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MANAGING MINE SITE DATA

Martin Kimber¹

ABSTRACT: In a world of Digital Data, companies fail in utilizing efficiencies when using multiple storage locations for various departmental data. Companies collect data in various ways, if this is presented within an easy-to-use system it becomes information, leading to knowledge. It needs to be stored in an easily accessible system, and one that requires minimal training, otherwise an employee will not buy into the use of the system.

Often, common data is of interest to different departments. For example, Human Resources (HR) need personnel information, also do the Safety and Training department, but the data is not linked. Many other examples of duplication exist within their corporate structure, which if this data was shared, productivity would increase.

What is needed is a system that integrates all the data captured whilst allowing any employee to retrieve it quickly. By doing so the number of employees required to process data can be reduced, allowing those people to be gainfully employed in other duties with their 'spare time'. This becomes a productivity gain for the company.

Realising this was a problem, software was developed with the aim of making it as versatile as possible and of course, easy to use.

The solution discussed below addresses this problem by providing various departments the ability to share the same data file across all network devices including mobile devices. It thus allows all users to access current information meeting their requirements. Furthermore, should any user require either the capture or the dissemination of different data, the database can be easily modified to their requirements.

THE PROJECT

A typical scenario

A new (staff) employee arrives to work, and is shown the office they will use. The computer on the desk is probably running a version of MS Windows and the only useful software on it is MS Office. The employee has tasks to perform, and data to record, so how does that happen?

Of the available programs (often), MS Excel is used for recording data, but MS Excel is not a database. The next issue to confront is that any document created, is not necessarily stored on a location for other users can access, or, it cannot be accessed concurrently by multiple staff, it is probably stored on the local machine. Instantly there is a problem in communicating the data to other people and shared, who has the most current file with the most recent data in it?

To complete their tasks, people require knowledge, not just data. This is achieved by reviewing the captured data and transforming it into information by filtering and presenting it an appropriate way. It then becomes knowledge.

How many times have people input data more than once, simply because the system has not been structured correctly? If one has a database of people, and need to output some address labels, it would be simply a task of designing a 'report' format to perform the task, and yet there are companies that have a specific table for address labels, independent of the main file.

A Mine Manager recently stated that his company employed four people to process recruitment paperwork, and they were still having difficulty doing so. Obviously, their system had not thought out properly. It was probably derived from ad-hoc circumstances, which now have become too cumbersome for efficient processing. Many times, people input data more than once, simply because the system has not structured correctly. If data is captured, then this data can be massaged into a format chosen time and time again. If there are changes made to the main file, they are mirrored in the new output format without the need to edit the file.

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Commencing in 2005, design consideration was given to a suitable database whilst employed at an Australian mine site. The database format has successfully been used in all subsequent roles both domestically and international and was named 'iNfO', i.e. Integrated Network Filing Options. <http://info-software.net>

In the development cycle, discussions were held with many people across a variety of roles to get an understanding of what data they needed reliable and quick access to, thus enabling them to perform their role efficiently.

THE RESULT: 'INFO' - 'INTEGRATED NETWORK FILING OPTIONS'

Companies may have an existing system; however, it is probably limited, consisting of various independent solutions that are not connected (interfacing) together. Considering the various systems currently installed, it should be noted that they fail in providing a 'complete solution' to what all mine departments need. They concentrate on the security gate, and currency of qualifications. They do not offer other modules such as document management, contractor management, production reporting or mining/engineering delays. How many of these systems offer an easy way to export or import data?

iNfO is an integrated system offering the capture of data, which is then converted into information for the user to utilise and thus have knowledge. Specifically, it captures routine data, and can present it to the user as a visual or printed output. Data may be input via a keyboard, RFID card reader, or imported (Custom-Separated, Comma-Separated, Merge, .xls, .xlsx and dBase) and exported (Tab-Separated, Comma-Separated, DBT, Merge, HTML Table, XML or Excel formats).

The data file defaults to English; however, it can use custom languages at any time, concurrently with other users. For example, one user can select 'English' and another select 'Russian' to access the same file. Whilst this feature is active, full compatibility is dependent on confirmation of various language dialects to be confirmed and entered in consultation with the client at time of installation / configuration, e.g. Spanish dialects vary between Spanish speaking countries.

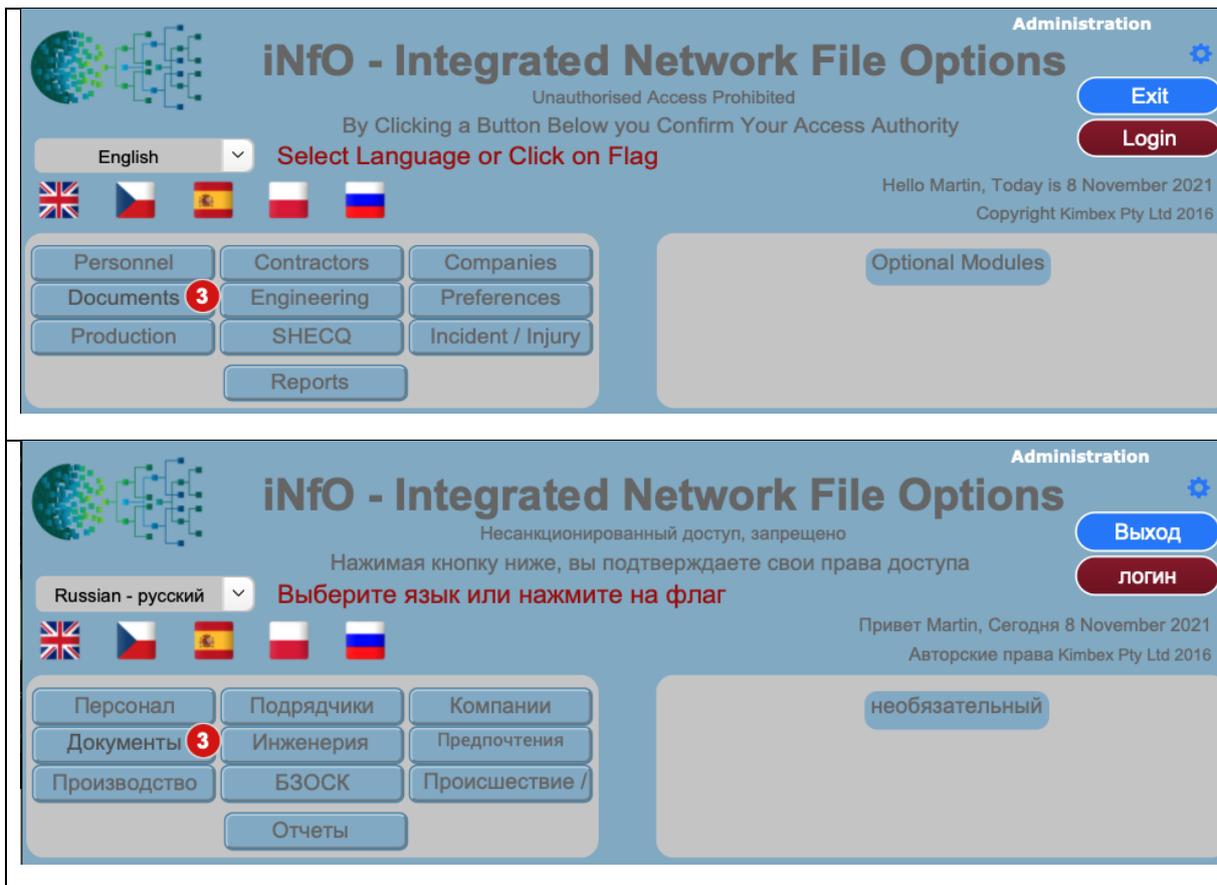


Figure 1: INFO login screen for various languages

Designed to suit various users. The labels of the fields can be changed to suit client requirements, e.g. in the 'Production' table the label for 'cars' (underground coal) may be altered to 'trucks' (to suit underground metal or open cut).

The database includes the monitoring of employees, companies contracted to perform irregular tasks (such as mowing lawns, clearing trees or excavations) and the employees of those companies (known as contractors), and of course, visitors, in fact all persons that attend the site (facility). It allows ALL persons (by entering their employee number / contractor ID via a keyboard or I.D. card) to view their own records, and to record their attendance, and if necessary, access the document management area of the database to view stored documents (such as SWPs, MSMPs, RA's in fact, any document, audio file or video in the document management system).

Since visitors are also required to log in, (and if it is their first visit, their company details are recorded, their photo and signature can be captured with the use of a portable tablet), the system can output a self-adhesive label for them to apply to their clothing.

The site or client administrator has 'super-user' permissions and can create accounts for 'registered users' so long as the number of registered users does not exceed the software licence. Registered users have access to view and edit records (within their privilege settings). If a registered user forgets their password, they can automatically request a new one by clicking on a link, and a new (system generated) password is emailed to their registered email address.

Persons are refused entry to site based on mandatory training being expired. Prior to it expiring, they are warned of the number of days left on those mandatory qualifications so they can arrange for their training to be updated prior to logging on. Warning days are colour coded – Black OK, Yellow Warning, Red – Critical. The Safety / Training Dept can produce a report of persons with approaching expiry to pre-arrange the necessary training, Induction, Generic, Medical and First Aid etc.

INFO allows for a labour hire company that provides a workforce to various locations to record their training and appointments at each location separately, thus allowing confirmation of their skills prior to directing them to attend the alternate work location. This is also appropriate for any company having multiple operations (and sharing the same data file) with their employees being occasionally directed to attend a location they do not normally attend, or simply to manage all records within the same file, allowing the data to be transferred from one location to another if that employee re-locates between their operations. When implemented for multiple site use, reports can be produced for the individual sites an employee has on their record.

SMS Messaging is built into the file; it requires subscription to a service and to be configured for that service provider. Typical costs per SMS for such a service in Australia are U\$0.049 to send, U\$0.0075 to receive. This type of notification can be linked to the linked APP (iOS / Android) also developed.

Human Resource (HR) Inclusions

Up to 24 documents, (this number can be increased if required) e.g. employment contracts, counselling/warnings, general correspondence and scanned copies of qualifications can be stored within an employee record.

Personal detail information for Employees, Contractors and Companies include:

Name, Address, DOB, Age, Phone, Email, Sex, Ethnicity, Native Language, Roster, Shift, Qualifications, Medical, Clothing, Documents / Keys Issued, Site Assignment, Date of Hire, Work Location, Photograph, Star Sign, Training Qualification, Medical, Clothing Issues, Document / Key issues, Workcover Certificates and Safety Statistics (plus many others) including:

- Emergency Contact Details: Name, Address, Phone, Relationship
- Qualifications: qualifications/skills held by the employee
- Historical commencement/resignation/termination dates, to provide visibility to employees that leave and return to the workforce
- Access Privileges control access to some content, e.g. performance reviews and salary information
- Should a person have a medical condition, their record is highlighted in RED
- Allow linking of relevant documentation to a position, e.g. position description flag can indicate if a position is mandatory, i.e. has statutory requirements for it to be filled

- Audit Log Tracking such as changes when Employees change shift or employment status changes
- Recording of all applicants, thereby providing a history of previous applications by the same person.
- Provide support mechanism for induction process
- Record results of various checks carried out for prospective employees. e.g. medical tests, employment history or references

Details recorded as part of the recruitment process may be restricted by file permission to specific staff (e.g. HR). Includes the recording of the following recruitment processes:

- Advertise position
- Correspondence (emails, phone calls, notes)
- Form letter templates
- Select candidates
- Conduct interviews (multiple)
- Prepare employment contracts (standard documents created by merging database content)
- Medical checks
- Workers' compensation check
- Start Work, might be delayed before all steps are completed and management sign documents

Human Resource Reporting

Breakdown of workforce by the following criteria:

- Men / Women
- Language(s) spoke at home
- Ethnicity (e.g. Aboriginal/Torres Strait Islander)
- Age groups
- Persons approaching retirement age
- Who is currently on site – Personnel, Contractors and Visitors?
- What hours those persons currently on site have worked
- Breakdown numbers of Employees / Contractors / Visitors who have attended on site between specified dates

Succession planning: identify those positions where staff members are closing in one retirement age. Identify positions in company, which are not filled – requires input from an org chart to facilitate this function.

Calendar (display) – shows 'individual' entries and 'All' for registered users. Can be colour coded, for ease of viewing / allows for easy entry of 'Tasks' associated to the calendar by 'user' or 'all' to see. Staff leave taken for specified period – used to identify excessive (sick or unexplained) leave.

Easily identify individual skills / training and appointments. Provides mechanism to easily find employees with a particular skill mix – Create a Skills Matrix, export to MS Excel.

Complete production recording / reporting including delays (machine / type of delay / other) allowing for delay history by shift, work area, supervisor, or machine.

Reporting on how many people have been onsite during the month/quarter (department of industry report)

Contractor Company Insurance details (Workers Compensation and Public liability policy number and renewal date) – report the validity of their policies

Tracking attendance

Tracking attendance provides mechanism by logging time in and time out by creating a 'session' report. It can report persons currently on site, in addition to the persons that have left the site, at any time, e.g. a search can be performed for who was on site between specific times on specific dates as required, or simply viewed to ascertain who is currently on site (indicated by a 'flag active') in the output (screen or printed)

Manning

Manning sheets available for each shift detailing all persons expected to attend on the defined roster / shift which can be printed directly from the database.

Report on shift history, i.e. which people worked on a particular shift/workgroup in a specified period (people may have moved in/out during the month)

Visibility to shift history might also prove useful when reviewing absenteeism, i.e. employee is taking more sick leave since switching from day shift to night shift or from a popular shift to one that is not as desirable.

Issues – Clothing, Keys, Documents, Lockers, SCSR, Lamps

Clothing Issues for employees; clothing can be managed by recording the individual's choice with a report generated for the purchasing officer / storemen to handle the issue to employees by name and by clothing choice, e.g. it allows the storeman to know who has ordered what items and groups the items selected by employee (for distribution) and by clothing type (for easy ordering) – e.g. 25 size 9 boots, 30 size 10 boots and so on, are required to supply the workforce.

Keys; keys can be issued to individuals (including contractors), tracking the date issued and if returned

Bathroom Locker; Basket allocation (clean / dirty)

Lamp and SCSR recording

Rosters

Rosters can be defined easily, with employees allocated to specific rosters / shifts. This allows the correct 'Manning Sheet' to be printed at any time (current shift, next shift, today, this week, next week)

Rosters can be defined as 5/2, 9-day fortnight, 7/7 and even 7/7 rotating, in fact, whatever schedule is used.

Inbuilt Calendar – Tasks (individual and group)

Can record details of employee periods of absence – holiday / sick. Can also be used for planning purposes or meetings, along with assigning tasks for groups or individuals

Document Management

Storage of ALL document types, including risk assessments, material safety data sheets (MSDS), management plans (MSMP), technical documents, reports, training documents / assessments, procedures, photos, video or audio files. With the ability to retrieve any document by searching for all or part of document name / document type

Complete auditing history when documents are revised – allowing for previously revised documents to be retrieved, if required. The number of documents needing review are shown in the 'User' 'start-up screen' as a warning (see **Figure 1**).

Production

Easily identify production between specific dates or select the quick finds for past 7, 28 or 90 days. Shift Delays, Metres Supported, Mining Delays, Production tonnage by date, and shift.

Actual Vs Forecast by Production Area, shift and date range, showing the Production Activity, (e.g. Cars loaded, Mesh installed), Time Based Activity (e.g. Prestart Checks, Boot End move), and Delays (e.g. Stone Dust, Water Management).

The Shift report (Actual Vs Forecast) covers Metres Developed, Tonnage (quantity, and dollar value) and a summary of cars loaded. All reports may be viewed or exported to Excel

Details machinery in the work area (panel / stope), Production and Delays (Actual Vs Forecast), Delay report. Machine delay and Machine location history

INFO now supports (in the 'Production' table) Secondary Support and Drilling (coring) to support contractors. Further detail to be enabled shortly is the inclusion of pricing to account for contract variations and charges from contractors.

Safety

The combination of safety programs is monitored for each employee. This can be displayed either graphically (screen) or exported to Excel (spreadsheet) for a quick review.

Participation in safety programs is normally a part of each employee's KPI's

Examples are:

- SAMs (Stop Act Manage)
- Take 5
- JSEA (Job Safety Environment Analysis)
- JSO (Job Safety Observation)
- SHECQs (Safety, Health, Environment, Community, Quality)
 - Assign responsibility, can change over time
 - Provide reporting on total open, total closed, open by department
 - Allow SHECQ's to be assigned per person (can be reported as part of the safety scorecard as well as "point in time")
 - Record Date of Completion

An Incident / Injury report can be linked to a SHECQ for attention. When a new SHECQ is created, the responsible person can be sent an email advising them of its creation for their attention.

Complete management of emergency equipment such as fire extinguishers and SCSR / rescue equipment, including depreciation schedules and testing / fire officer inspection reporting.

Confirm the quality of employee training by restricting trainers to those who have the necessary training qualification and have been appointed as a trainer for that task.

Fire Officer

Details of monthly inspections of fire-fighting equipment can be captured. This covers Fire Depots, Sub-Stations, and mobile equipment. Location of the equipment. Equipment purchase and testing history is captured to allow for a depreciation report to be produced facilitating budgets.

The same is captured for rescue equipment (SCSR): personal, rescue team, cache and stock held in storage.

Lost time injuries / incidents

Incidents can be categories as; Return to Work, Medical Centre, Home, Suitable Duties, Hospital or Other. One incident can be assigned many of these categories. Then a detailed report (in Excel format) can be generated for review (screen or printer) resulting in a Corrective Action (SHECQ) record / management

Preferences

The number of 'Days' for a warning can be set for the following:

- CABA
- First Aid
- Medical
- Rescue Medical
- Training Expiry
- Appointment Expiry
- Birthdays

Company eMail setup – so that emails can be sent through the company domain

Username and Password of the database Administrator - 'Super-User'

Default Language – English unless otherwise selected

Automatic phone number formatting

Automated PostCode (ZipCode) lookup

Layout (Screen) access – user privileges

Safety Sheet Names (e.g. Take 5 / SLAM)

Workgroups / Rosters

Mandatory Training

Address Label Printing

Photo I.D. Card Printing

Training and Appointment validity (Audit)

Mandatory training for site access (with warning on expiry)

Screen and printed output include the following (plus many more):

- Appointments / Training / Lamp – SCSR Number / Locker-Basket Number
- Days till Birthday – Birthday List
- Emergency contact details
- CABA / Egress

Expired training – results in person prevented to access site

Employee Clothing Issues

Employee Document Issues

Medical – Exam, First Aid, Penthrane, Mines Rescue

Production Reporting (by 7,30, 90 days or specific dates)

Production Delays / Machine Delays

Employee Timesheet / Manning Sheet / Employee Rosters

Safety (SAM, Take-5) Recording per individual – Site summary output by selected timeframe (e.g. in the past month, quarter, week)

Fire Officer (Firefighting equipment – Extinguisher, Hoses, Depots) including depreciation report to assist in budget forecasting

Self-Rescuers including depreciation report to assist in budget forecasting

Companies (Contractors) Insurance details / validity

Ventilation - - Water qty in expelled air through fan (for mine water balance)

Meetings / Tasks / Work Requests

Data access

There is no point in limiting the way information can be accessed. iNfO may be accessed via specific client software to the data file located on a server or from one in the 'Cloud'. It can be also accessed via a web browser, or a mobile device.

It is therefore possible for an employee to remotely 'sign in or access any documentation they require even if not at their usually place of employment. This may be useful for those employed in the field, e.g. on a drill rig.

File size

A database does not need to be huge to be effective. When properly structured, it allows for the economical storage of data. Whilst databases can easily contain more than 2Tb of data, currently, the INFO demonstration file is approximately 160Mb, and contains 113 tables. One such table contains 18,275 records, another 4,529 records. Whilst being very efficient in storing data, it remains extremely fast to retrieve information.

FUTURE IMPROVEMENTS

Improvements include labour charges for contract labour and other duties offered by contractors such as ventilation appliance installation.

OPERATING SYSTEM (OS) REQUIREMENTS

- Mac users need the current or previous version of macOS.

- Windows users need Windows 10 (Enterprise, Professional) or Windows 8.1 (Standard, Professional). Must be 64-bit.
- For Mac Server: requirements are the same for Mac users.
- For Windows Server: Windows Server 2019 or 2016 (Standard, Data Centre).
- For Linux: Ubuntu 18 (Server or Desktop) 18.04
- FMGo requires iOS 13.2.0 or later.
- Web Access requires the latest versions of Edge, Chrome (and mobile), or Safari (and mobile) browsers. No official support for FireFox.

CONCLUSIONS – FOLLOW THE “K.I.S.S.” PRINCIPLE

No matter whichever database solution is used, it must fit the needs of the end user. It should be flexible enough to accomplish modification quickly and easily without complicating the interface. When users find software both easy to use and appropriate to their needs, then the productivity of the employee is increased, and the profits of the employer improve. Do not consider any solution without consultation with the people who will be required to use it.

- Before implementing a system, or if reviewing an existing system, it is best to speak to the various stakeholders to ascertain what data is necessary for their task. Secondly, do not rely on a spreadsheet for storage of this data.
- Utilize a relational database which follows human interface guidelines (HIG)², and one that can be readily modified to account for changes in requirements, and that can be accessed via extended networks (including mobile devices).
- If outsourcing the creation / review of a system, use a company with mining experience not one that offers the same solution to a supermarket or an airline. They don't speak your language.

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