Alan Hodgkinson, founder of SoftXS GmbH, explains issues associated with selecting a drawing management system (DMS) and lists the main requirements they should fulfil

Document management in construction

Large complex IT systems are standard practice in industries such as banking and insurance. Companies using these systems have decades of experience developing and deploying them - and deep pockets! In banking, it is estimated that IT expenses can approach 5% of revenue.

Obviously, the construction industry has not embraced IT in the same way. In fact, you could argue that it shouldn't. In construction, the time scales for producing documents and drawings are measured in days and weeks, not seconds as in banking. The number of records, or documents, is in the thousands and not millions.

Early document management

But even having thousands of documents implies that a management strategy should be developed. In the old days, a company 'librarian' managed all your project documents. Unfortunately, your librarian has probably already retired and it's difficult to find the right document now. Worse, there is a new generation of staff who have grown up with PCs, but have no direct experience of the value offered by a well-managed corporate archive. This is potentially a serious loss to the industry.

Now, in the days of the Internet, we typically manage electronic documents using email and shared drives. Whilst immediacy and accessibility is vastly superior to a paper system, the organisation is woeful. While each person or project may be able to find its own documents, finding the right document in a project that you are not familiar with is near impossible. Updates are often lost as no one is certain who had the latest version. Cross-fertilisation between projects has decreased and there is a danger that lessons from older projects will not be passed on to new ones.

Why electronic management?

It is worthwhile remembering why we would want to organise construction documents - namely to ensure that our project builds the right thing, safely, on-time and in-budget.

A starting point for electronic document management is to use a Content Management System (CMS). A CMS is basically a shared archive for storing documents (or 'content' in IT jargon), which offers web-based access and some organisational and search features. Usually a CMS will offer many more features; but CMS' are general-purpose systems with no specific features that make them particularly useful for the construction industry.

Document management systems

In practice CMS' are too generalised and lead to poorly indexed documents. It is therefore better to have smaller systems engineered for the construction industry. A Document Management System (DMS), which is a CMS that specialises in indexing and retrieving documents[1] is a better choice. A good DMS enforces consistent document classification and indexing, a key to success in document management.

A senior tunnel engineer once remarked to me: "If you have the drawing list under control, you have the design under control."

While perhaps an overstatement, having the drawing list under control is certainly a necessary condition for having control of the design. It is also a fundamental requirement for a DMS. Central to this requirement is that you can produce an up-to-date drawing list and find the latest revisions of all drawings.

The construction industry's existing practice for processing documents should therefore be the starting point for evaluating a DMS. The DMS should simply automate procedures you already use. This also insures that your project team will be more likely to understand and accept it. Basically, everything in a DMS that helps automate your existing procedures is good and everything that makes it harder is bad[2].

You already have well-defined practices for managing documents. Consider the most obvious: every construction drawing in the world today has a drawing number and a block that indicates the drawing's title, number, revision, date, designer, drafter, checker, etc. Every project has standardised layouts for design reports, memos and other common documents. All have specific fields that indicate things like the document author, approval date, contract number, location, etc. These fields represent the language and the way your project team thinks about documents, and should also be the way that the DMS indexes and searches for them.

The DMS should file documents in a structure that matches your existing classification system. If your project team thinks in terms of work types and chainage (which it probably should), then your DMS should let you file and search for documents using work types and chainage. If you use a set of spreadsheets to keep track of drawing lists and their due dates, your DMS should automate the creation and management of those lists. If you use spreadsheets to track site queries and requests for new revisions, your DMS should automate these procedures too. Your DMS should not only act as an electronic filing cabinet; but also take over the tasks that your librarian performed. If after setting up a DMS, you find your project team having to manage all sorts of lists associated with documents, then the DMS should be doing more.

Your project's quality standards should define the DMS's document numbering and indexing systems, and all the procedures associated with document workflow. In fact, your project's quality standards are the main requirements for your DMS. Give your DMS vendor copies. Also send copies of example drawings and all the lists and spreadsheets you currently use. Explain your procedures and ask for a demonstration of how their DMS system will implement them. Ignore all other DMS features until you are genuinely satisfied that your fundamental requirements will be met.

Additional DMS tasks

We want our DMS to help ensure all documents are correct and up to date. Since changes often cascade over multiple documents, we want the DMS to identify which ones are likely to need updating, given a specific change request. In addition, a DMS should:

- Manage the workflow associated with the checking, approval and distribution of documents.
- Track due dates for document production and remind those responsible when deadlines approach.
- Manage queries, change requests and other issues associated with updates to documents and drawings.
- Identify documents 'related' to a specific project area.
- Produce common reports.

Many of these tasks are essentially 'to-do' list management and could arguably be performed using Outlook or some similar system. While you could manage to-do lists in an external system, it's better to have the DMS manage them directly. This way the links to the documents and other supporting information are always conveniently at hand, making it more likely that people will actually follow through and cross-check. While this may seem like a small point, these 'convenience' features make a big difference to users. If not provided, your project is less likely to get the full benefit of the DMS.

Finding 'related' documents is useful because this is how you find out which documents need updating after you receive a change request. This also highlights the importance of the DMS supporting a document classification system that really matches your project and the way your team thinks. In the best case your DMS will allow you to easily identify and flag suspect documents with a note explaining what must be checked, and allow you to assign a task with a priority and a due date.

You should designate someone familiar with the project to be the DMS administrator, preferably someone with excellent PC skills and a good understanding of project documentation, to ensure that the project team gets the maximum benefit from the DMS. The administrator should also be the first line of support for DMS questions from the project team.

Once you have deployed your DMS, you must make sure that it does not overwhelm your project. Remember that the DMS is there to help the project and should not be a source of bureaucratic delay. Unfortunately, finding the right balance between accurately managing documents and actually getting things done is an art, which requires experience that you won't initially have. Have the DMS administrator collect feedback from your users in order to locate bottlenecks; and don't be afraid to change procedures if you feel things can be improved.

'Nice to have' features

Because a DMS is a computerised system, there are a number of additional issues that should also be considered. Many of them are concerned with integration of the DMS with other computerised systems you might have. None of the following are absolute requirements, but they do represent the most frequently requested features.

Document import: Is it easy to register many documents at once into the DMS? Sometimes documents arrive in batches from vendors or contractors. Or a DMS might be deployed after a project has started, and a large collection of documents must be imported.

Document export: Is it easy to export sets of documents? You might need to send collections of documents to someone who does not have access to the DMS.

Data export: Is it easy to export the classification and other data stored in the document index? Reasons for wanting to do so include: Generating special reports not provided by the DMS; analysing the data in other programs; feeding the data into other applications, such as CAD[3] or bookkeeping systems, for further processing.

Alternate document numbers: Does the DMS accept multiple or alternate document numbers? Consider projects with vendor-supplied drawings where you'd like to be able to recall a document using the vendor's drawing number as well as by the project's normal document number.

Ease of use: Is the DMS simple enough for untrained users to productively use the system? Consider external contractors and vendors who might be allowed to use the system to access your documents or file their own.

Security: Is the DMS secure enough so that only those documents that you allow are viewable by external users?

Lightweight: Is the DMS lightweight

enough to be used under less than ideal conditions? Consider users in remote locations who have inferior Internet connections or computers. Consider also extreme cases where travelling engineers might need to find information from documents using a handheld device or web-enabled telephone.

Delegated Responsibilities: Will the DMS allow users to enter data or perform operations on someone else's behalf? Consider cases where a deputy engineer or assistant might be authorised to issue documents in your absence[4].

Audit Trail: Does the DMS keep an accurate and complete record of all operations performed on the system?

Conclusion

An electronic document management system can provide enormous benefit to a construction project. A DMS can ensure that all your project documentation is well organised and greatly reduces the risk of problems caused by obsolete or superseded documents.

Having all your documentation instantly available to the entire project team, including staff at remote sites and staff working for external companies, increases the likelihood that problems will be discovered and corrected early. Automated procedures for tagging documents for checking and updating help insure that corrections will actually be made and communicated to the people that matter.

One of the critical success factors for a DMS is user acceptance. The DMS can only provide its benefits if people actually use it. If the DMS is not the easiest way to find project documents, then users will bypass it and use other methods. User acceptance is vastly improved if the DMS duplicates the way that the construction industry already works; the most important points being that the DMS: supports a document indexing and classification scheme that matches your project; and automates standard industry document management procedures.

Other usability issues must be tested on a case by case basis, preferably before you buy the DMS. Don't be afraid to engage the DMS vendor. Explain your current procedures and ask for a demonstration of how the DMS will implement them. If the solution seems ill conceived or awkward then move on to a different DMS. Don't commit to a DMS until you are sure that it will really solve your document management problems in a way that your project team will accept; and make sure the fundamental requirements are met before you consider other features.

If all goes well, your DMS can be used for multiple projects, forming the basis for rebuilding your corporate project archive in electronic format. In the long term you will have a valuable repository of your firm's knowledge available to all your employees and projects. T&T

FOOTNOTES

1. As opposed to the generalised content managed by a CMS.
2. This assumes you are satisfied with your current practices. If not, attempting to automate them will lead to chaos.
3. One useful feature is to be able to generate blank drawings with pre-initialised title blocks.
4. A common problem with DMS' is that authorship is assigned to the user registering the document, resulting in clerks being listed as the author of virtually every document.