

A distributed document management system

by Garry R. Homer, Diana M. Thompson and Mark Deacon

A commercial system for distributed document management, which was designed during a recent TCS Programme, is described. A brief introduction to the commercial partner, AMI—The Advance Group Ltd., is given, and the design features required from the system are discussed. The article concludes by discussing the degree of commercial success accruing from the system and the associated business demands resulting from this work.

AMI—The Advance Group Ltd. (AMI) is a small to medium-sized private limited company situated near the centre of the City of Wolverhampton in the UK employing approximately 200. The company was formed in the early 1970s as a microfilm/microfiche bureaux. It continued to grow and strengthen its position such that it quickly became a major UK player in the document archiving industry, offering microfilming and document archiving services to a variety of large and small customers. AMI is the UK's largest microfilm bureau storage, with major customers that range from Virgin plc to the Ministry of Defence (MOD).

The company expanded its document archiving business by becoming the UK distributor for an American document software product, in addition to the microfilming bureaux activity.

Problem addressed by the TCS Research Programme

During the mid 1990s it became apparent to the company that it faced a potential serious threat to its business growth. Microfilm technology was beginning to appear extremely dated in a business world where the 'dot.com' company seemed to be the only business-model of any significance. Whilst recent events have clearly shown the weakness of this business model, it did raise certain expectations amongst the customer-base and also indicated to management at AMI that it must develop and improve the services it offered to customers if it was to survive.

The microfilm industry in the UK is declining rapidly.

Electronic document management is seen to be the only viable method of document management in the private and public sectors, and is essential to the survival of AMI.

It was against this backdrop that AMI began a TCS Programme in conjunction with the School of Computing at the University of Wolverhampton. The TCS Programme is mature and well documented^{1,2} with similar schemes existing in other countries.³ The School of Computing of the University of Wolverhampton had undertaken several TCS Programmes over the past ten years and as a result of this successful and mutually rewarding TCS experience the University readily undertook this new programme of research.

The major objective of the TCS Programme was to investigate alternative and new technologies that could be used or developed to support the expansion of the business, especially systems and technologies that store documents and data on an application service provider's network, in this case AMI's network.

With the exponential growth in the 'information society' fuelled by the UK Government and market pressure in the global economy, a market size which at least matches the current market for microfilm storage in the UK was anticipated (in the region of £50 million). Ultimately, the market is expected to grow to be many times the size of microfiche. Re-positioning the business as an online information storage and management bureau, AMI expected to capture a significant share of this market in the short term and later, with a more sophisticated system and high quality after-sales, to retain much of this client base in the longer term.

TCS PROGRAMMES

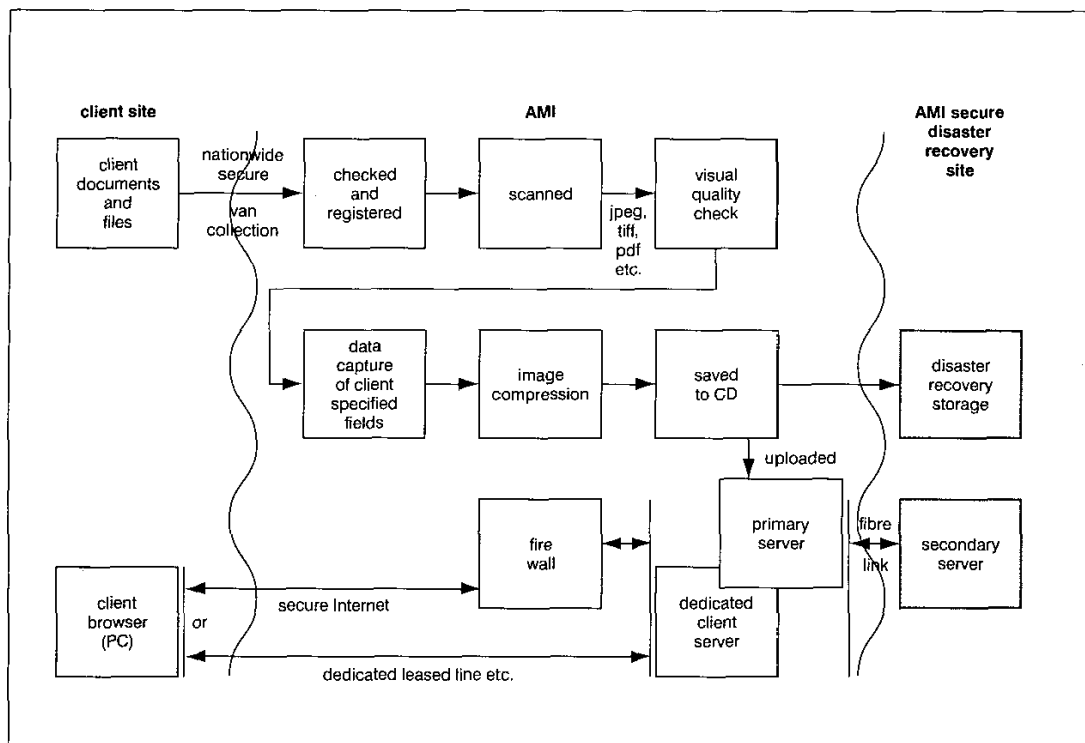


Fig. 1 System schematic

Methodology used

The initial stage of the project was to conduct a detailed survey of any other distributed document management systems offered by competitors. This survey revealed that a few of the competitors did offer distributed services of varying degrees of sophistication, but in all cases the services offered fell short of design objectives set by AMI. These included:

- high level of security of document content and confidentiality restricted to intended recipient
- minimised time between request for document and delivery of that document
- high level of service availability (i.e. minimised system down time)
- cost-effective delivery system, allowing competitive pricing structure
- maintainability of system
- delivery of requested document/images direct to desk top
- ability to meet all current regulatory requirements.
- ability to accommodate large volumes of legacy analogue images.

System

The distributed document management system (AMISERVE) resulting from the two year TCS Programme is represented in the schematic shown in

Fig. 1. Paper documents are picked up from the customer site on a regular basis, perhaps several times per day. When received at AMI these documents are scanned by ultra-high-speed document scanning machines and converted to electronic images stored on RAID (redundant array of independent discs) servers.

After an initial visual quality control check, the images are indexed whereby key identity data (e.g. surname, policy number etc.) is keyed in to uniquely describe each image.

Indexed images are processed by a software compression tool that reduces the size of the image files by up to 80%, thus minimising the storage and transmission times. The compressed images are saved to CD-ROM and forwarded to a remote disaster recovery storage site. In addition, the images are uploaded to the primary Internet server running Microsoft Server 2000 and Internet Information Server 5.

To retrieve these stored documents at some time in the future the customer's employee uses a standard Web browser (e.g. Microsoft Internet Explorer) to enter the criteria describing the documents they require, for example, if the customer is a building society or bank the criteria might include mortgagee surname and/or policy number etc.

This request is processed at the AMI site in Wolverhampton by Microsoft Active Server Page (ASP) software code residing on an Internet server supported

by additional software written using Microsoft Visual Basic version 6. This code identifies the database records (Microsoft SQL—Structured Query Language) corresponding to the requested documents and from these retrieves the image files containing the documents required.

The ASP code automatically returns the images to the browser on the customer employee's desk where a small browser 'plug-in' software utility automatically de-compresses the image before displaying the image on screen to be viewed, saved locally, printed locally etc.

Legacy analogue documents

A unique feature of the system developed as a result of the TCS Programme is the system's ability to integrate legacy analogue images held on microfilm into the distributed document management system (Fig. 2).

Many customers, particularly in the financial sector, may have been using microfilm as a means of archiving their (paper) documents since the early 1960s. This may have resulted in many tens of millions of images existing on many thousands of separate rolls of microfilm. Often it is not practical or commercially viable to undertake an enormous batch exercise to convert this archive of microfilm images to electronic images. The AMISERVE system provides a solution to the problem of legacy analogue images.

When a customer requests a document via a browser, say, by searching on policy number, then that request is processed by the ASP code residing on the server at Wolverhampton as described earlier. If that document cannot be found in the SQL database holding the index of electronic images (that is, current or recent documents) then the software automatically redirects that document request to a secondary image retrieval subsystem and the client at the customer's site receives a message to the effect: 'The document you requested is held on microfilm, the document will be available within x hours' (where x can be anything from as little as a few minutes to several hours, depending on the level of service agreement that has been negotiated between the customer and AMI)

When the request is passed to the secondary image retrieval subsystem, any one of an array of PCs can automatically 'accept' that request. This array of PCs each has a microfilm

reader/scanner linked to the PC and the operation of that reader/scanner is under direct control of the software (Visual Basic) running on the PC.

The software processes the document request and from a database of 'offline' (i.e. microfilmed) documents identifies the appropriate roll and the location of that roll containing the required document. A message is displayed on the screen of the PC to the effect 'Insert ROLL 265, located in CABINET 3, TRAY 12' and a flashing beacon is activated to attract the attention of the human operator (who may currently be engaged in some unrelated task or activity). The human operator thus 'picks' the required roll of microfilm and inserts it into the microfilm reader/scanner (the one step of the process that cannot be automated and requires human intervention). The software then drives the roll of film to the required frame or frames containing the required document and instructs the reader/scanner to scan those frames, storing the resultant images electronically.

Once this physical stage has been completed, the (now) electronic images are integrated into the primary SQL database containing current documents. Thus, when next a client at the customer site accesses the AMISERVE system (perhaps to retrieve an unrelated document) they are informed by the browser content that the document they requested earlier is now available for viewing and, when they choose to view that document, it appears in their browser in the normal fashion.

When next that same document is requested, instead of having to retrieve that document from legacy microfilm storage media, the software is able to retrieve the document from the RAID (electronic) media. Thus, a unique feature of AMISERVE is that it provides an

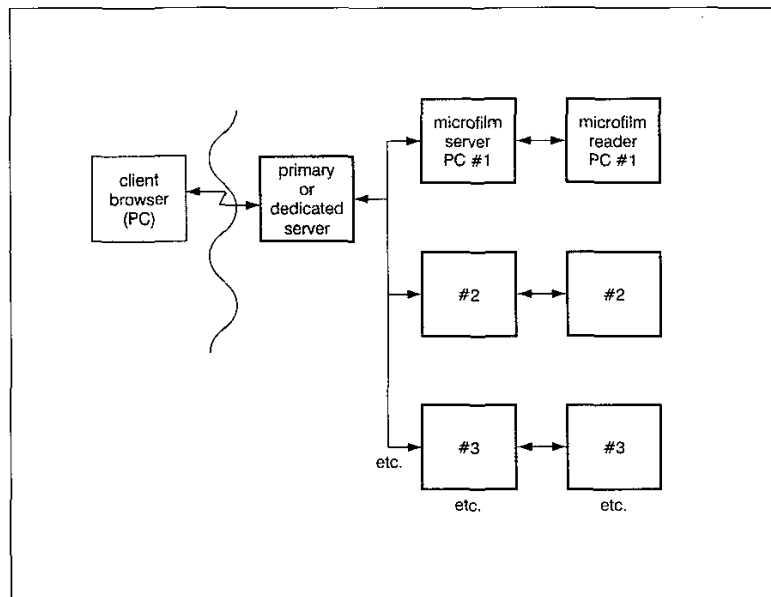


Fig. 2 Offline access to legacy images

TCS PROGRAMMES

incremental cost-effective 'scanning on demand' facility not available in distributed document management systems from competitors.

Conclusions

The distributed document management system (AMISERVE) resulting from the TCS Programme has achieved all the design objectives identified at the outset of the project. Commercially, the system has created revenue of over £2 million in the two years it has been operational. The status of the company as one of the leading UK players in the document management sector is reflected in the customer base, which is now predominately large-corporate or 'blue-chip' organisations such as banks, building societies, insurance companies etc.

This specific project, as an example of the application of the TCS Programme mechanism for the delivery of applied research-based systems and product development, has proved very successful. It has been a major catalyst for change within the industrial partner, AMI, developing a culture that now embraces new technologies and especially Internet technologies. The system resulting has provided an improved service to existing clients, negating the need for technical investment in equipment and manpower within the client company.

From an academic perspective, the programme has enabled the School of Computing at the University of Wolverhampton to attract additional private commercial income to the value of some £160 000 for related R&D

work. A further £152 000 ERDF contract has been won to undertake work on the use of Internet technologies in the automobile supplier chain in the West Midlands. This work is being undertaken in collaboration with Warwick Manufacturing Group (University) and EAIG, the European Automotive Initiative Group.

The relationship between the company and the university continues to evolve. University of Wolverhampton graduates currently comprise 50% of the IT staff at the company. In addition, the company employs an undergraduate from the university on its industrial placement year.

References

- 1 INNS, T. G.: 'Transforming the bottom line of a SME through product design', TCS Design Seminar, 1995
- 2 <http://www.tcd.co.uk>
- 3 GUNN-TURID, K.: 'Technology transfer from R&D institutions to SMEs', TT196 Conference Proceedings, London, 1st July 1996

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Harnessing the power of national cultures

National cultures are intangible phenomena. Yet, they can have a significant influence on the performance of individual organisations and entire industries. National cultures have been described as the means by which peoples communicate, perpetuate, and develop their knowledge about attitudes towards life. Compared to less elusive factors, such as exchange rates and trade agreements, the influence of national culture is rarely mentioned. However, companies like the Ford Motor Company use business methods that harness the congruous aspects of foreign national cultures and filter out the incongruous aspects of indigenous national culture. These methods have made a major contribution to their fight-back against Far Eastern competitors.

The influence of national culture on organisations and industries has been explored in a series of articles in IEE's Engineering Management Journal. These articles are being followed up by a survey of IEE members. You can make a contribution to this important survey by completing a short questionnaire on the IEE Management Professional Network website at <http://www.iee.org/OnComms/pn/management/>. The questionnaire is based on extensive research undertaken some years ago which now needs updating. The survey is concerned with broad trends rather than particular organisations. Accordingly, the questionnaire is anonymous. Results will be reported in IEE publications but no reference will ever be made to individual responses. Please note that the more realistic your answers are, the more benefit the survey will have. Also, please note that there are no 'right' or 'wrong' answers. A pilot study has been carried out to ensure that the questionnaire can be completed in less than five minutes.

Please visit the website at <http://www.iee.org/OnComms/pn/management/>. The input of every IEE member is important, and your input will be much appreciated.