respect to on-going service and support. XIOS might have significant advantages when negotiating licensing arrangements because it has been working on the implementation of more technically advanced features.

On the other hand, we too are critical of the XIOS product at the present time because of its user-interface. You cannot have a high-priced product that is more difficult for users. It must use technology, as does Mercedes, to create the "luxury drive". Better use of graphics, windows, scrolling and soft keys are all vitally important to the user and it is in these areas where XIOS is relatively weak at the present time.

The European experts were also unaware of the inclusion of the fibre optic Hubnet local area network in Renaissance. The network is transparent to the user but it may create some interesting capacity and growth opportunities for the XIOS product which could be important to large users and once again important in establishing licensing arrangements.

As in the case of all studies there has been subsequent developments that are relevant. Officesmiths for example has established relationships with Olivetti and is having significant discussions with AT&T.

The competition is also heating up significantly. Apple has announced some important new additions to its MacIntosh product line aimed at the office automation marketplace and Xerox announced some potentially very important products. The Xerox 6400 products make extensive use of graphics to provide very simple user interfaces. These features should have broad appeal to the market and will make the product easier to sell. We don't believe the Canadian participants should be discouraged by Xerox's announcement. They were to be expected because of Xerox's long history of research in this field - much of which led to the original development of the Apple MacIntosh.

One advantage of obtaining the European views is that their input is a detached view that provides an excellent focus on market realities. On the other hand, for this project the perspective was on the overall objectives of the program and whether they were achieved. Our view of the results thus far are somewhat more charitable with respect to Canada's long term objectives than the European view as expressed in this report. The Europeans were evaluating the initial release of new products as presented by some relatively new companies. In marketing jargon they saw and evaluated the steak; they did not see and were therefore critical of the lack of sizzle. It is generally recognized that the "sizzle" sells the steak and therefore the European experts had good reason to be critical.

Our view is that the program helped create some good industrial expertise that is acknowledged as being technically competent. The advantage of focussing on the office automation sector as an industrial strategy is fairly obvious. Service industries are growing significantly in Canada as our manufacturing base continues to decline. Good office systems will assist both our manufacturing industries and our service industries in their continuing quest for efficiency and productivity. Therefore, there can be user benefits as well as the advantages of creating a new industry on the supply side.

The field trial program has created a credible first stage industrial capability. The government will now be facing the conundrum of trying to reduce the deficit which may unfortunately impact on spending in science and technology. When viewed purely as an industrial program though, there are some excellent opportunities ahead. A strategy should now be developed for phase 2 of the industrial program. These strategies should include an evaluation of opportunities for further linkages with the results of our university research - particularly in the artificial intelligence field as it might be applied to office automation. We should also evaluate opportunities for further linkages with government funded research centres - particularly the one in Montreal specializing in office automation.

We have created some interesting opportunities for future development. If we spend a small portion of what we have been spending on our space efforts, we may well achieve important industrial efficiencies and new industries in a rapidly growing office automation field.

APPENDIX A

OCS EXPERT PANEL - PRODUCT RATINGS

OCS EXPERT PANEL - PRODUCT RATINGS

COMTERM

	COMTERM	THREECOM	NIXDORF, OLIVETTI SIEMENS	DATAPoint VISTA	CURRENT SWEDISH TECHNOLOGY
FRANCE	7.5	9			
GERMANY	5.5		5		
ENGLAND	3.5			6	
SWEDEN*	9				8.5
* The Comterm product provides a marketable "package" similar to what Swedish users have custom designed for each application.					

OCS EXPERT PANEL - PRODUCT RATINGS

GANDALF - INITIATIVE

	GANDALF	DEC	DATA GENERAL	IBM	RACAL
FRANCE	5	9	9	7	
GERMANY	4	8	8	6	
ENGLAND*	9				6
SWEDEN**	4	7.5	7.5	7	

* The English experts gave a rating to the generic classifications of OCS systems as follows -

Big Time Share Systems	Local Area Network Systems
(i.e. DEC) 10	(i.e. Ethernet) 6

Clustered Systems
(i.e. Gandalf, RACAL) 2.5

** The Swedish expert had the same hesitation in rating this product as was noted under XIOS.

OCS EXPERT PANEL - PRODUCT RATINGS

OFFICESMITH

	OFFICESMITH		BULL	Standard D-base systems (D-base III etc.)	SAMNA	Display- Write	NBI	CPT	MAPPER
FRANCE	7		5						
GERMANY	2.5			9					
ENGLAND	5.5				10	7.5	7.5	7.5	
SWEDEN	6.5								7.5

OCS EXPERT PANEL - PRODUCT RATINGS

XIOS - RENAISSANCE

	XIOS	IBM	DATA GENERAL	DEC	COMPUTER CONSOLES
FRANCE	6	7	9	9	
GERMANY	7.5	3	3	3	
ENGLAND	4.5		8	8	10
SWEDEN*	4	7	7.5	7.5	
* Note - In Sweden, OCS systems are custom designed by selecting hardware and software components and building a "shell" to manage the system. The Swedish expert was therefore hesitant to give ratings on these products.					

APPENDIX B

METHODOLOGY

The objective of this study was to obtain the opinions of top office automation experts in Europe regarding -

- the technical competitiveness of four Canadian office automation products developed and installed under the OCS field trial program, and
- the attractiveness to industry of the field trial program as a method of industrial stimulation to develop competitive products for international markets.

Given the budget constraints of the project, it was not practical to bring the European experts to installation sites in Ottawa to benchmark the systems. William G. Hutchison and Co. Ltd. (WGH) therefore designed a series of briefing packages and videotaped system demonstrations on each of the products to be reviewed by each expert in an office in his own city.

Originally, the Meridian technology, currently marketed by Northern Telecom Limited, was to be included in this study. However, Meridian was omitted because Bell Northern Research Limited and Northern Telecom Limited indicated that Meridian, nor any other product development, resulted from their participation in the Customs and Excise field trial. Copies of formal statements from both firms in this regard are included in Appendix F.

Office automation experts in France, Germany and England, the three countries specified in the contract, were identified through WGH's associates in Europe. At WGH's recommendation, Sweden was also included in the study, representing the Scandinavian area which is considered one of the most advanced in the use of office automation in Europe. A list of candidates was interviewed, and a panel of five experts selected, one each in Paris, Frankfurt and Stockholm, and two in London.

To develop the briefing packages, WGH compiled a questionnaire of 110 questions covering all relevant areas of system features and functions, which each vendor was asked to complete. A copy of these completed questionnaires, along with product literature and other relevant articles, were sent to each of the experts approximately 10 days prior to their scheduled interview.

Prior to filming the product demonstrations, WGH designed a 'script' based on system benchmarks to help the demonstrators focus on the technical performance of their products. Filming took place at the vendors' offices in the Ottawa area.

Meetings were scheduled with each expert for the last week in November and first week in December. WGH wishes to thank the Canadian embassies in Paris, London and Stockholm, and the Ontario Trade office in Frankfurt for their considerable assistance in providing meeting facilities for this study.

At each meeting, the expert was apprised once again of the objectives of the project, then shown each product demonstration film in turn. Following each demonstration, a WGH interviewer led a discussion of the technical competitiveness of the product, as well as some broader issues concerning program effectiveness. A copy of the interview guidelines developed for this study is attached.

Each meeting was recorded on audio cassette. The tapes were all transcribed in preparation for the writing of this final report, summarizing the findings of the study.

APPENDIX C

RESUMES OF EUROPEAN EXPERTS

ROGER PYE

Managing Director, The Economist Informatics

Fields of Work:

Formulation of strategic plans for information technology on behalf of user organisations, system and service suppliers and governments. The matching of technology to business needs and organisational culture. Establishment, monitoring and growth of pilot projects. The role of information technology in economic development and formulation of national policy.

Professional Experience:

1982 to date: The Economist Informatics Limited

Project Responsibilities Include:

- Director of a major consortium project to evaluate a programme of twenty-one pilot trials of office automation conducted in the UK public sector in terms of equipment reliability, extent of use, user acceptance and organisational benefit.
- Assistance to the sponsor in the establishment and approval of the first of those trials in the UK Cabinet office and assistance in its implementation.
- Participation in the appraisal of thirty-seven applications for preliminary UK licenses for cable television, with management responsibility for the assessment of ownership and management structure and for presentation of results to government ministers.
- Direction of a study to assess members of parliament's needs for office automation and recommendation of an appropriate strategy.
- Direction of an information strategy for a European export agency to identify new means of providing guidance to exporters and the resulting role of information technology.

- Coordination of a major programme to formulate actions concerning the use of telecommunications to aid regional development in Greece, Ireland, Italy and the UK.
- Direction of a study to assess small and medium sized business needs for training with respect to information technology.
- Participation in a multi-national consortium project to identify ways in which the European commission could install developmental systems in order to advance European information technology industry.

1976 - 1982 Principal Consultant, Founder and Director,
Communications Studies and Planning Limited

- Responsible for Applications Studies Division
- Worked extensively in the United States and Canada, including six months with Stanford Research Institute's "Technology Assessment" project during 1975-1976. While at SRI gained considerable experience with office automation systems and acted as a consultant to the US National Academy of Engineering on energy saving through use of telecommunications. An earlier secondment to the USA involved the design and analysis of a survey of all face-to-face, telephone and written communications of an office, funded by the US Department of Housing and Urban Development.

Professional Membership:

- Member of the Office Automation Consulting Group
- Member of the Editorial Boards of Office Technology and People, Telecommunications Policy and Behaviour and Information Technology.
- European Director of the Society of Office Automation Professionals

HARTMUT BOEDEFELD

West Germany

Mr. Boedefeld is currently President of EPS-EDV Peripherie Support GMBH. However, he started his informatics career in 1963 with IBM Deutschland GMBH and through the years has held senior positions in Honeywell and ICL. He has been responsible for the planning and evaluation of new markets and products in the Middle East, Africa, Austria, Germany, Denmark, Finland, Norway, Sweden, Spain, England and Saudi Arabia.

EPS-EDV, GMBH provides consultancy services in office communication systems and data processing implementation.

GORAN BENGTSSON
WM-data Konsult AB
Sandhamnsgatan 61
Box 27064
102 51 Stockholm

Mr. Bengtsson started his career in the early 60's as a computer operator, becoming a programmer after two years. He left the office environment shortly after that to join the Merchant Marine, with whom he worked for eight years as a radio operator.

In 1970, Mr. Bengtsson joined the Swedish Federal Board of Statistics, where he worked on various systems development projects, often in close cooperation with the systems department at Statistics Canada. He remained with the Board of Statistics for ten years.

In 1980 he was appointed head of the Systems Department of Lamco, a Swedish/American mining company operating in Liberia. Mr. Bengtsson's department was responsible for developing and operating all of the company's systems and office communications.

After two years, Mr. Bengtsson joined the Swedish General Post Office, supervising the Systems Development group. The group was responsible for new product development, including a large scale communications system for the Tourist Board that would allow users to book camp sites, hotel rooms, and theatre tickets, and plan future travel outings.

In 1983 Mr. Bengtsson joined WM-data, Sweden's largest office automation consulting company. While with this company, he has worked with two major banks in Sweden, developing a system for one which allows small corporate clients to complete all financial transactions including payables and receivables either on-line or by sending an updated diskette. Currently, Mr. Bengtsson is developing a fully integrated office automation system for Sweden's federal government Department of Labour.

KEITH WHARTON

Keith Wharton is a 25 year veteran of the computer environment. He is the Managing Director of Wharton Information Systems, and the Publisher of The International Information and Word Processing Report, The International Communications Report and the Business Computer Report. The information services and the publications together reflect the founder's experience in information processing which go back to his days as a programmer in 1961.

Before launching his own company Keith was the General Manager of Bemrose Esselte, a jointly owned Anglo/Swedish venture in the field of computerised phototypesetting systems. Keith Wharton took his company from start up in 1972 to a turnover of 250,000 by the time he left in 1974.

Much of Keith Wharton's marketing and product planning background comes from the period he spent in the Marketing Services Division of Rank Xerox where he saw two products through from concept testing to successful launch. It was particularly during this time that he acquired a very sound knowledge of forecasting techniques and of the "control mechanisms" which are essential ingredients in the successful marketing of modern office products.

It was during the early years of his career that he acquired his knowledge of computers, firstly with ICT as it then was, and subsequently as NAAFI's European Computer Manager in Germany. In this latter post he had the interesting challenge of installing, with a mixed nationality staff, an integrated warehousing system to handle NAAFI business throughout Germany.

Wharton Information Systems has now directed in excess of 100 conferences, seminars and workshops covering most elements of office automation. Its mainstay are two OASIS (Office Automation Systems Information Service) products which profile the 25 leading vendors in Europe, and their installed base and annual sales in each of 10 European countries. This large (1500 page) database is now used as the springboard for a large number of individual research assignments for vendors who need advice on pricing, promotion, potential, development, positioning etc.

We also undertake individual consulting assignments for users who commission the company to advise on many aspects of implementing office automation concepts and suppliers who require advice on a number of topics ranging from market statistics through product specification and distribution. Also under Keith Wharton's direction the company has developed a range of methodologies for evaluating the ideal levels of management, clerical and secretarial support. This mixture of practical everyday management experience combined with the planners skills tend to create a down to earth but stimulating environment which makes Wharton Information Systems, one of the best known and most respected names in office automation consultancy.

LOUIS M. NAUGES

Mr. Louis Nauges is the founder and the President of BUREAUTIQUE S.A., the first french consulting company specializing in office automation.

He is the recognized leader in the field in France since 1976 when he created the neologism "Bureautique" which is now widely used in the French speaking countries to translate Office Automation.

His consulting assignment covers all branches of industry, services or public organizations.

Mr. Nauges is also Professor of Information Systems at the University of Paris in an M.B.A. program. He holds a B.S. in electrical engineering and an M.B.A. from the Paris University.

After four years of works in the EDP field, with a large computer manufacturer and a shipping company, he went to the States where he was awarded an M.B.A. at Northwestern University in Chicago (1971).

APPENDIX D

INTERVIEW GUIDELINES

1. In your experience, what functions and performance features are most important to a European client selecting an office automation system?
2. How does each of these Canadian products, within its product category, compare with the current state of the art product(s) available in Europe?
3. For each product, within its product category --
 - what is particularly noteworthy about the system?
 - what features or functions are noticeably missing?
 - what features or functions are built in unnecessarily?
 - what systems in the European market would this product be most closely competing with?
 - what is your overall technical assessment of the product? Where would it place on a rating scale from 1 - 10.
4. What are the current trends in OCS product development in Europe and how will they impact on the competitiveness of each of these products in the next 1-2 years?
5. Is the Canadian experience of 4 years for product development in this area reasonable?
6. Was the level of support given to each company for development and/or field trial activities adequate to support the stated objectives of the program?
7. In your experience, how effective is the field trial program as a means of stimulating the development of a new indigenous industry in the information technologies field?

Based on what you have seen of the four Canadian products, how effective was the OCS field trial program?

8. What initiative(s), if any, has your country's government taken to stimulate the development of an indigenous office automation industry. What was the level of spending and the effectiveness of each one?

APPENDIX E
QUESTIONNAIRE

- SECTION 1 - OVERALL ARCHITECTURE
- SECTION 2 - OPERATING SYSTEM SOFTWARE
- SECTION 3 - APPLICATION AREAS
 - A - Word Processing
 - B - Electronic Mail
 - C - Calendar & Rolodex
 - D - Decision Support
 - E - Graphics & Image Processing
 - F - Data Base Management
 - G - Voice Services
- SECTION 4 - INTEGRATION AREAS
- SECTION 5 - SYSTEM USABILITY

SECTION 1 - OVERALL ARCHITECTURE

1. Does the system have networked intelligent workstations versus multi-terminal shared resource (CPU+cluster) versus a combination of the two?
2. Will the system support stand-alone, clustered, distributed networked architecture as part of the integrated environment?
3. What is the system's size, range and expandibility in terms of number of terminals or workstations and amount of storage?
4. Can you start small and upgrade to a larger system that accommodates more storage and more devices?
5. Can you upgrade incrementally without throwing away the starting configuration?
6. Can the system use dumb and/or intelligent terminals?

7. Can it support the following devices:

- a) etrons with/without display?
- b) executive workstations?
- c) graphics versus alpha numerics?
- d) cursor control devices: keyboard _____, mouse _____, joystick _____?
- e) printers: reprographic lasers _____, impact _____, dot matrix _____, electrostatic _____, line or band _____, ink jet _____?
- f) storage devices: floppy disk drives _____, rigid disk drives _____, tape drives _____, optical disk _____?
- g) back up devices _____?
- h) optical character readers _____?
- i) voice recognition devices _____, synthesizers _____?
- j) modems _____?
- k) multiplexors _____?
- l) keyboards: electronic _____, soft or combo _____, hand-held _____, low profile _____, adjustable _____?
- m) telecommunication integration _____?

8. Can IBM PC or look-alike interconnect? How?

9. Can other vendors' systems or peripherals be linked to the network and how?

10. If non-intelligent terminals are used, are they supported by a host processor or by a separate terminal processor? What are the performance ramifications for both the host and the end-user?
11. If the system has multiple nodes or processors, how aware is the user of the mechanics of moving from one to the other for file retrieval or transmission.
12. In a vendor's proprietary network, can you link different models of systems together to share programs, devices and files without having to use terminal emulation to gain access to a process to which a terminal is not directly attached.

SECTION 2 - OPERATING SYSTEM SOFTWARE

1. Will the system support applications intended to run under industry standard operating systems?
2. Does the operating system span the network?
3. Does the system's original operating system design predicate interactive or batch operations?
4. Can the system perform both foreground and background tasks?
5. Which tasks can be performed in the background?
6. Can the system support a guest operating system? Does the guest operating system co-exist on the same hardware as the primary operating system?
7. Are there dual operating systems, one emulating the other and how will the hardware performance be affected?

8. Is it possible for the operating system in a networked environment to share processing resources, memory, disk storage and other facilities across the network without the user's explicit involvement?
9. Is there a common file management/database facility underlying all applications?
10. Can various applications share a common filing system or must they be segregated by type (word processing versus spreadsheets)?
11. Can users add their own or third party application programs?
12. Will all system models use at least one consistent operating system as the basis of the integrated structure?
13. Is the file manager flexible enough to accommodate varying degrees of user access privileges?

14. Can access rights be issued both to personal and to shared groups of files?
15. Can data in the main system's file cabinet be retrieved from any system on the network? Must you know where the data resides in order to do so?
16. How many steps does it take to locate where data resides in the main system's file cabinet?
17. Is the file manager consistent between remote and central systems in terms of command syntaxes, file categories and access authorizations?
18. Can any task be interrupted to view a directory listing?
Can the directory be viewed together with the working file?
19. Can files be retrieved using boolean logic combinations on file header data? Is it possible to do so across all applications?

20. Can an entire cabinet be searched for all files containing a specific word or phrase? What file level does this facility search (folder, drawer, cabinet, disk)? Must these words or phrases be marked or must the file be indexed first?

21. Can you create a file folder (or similar entity) on-the-fly? Can you assign security rights to that entity on-the-fly?

SECTION 3 - APPLICATION AREAS

A - WORD PROCESSING

1. Does the WP package have the following features and capabilities:
 - a) Document versus page orientation
 - b) Multicopy printing
 - c) Justification (right/left)
 - d) Centering
 - e) Indents
 - f) Scrolling
 - g) Delete character
 - h) Backspace/erase
 - i) Delete word
 - j) Delete line
 - k) Delete block
 - l) Move word
 - m) Move line
 - n) Move block
 - o) Bold and underlining
 - p) File merge
 - q) Global search/replace
 - r) Automatic wrap-around
 - s) Headers/footers
 - t) Widows/orphans
 - u) Spelling checker
 - v) Multifont capabilities (imbedded?)
 - w) Screen/page actual
2. Are the same conventions used for these capabilities in non-word processing mode?
3. Is the same WP program used throughout the system?

4. In a cluster or networked architecture, how many users can simultaneously access the WP processing before performance is significantly affected?
5. Can you append or move blocks of data from other files (graphics, spreadsheets) into a WP file without losing the integrity of that file?
6. Can you interrupt a WP document to check mail, calendar, etc. without first having to file the document?
7. Which of the WP features can be invoked outside of WP, for instance in mail or calendar?
8. Can documents be passed between different types of workstations and freely edited and reformatted?
9. Are word processing files stored in the same cabinet as other applications
10. Does the WP offer a stored-keystroke option for storing user-developed commands?
11. Are math functions supported within word processing?

APPLICATION AREAS (continued)

B - ELECTRONIC MAIL

1. Is there a master directory for all local and remote user addresses? How can this directory be searched?
2. Can documents, data files, images, voice, graphics or spreadsheets be appended to mail? Can receiver revise, store, forward or print these files?
3. Are you notified of mail arrival, no matter what menu, screen form, or application you are in? Can working screen be interrupted to read mail? What can you do with mail in interrupt mode (eg. forward, private) without exiting previous application?
4. Are calendar and rolodex entries able to be sent along with mail messages?
5. Is the word processing editor invoked in the mail facility?

6. Is there a central mailbox for mail distribution to a department with individual security provisions for each user assigned to that mailbox address?
7. Can information be sent from one operating system environment to another? What happens to the form of the information?
8. Can individuals maintain personal distribution lists?
How many per user?
9. Can the creation of a mail item be interrupted to view a distribution list?

APPLICATION AREAS (continued)

C - CALENDAR & ROLODEX

1. What security provisions are supported on an individual basis for the electronic calendar facility?
2. Can you enter your calendar from any screen within any application? How quickly?
3. Will calendar schedule meetings etc. with other users on the system? With other users on another system in the network? Is this done in the background? Is the scheduler linked to E mail.
4. Is there a tickler file option to which documents or files can be attached?
5. Can each user create a personal rolodex? Can entries be annotated?
6. Can the rolodex be used to generate form letters? Is there an autodial option for the rolodex?

APPLICATION AREAS (continued)

D - DECISION SUPPORT

1. Can spreadsheets be incorporated into documents with the formulas still embedded in the spreadsheets? Once merged, can the spreadsheet information be massaged, based on the underlying formulas?
2. Is the spreadsheet package similar at all levels in the network (eg. can you execute spreadsheet formulas created at the mini level on the personal computer in the network)?
3. Are command sequences for spreadsheet similar to those in other applications?
4. Can spreadsheet cells be referenced from within a document to have numbers automatically inserted into text and updated?
5. Once a spreadsheet or a piece of a spreadsheet has been embedded into a word processing document, can it be automatically formatted as would be tabular material within a word processing document?

APPLICATION AREAS (continued)

E - GRAPHICS & IMAGE PROCESSING

1. Can text be inserted into a graph or is the text restricted to titles and legends?
2. When a graph is transmitted to a workstation that does not support a graphics monitor, does the system mark the area in the document that would contain the graph?
3. Can you scan a page with both image and text? Can you store, edit and transmit this compound document?
4. Will the system link image processing with fax transmission?
5. Can you add free-hand touches to business graphics? Are free form drawing capabilities separate from the business graphics application?

6. Can graphics and text be combined within a document or within electronic mail? Will the graph retain its structure? Can it be manipulated once it has been integrated into a document?
7. Can commands used to create a graph be stored for use in other files?
8. Does the graphics program have different levels of complexity so the user may choose?

APPLICATION AREAS (Continued)

F - DATA BASE MANAGEMENT

1. Does the system include a data base management capability? What is its structure - hierarchical, relational or networked?
2. Can you easily switch from a local workstation mode to a host-connect mode by depressing a single key? What functions can you perform on the host in this mode?
3. Can the same retrieval criteria be used to locate records with the data base package that are used to retrieve groups of files?
4. Can the results of a query from a local or remote data base be easily merged into letters, reports, and electronic mail?
5. Can the user interactively query a host data base or is it a batch procedure?
6. Can query routines be embedded in other files, so that information can be updated constantly based on changes in the data base?

APPLICATION AREAS (Continued)

G - VOICE SERVICES

1. Can an autodial facility be used from the on-line rolodex?
2. Can a digital telephone partially emulate the vendor's terminal to be used in accessing electronic mail and calendar?
3. Can the system easily produce a phone usage report?

SECTION 4 - INTEGRATION AREAS

1. Is it possible for third party or in-house software programs to become applications that are integral to the system's software?
2. Are third party applications integrated by becoming an option on the office systems menu or will this "foreign" package inherit the user interface, command structure and share utilities with the turn-key office applications?
3. Can you take a file or a portion of one created under MS/DOS or CP/M and include it in a file created using the proprietary office system file structure? If so, will the foreign file retain its original format or will it take the format of your working file?
4. Can multiple applications open on the screen simultaneously?
5. Can you flip in and out of a communications session flexibly?
6. Can an entire telecommunications session or portions of

one be automatically transcribed on disk with the option to print later?

7. Can the system automatically dial a host, log on, execute operations and cause data to be transmitted and recorded - all as a background operation?
8. Can a non-programmer query host data bases?
9. Can data extracted from the host be stored in a personal file? Can it be mailed, printed and so forth?
10. How can other vendors' PC's be linked to the integrated office system?
11. Are any of the workstations dependent on terminal emulation programs to access the office system's programs?
12. What other emulation programs does the system support?
(3270, VT-100, TTY)
13. What functions are satisfied in emulation mode?

SECTION 5 - SYSTEM USABILITY

1. Is the operator prompted through each step of a program?
2. Will the system display error messages? Do the error messages provide help instructions?
3. Will the system prompt the operator on device status (printers, disks)?
4. Can "help" facility be accessed from any screen menu or application?
5. When help is accessed, will the system go to the appropriate help screen related to the cursor activity or must the operator start at the beginning and scroll to the requested item?
6. Is cursor movement consistent with all screen forms/programmes?
7. Can the operator move freely from one page of a file to another page in either same file or another? Is the file index required to move to another file?

8. How many levels of interruptions are supported? For example, can the operator interrupt a document to check a mail item, then interrupt the mail log to check his/her calendar, and return to the original working document at the correct cursor location?
9. Can a function be cancelled at any point in an applicaton?
10. Can a section of text be marked for quick access to that area in the file while in another file? Is the marked text stored in a buffer that would be lost when the terminal is shut down? Does this apply to all applications or only word processing?
11. Can the system software support a feature that allows the user to undo a function just executed? (e.g. bringing back a deleted phrase to the display?)
12. Is this "undo" feature limited to the last deletion? Can it include all editing features? (e.g. can the system undo all phrases that were replaced by a "search and replace" action?)
13. Can menus and screen forms be customized by changing the order, renaming, adding or deleting items?

14. In calendar feature, is each user allowed to specify the viewing format of his calendar (day, week or month)? Can he designate hours in which others can schedule appointments with him?

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