

GJMC AUDIT OF TRANSPORT RELATED STUDIES

An insight into the Document Management System

Barend du Preez* and Desmond Ho**

*UWP Engineers, Private Bag X66, Bryanston, 2021

**Greater Johannesburg Metropolitan Council, P O Box 32168, Braamfontein, 2017

1. BACKGROUND

Information is the key element in sound decision making. Information comes in many forms, such as hardcopy reports and documents, electronic documents/reports, etc. Still one of the most commonly used is the paper documents/reports media. To manage these has become increasingly difficult, but with the availability of new electronic database systems, it has become much easier to address these problems through the development of Document Management Systems.

Many transportation studies have been undertaken in the past in the Greater Johannesburg Metropolitan Council (GJMC) area. These studies are public transport, private transport, operational or land use related. A large number of originals and copies of these reports and documents have been gathered by the Metropolitan Transportation Cluster of the GJMC.

To use these documents and reports effectively, the GJMC required a reliable system to keep record of these documents as well as keep track of the various studies that were carried out. The system also needed to be maintained on a regular basis ensuring that all new transport related documents were also captured. Further, the consistent turnover of professional staff within the GJMC area resulted in a situation where resources were wasted in duplicating efforts of the past.

This need for a reliable system was recognised by the GJMC who initiated a process for the establishment of a Document Management System for all transport-related documents and reports undertaken over the past 10-15 years.

2. GOALS AND OBJECTIVES

The primary goals for the development of a document management system for the GJMC were to:

- ❑ Minimize the wastage of limited resources and eliminate the duplication of efforts in the past.
- ❑ Improve the accessibility of information on transport related studies undertaken in the past to all parties interested in transportation/land use planning.

The objectives for the development of a central document database were to:

- ❑ capture all transport related documents and reports onto a centralized database.
- ❑ establish a common method for the storage and retrieval of these reports.
- ❑ promote more efficient transportation planning within the GJMC.
- ❑ develop a procedure within the database that would allow one to search for all documents of a specific topic or subject.
- ❑ manage the database through regular updating and maintenance thereof, ensuring that all new reports are captured on a regular basis.

3. DOCUMENT MANAGEMENT SYSTEM DEVELOPMENT

3.1 Liaison and Interaction

The process to gather the relevant transport reports required regular liaison and interaction with all the officials involved with transportation planning. For this purpose a steering committee was established, consisting of representatives from the following organisations:

- ❑ Greater Johannesburg Council
- ❑ Western Metropolitan Local Council
- ❑ Eastern Metropolitan Local Council
- ❑ Northern Metropolitan Local Council
- ❑ Southern Metropolitan Local Council

Gautrans was contacted separately for their input, reports and documents.

Regular meetings were arranged to discuss the format and structure of the database as well as the document assessment form. The inputs and views of the steering committee proved to be very valuable without which the development of the database would not have been such a success.

3.2 Development of Assessment Form

To capture the documents into the database an assessment form was developed. This form serves as a record to input into the database. The assessment form contained all the relevant information necessary to easily trace a document located in the Metropolitan Transportation Cluster Library.

The list of topics included on the assessment form were developed and approved by the steering committee. The form was divided into separate sections.

The final assessment form consisted of the following three main sections:

- ❑ Document Identification
- ❑ Study Details
- ❑ Relevance

The information contained in each section is discussed separately.

Document Identification

To easily identify the document or report, the following information had to be obtained:

- ❑ Library reference number - a unique number containing a number and category under which the document is catalogued and filed.
- ❑ Document number - report number, authors file number or the ISBN number printed on the document cover or on the fly sheet.
- ❑ Document location - library in which the document is housed.
- ❑ Document title - self-explanatory.
- ❑ Prepared by - the organisation's name that conducted the study as it existed at the time.
- ❑ Prepared for - the client or authority who initiated the study.
- ❑ Document type - documents are classified as study proposals, transportation studies, etc.
- ❑ Study date - month and year when the document was prepared.
- ❑ Document status - choose draft or final. Draft documents include preliminary, provisional and discussion documents. Final documents include amongst others final preliminary design reports, traffic reports, etc.

Study Details

During the assessment of each report the following study details had to be confirmed:

- ❑ Area
- ❑ Transport modes
- ❑ Document topics/subjects

Each of these aspects are discussed in more detail below:

- ❑ Area:
Identify the judicial and or geographical area to which the document or report applies. The following options are available:
 - Not applicable, international, national, provincial, metropolitan and local. The assessor can also indicate the specific area being dealt with by the report.
- ❑ Transport modes:
Many documents refer to several transport modes. Often they refer only briefly to a specific mode such as cycles. For the purpose of the assessment all transport modes addressed in a report need to be indicated.
- ❑ Document topics/subjects:
The assessor needs to briefly study the document/report to assess the topics addressed within. For this purpose comprehensive main topic headings have been identified. Under each main topic heading a list of sub-headings were also identified.

The main topics are listed below:

- ❑ Costs
- ❑ Design
- ❑ Education
- ❑ Engineering services
- ❑ Environment
- ❑ Land use
- ❑ Management
- ❑ Operation
- ❑ Parking
- ❑ Passengers
- ❑ Public transport
- ❑ Routes
- ❑ Safety
- ❑ Signals
- ❑ Signs
- ❑ Social
- ❑ Terminals
- ❑ Traffic

Table 3.1 gives a detailed breakdown of the main topic headings and sub-headings together with some key words for ease of assessment.

TABLE 3.1 GUIDE SHEET TO ASSESSMENT FORM TOPICS

TOPIC HEADING	TOPIC SUB-HEADING	OTHER WORDS
Costs	Budgets, estimates, funding, operating, capital, fares, subsidies, vehicles, tolls	Assistance, comparison, fuel costs, fuel conservation, allocation, cutting control, evaluation, rolling-stock, infrastructure, expenditure
Design	drainage, implementation, vehicles, geometrics, standards, plan	Geometrics, basic planning, drawings, computer aided, guidelines, limits, construction
Education	training, information, products, papers	skills, proceedings, lectures, internal, study, courses, brochures, technical facilities, teaching, notes, development, subsidies, communication, libraries, seminars, conferences, guidelines, instruction
Engineering Services	maintenance, provision, re-location, protection, upgrading	types, location, tunnels, underground
Environment	preservation, impact, noise, assessment, pollution	control, conservation, EIS, crime, violence, vibration, pollution, upgrading
Land Use	development, corridors, population, infrastructure, urban design, trip generation, zoning, employment, plan	traffic effect, townships, commercial, residential, density, sprawl, households, socio-economic, control, planning, implementation, evaluation, rehabilitation, urban renewal, region
Management	policy, control, enforcement, legislation, TSM, traffic calming, priority	Planning, licensing, monitoring structures, laws, procedures, jurisdiction, systems, evaluation
Operation	capacity, usage, speed - delay, level of service, ranking, exclusive lanes, modes, access	volume/capacity, trends, congestion, priority, demand, monitoring, vehicles, density, reversible lanes, stopping, loading, counts, passengers, optimization, contra-flow and with-flow lanes, busway, crime, violence, modal change, questionnaire, structures, bays, lay-byes, occupancy, frequency
Parking	policy, facilities, bays, park-and-ride	Planning, programme, control, strategy, loading, stopping, maneuvers, signs, ranking
Passengers	commuting, needs, usage, attitudes, walking-distance, occupancy	volume, control, access, fares, ticketing, questionnaire, comfort, image, subsidies, terminal facilities, occupancy, safety, scheduling
Public Transport	policy, plan, legislation	modes, passenger transport, drivers, needs, usage, image, terminals, modal change, modal split

TABLE 3.1 GUIDE SHEET TO ASSESSMENT FORM TOPICS (continued)

TOPIC HEADING	TOPIC SUB-HEADING	OTHER WORDS
Routes	roads, systems, needs, maps, construction, maintenance, numbering, hierarchy	classes, classification, types, signing, upgrading, drainage, evaluation, determination, time, distance, planning
Safety	collisions, accident elimination, black-spots, crime control, warning signs, security	Accident rate, congestion, legislation, guards collision reporting, rescue services, safe geometrics, forgiving highway, data, road furniture, access control, reflective markings, restrictions
Signals	warrants, types, location, system, pedestrians, actuated	control, planning, integration, timing, traffic actuated
Signs	type, advertising, warning, information, regulation, guidance	control, location, reflective, changeable, illuminated
Social	socio-economic, public involvement, attitudes, employment, crime	Upgrading, consultation, housing, convenience, affordability, population, recreation
Terminals	park-and-ride, stations, garages, airport, ranks, depots	access, crime, control, policy, multiple use, depot, facilities
Traffic	needs, infrastructure, origin - destination, trips, monitoring, impact, service, occupancy, plan	routes, trip generation, traffic flow, traffic volume, traffic assignment, distribution, access, characteristics, network, framework, modeling, surveys, data collection, computer applications, questionnaires, evaluation, implementation, route determination

Relevance

The relevance of the specific document was also incorporated into the database. The relevancy of each document was identified under the following headings:

- ❑ **Superseded:** Was the specific document superseded by another and if so specify the document number.
- ❑ **Relevance:** *Relevant:* Classified into two categories namely "Topical" and "Useful". "Topical" documents will have to be studied and taken into consideration when doing planning, design or policy formulation. "Useful" refers to documents of general application. These documents may include some outdated information, but which still serves as useful background information. Manuals and guidelines will typically fall into this category. *Not Relevant:* Refers to documents, which have been superseded and have no relevance to transportation planning in the Greater Johannesburg area. *Uncertain:* The assessor is unsure whether a document is relevant or not.

Comments, existence of further copies and other reference numbers can also be indicated on the assessment form. The capture's name and the date documents were captured are also included on the assessment form.

3.3 Database Structure

All the information recorded on the assessment form was captured into a database. The database was developed in Microsoft Access.

The information was divided into groups and captured in sixteen different tables. The database structure had to accommodate relationships between all these different tables to ensure the development of an easy querying facility. The main database table contained links to all other tables ensuring the development of an effective querying facility.

The database contains a "main switchboard" menu to assist users to gain access to the database in a user-friendly environment. From the "main switchboard" you can access different menu options including add/edit data and reports to print. Choosing the "Add/edit data" option allow you to add new or change an existing records without modifying the database tables itself.

The "Report to Print" option allows you to setup a query. Two different queries can be undertaken from this menu. The first query can be based on a summary (excludes the sub-headings in the Topics section of the assessment form) while the second query covers all the fields contained in the assessment form.

Different search options are available for the undertaking of a query. The search can be conducted for single or multiple topics. By typing in keywords or by ticking on the relevant boxes easy and complex queries can be conducted. The query facility will scan the entire database and list all the reports matching the particular keywords and/or topics selected.

The structure of the database makes it very easy for users to search the database for documents containing information on a specific or range of transport related topics and subjects.

4. DOCUMENT ASSESSMENT PROCESS

Figure 4.1 gives a flow diagram showing the documents assessment process from the identification of documents through to the capturing thereof.

5. IMPLEMENTATION

5.1 Hardware and System Requirements

The system can operate on a personal computer, which should at least be of Pentium status or higher. The system would operate effectively on a PC with 64Mbyte RAM and consisting of sufficient hard drive space.

The system can operate on a local area network (LAN) or a wide area network (WAN).

5.2 Software Requirements

The database was developed in Microsoft Access 97 and requires Windows 95, Windows NT or Windows 2000 to operate effectively.

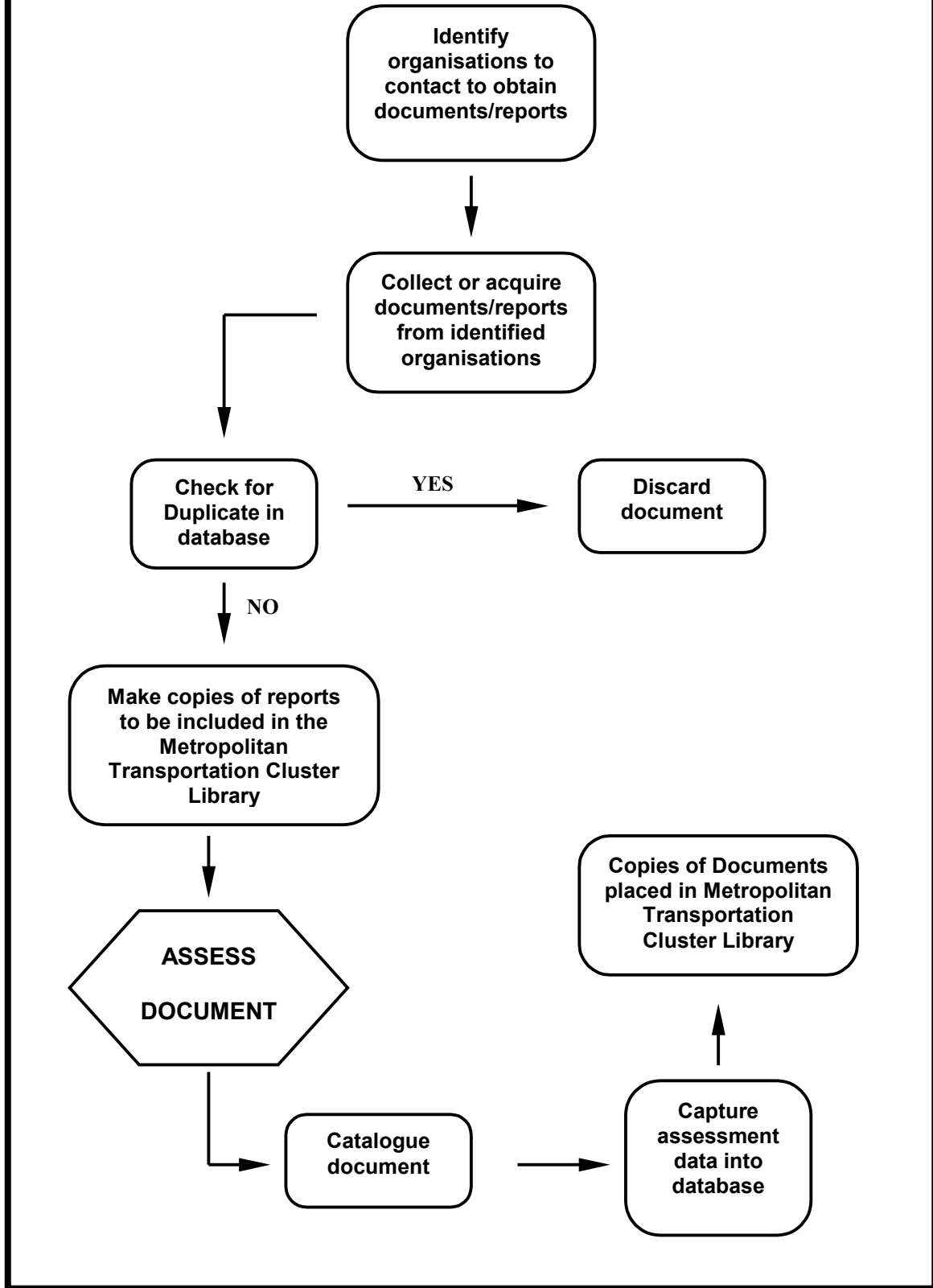
5.3 Database size

Currently the database contains approximately 1 928 different documents. The current file size is 3.4 Mbytes. The Microsoft Access database (mdb) file can reach a maximum of 1 Gigabyte. The database can also contain a maximum of 32 768 objects. It is envisaged that the GJMC database will not easily reach these limits in the short to medium term.

5.4 Security Aspects

As a security measure the database has been structured in a way to allow different levels of access, the so-called user-level security. This form of security is similar to methods used in most network systems. Users are required to obtain the necessary authorisation to access the database when starting Microsoft Access. Within the workgroup information file, they are identified as members of a group. Microsoft Access provides two default groups: administrators (named the Admins group) and users (named the Users group), but additional groups can be defined.

FIGURE 4.1: DOCUMENT ASSESSMENT PROCESS FLOW DIAGRAM



"Users" of the database are allocated read only access, which allows them to access the query facility only. Database administrators are allowed full access, and are able to modify the database when required.

The three main reasons to use user-level security are to:

- ❑ Protect the intellectual property
- ❑ Prevent users from inadvertently breaking an application by changing code or objects on which the application depends
- ❑ Protect sensitive data in the database.

5.5 Metropolitan Transportation Cluster Library

The database does not replace the document and report hard copies. It serves as a link to easily identify such reports. A library of hard copies still needs to be kept and forms an integral part of the Document Management System. In the database reference can obviously be made to documents stored in electronic format.

In the case of the GJMC, copies of nearly all the documents contained in the database are kept in the Metropolitan Transportation Cluster Library. Some reports not included in this library have been captured and their actual location has been referenced in the database.

5.6 Implementation Costs

The costs involved in the implementation of a document management system depend on a number of factors. These factors include:

- The cost of acquiring the hardware and software needed to operate effectively.
- Design cost will depend on whether an existing system is being utilized or modified for the specific application or if a new system has to be designed.
- The number of documents to be assessed catalogued and captured.
- Preparation of assessment form from existing or new database.
- Duplication of reports - if needed for a central library.
- Maintenance costs - budget for regular updating of database.
- Additional work such as linkages to GIS, Internet, etc.
- Professional time for liaison, attending meetings and project management.

These factors could be different for each system making it difficult to give a typical cost for the implementation of such a system. Once the system is in place the cost for updating the system is limited to reassessment and capturing of additional documents.

6. GJMC EXPERIENCE TO DATE

The transport audit database has been in operation since 1997 and the GJMC wishes to share with interested parties the advantages and disadvantages experienced during the elapsed period. The options for updating and maintaining the database, current users of the database and possible future developments or initiatives involving the database will also be briefly discussed.

6.1 Benefits/Advantages

The development of the transport audit database has provided the following advantages/benefits to the GJMC:

- i) With the keyword search facility, it assists in the easy tracking of catalogued documents, which are currently located in the Metropolitan Transportation Cluster library. In addition, it provides easy access to strategic transport management information such as the organisation who prepared the document should further copies of reports, not located in the Metropolitan Transportation Cluster library, be required.
- ii) It provides a quick and easy method to interrogate the database when searching for documents dealing with specific transport related topics or subjects.
- iii) The capturing of new data is a simple process and could be performed by unskilled persons with minimal training but preferably should be undertaken by semi computer literate persons who are not highly qualified.
- iv) The problem of a consistent turnover of professional staff within the GJMC will not result in a situation where resources are wasted in duplicating efforts of the past.
- v) The database has been designed to provide a user-friendly interface, easy implementation, high flexibility for changing the database structure and format and easy updating and maintenance of the system.
- vi) The database can be installed on a standalone computer or a local area network and any modifications to the database can be transferred electronically to all users.
- vii) The built in security measure provides some confidence to the database administrator that the database cannot be modified or edited by unauthorised persons.
- viii) A copy of each report is not necessarily needed in your own library.
- ix) The system can make reference to the availability of documents in electronic format.
- x) Possibility exists to link to a spatial GIS system.

6.2 Disadvantages

The following disadvantages have been identified:

- i) The management and control of the database is a crucial issue, which must be addressed at the outset when embarking on such an initiative. It is thus necessary to have a dedicated staff member to manage and administer the database.
- ii) The evaluation of the transport related reports must be undertaken by personnel with transportation expertise, in particular when assessing the relevance of the documents.

- iii) Related to the management of the database, it is imperative that the database is maintained on a regular basis, which requires continued human and financial support.
- iv) The size of the database is reasonably large which is problematic on some storage devices. The advent of the CD ROM will negate this shortfall.

6.3 Maintenance Options

The GJMC identified two possible options available for the continued maintenance of the transport audit database. The database could be maintained internally by officials of the GJMC or outsourced to the private sector. The work to be undertaken in maintaining the database include:

- i) Liaising with Metropolitan and Local Councils of the GJMC, Gauteng Government - Department of Transport and Public Works (Gautrans), transportation consultants, amongst other, to establish the most recent transportation relevant studies undertaken by each organisation.
- ii) Obtaining copies of the most recent reports, which are then checked for duplication, assessed, catalogued and captured onto the database, if relevant.

The GJMC has recognised the importance of maintaining the transport audit database and has, where possible, tried to update the database using internal resources. However, in general, due to the lack of capacity the GJMC opted to follow the outsourcing option at present.

6.4 Users of the Transport audit database

In theory, all parties interested and involved in transportation/land use planning could be classified as potential users. To date councilors, officials of the GJMC and Metropolitan Local Councils, transportation and planning consultants and students have made use of the database.

6.5 Possible future initiatives for the database

The transport audit database was viewed by the Metropolitan Transportation Cluster of the GJMC as an initial phase for developing a transportation information management tool and providing a method to disseminate information to all interested parties on transport related studies already undertaken.

Possible future initiatives for the database under consideration are listed below:

- i) The possibility exists to map the transport audit database with a geographical information system (GIS). As a practical example, all traffic impact reports submitted to the Metropolitan Transportation Cluster could be captured on the database and interfaced with a GIS system. This would allow officials dealing with development control issues to evaluate, from a transportation perspective, new development applications taking cognisance of traffic reports submitted for other applications in close proximity to the new application.

- ii) The Metropolitan Transportation Cluster envisaged that this database could be publicised and made accessible to a wider audience than originally anticipated. With the advent of the Internet, the possibility exists to include the database on the GJMC's web site for wider exposure. Preliminary discussions have indicated that this could be implemented but requires more detailed investigation.

7. NEW DEVELOPMENTS IN DOCUMENT MANAGEMENT SYSTEMS

In recent times with constant changes in technology new improved systems have been developed which makes it far more easy to develop, implement and maintain a document management system.

The new systems allow users to archive, search, find, organise, share and reproduce documents with unparalleled ease of use.

Sharing and re-using knowledge starts with making all your documents accessible, without too much effort. The new systems retrieves documents based on their original paper-based and electronic information. These systems allow one to make paper-based and many different electronic file formats accessible by full-text search techniques. In addition, it allows end-users to organise these unstructured data collections into more structured data collections and make them available to third parties using LAN/WAN networks, the Internet, Intranet or CD-ROM's.

The systems combine the industry's leading technologies for archiving, searching, finding, organising, sharing and reproducing documents that may otherwise have been buried in file cabinets or stored electronically across a multitude of different media. It is also completely scalable, providing an excellent solution for small offices as well as large-scale production environments.

7.1 Archiving

The terms "document conversion" or "scanning" may sound intimidating to those who are just being initiated into the world of document management. However, you do not have to understand the mechanics of scanning and optical character recognition (OCR) to benefit from their capabilities. Documents are fed into a scanner, much like they would be into a copy machine, and translated into searchable text and images. In fact, these systems support many electronic formats including MS Word, Excel, PowerPoint, PDF and even dBase files. Just drag and drop files onto the index builder to make your entire collection searchable.

7.2 Searching

Once you have entered information into these systems, there are no limit to what you can do with it. The robust full text retrieval provides you with all the tools you need to find what your are looking for. From simple word searches to Boolean operators, fuzzy, proximity and progressive searches, you have the power to harvest information you did not even know existed.

The advanced fuzzy search technology compensates for OCR and spelling mistakes by allowing variations in search terms. For example, a search for the word "scanner" may

also highlight the words "scamer" and "scarnner". This feature comes in very handy when you are searching poor quality or old documents that produced OCR errors or when you are not sure how to spell the word you are looking for.

7.3 Finding

WYHIWYG, What You Had Is What You Get, represents a major breakthrough for the electronic document management industry. Rather than viewing raw, OCR-generated text as with other imaging systems, these systems present you with an electronic "photocopy" of the original document. The search terms you are looking for are highlighted directly on the image, so you can view the highlighted words in context, even when they appear with complex graphics and hand-written notes. Advanced hit navigation functionality allows one to locate the position of hits within a split-second or jump right away to the page with the hit, even within very long documents. These kinds of features make the difference between searching and finding.

7.4 Organising

One of the unique capabilities of the new systems is that they allow you to organise documents at any time. This minimizes the need for organisation and coding prior to scanning. As you work with your information, you can structure it in the most useful, meaningful way and build your own table of contents. This is especially important if you are involved in building new concepts and ideas, or if different people within your organisation plan to use the same information for varying applications. You can also enhance the navigational capabilities of your documents by adding key fields, bookmarks, annotations and page thumbnails.

7.5 Sharing

These systems also offer automatic options for making your information easily accessible via Intranet and Internet as well as for distributing it on CD.

Transform your computer into a knowledge portal that constantly delivers pertinent information based on your predefined search terms. These systems can also automatically analyse and filter continuous streams of incoming paper and electronic data and route the hits to you. Your search for knowledge is over – just check your e-mail.

7.6 Reproducing

Once you have found what you are looking for, you can easily reproduce the original document by printing it on your own personal printer or your network printer using all functionality such as bundle printing, stapling and mailbox facilities. Combining this with result lists from your query, you can create customized reports including all the necessary information. You will always have a 100% copy of the original document available.

8. CONCLUSIONS

From initiating, designing, testing and implementing the GJMC Transport Audit document management system the following conclusions can be drawn:

- The GJMC document management system is operating successfully and therefore met the initial envisaged goals and objectives set by the GJMC.
- The system provides easy access to strategic transport management information.
- The keyword and topics query interface is user friendly and easy to use.
- The database is highly flexible for changing the database structure and format.
- A dedicated and committed staff member is a prerequisite to ensure the continued maintenance of the system.
- The long-term viability of the system lies in the regular updating and maintenance of the system, which requires consistent human and financial support.
- Although this system operates effectively you should be aware of the new developments in document management systems. They are especially powerful in the fields of searching, finding and organising all information contained in the documents without using a database structure.

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