MonitorPro

A Guide to Selecting an Environmental Data Management System

EHS DATA

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EDMS Introduction

Larger-scale operations that have the potential to pollute will have some form of regulation, wherever in the world they are located. Much of this regulation involves monitoring the immediate and local environment to protect it from excessive pollution while allowing operations to continue responsibly. To do this, data is collected and compared to compliance standards or historical norms to ensure compliance. This environmental monitoring over the medium to long term generates large amounts of data across the entire biosphere. Data is captured via a range of processes, including loggers, field measurements, laboratory analysis, and process control. To effectively evaluate and maintain large amounts of information, professional Environmental Data Management Systems (EDMS) are invaluable in complying with these regulations. Using an EDMS to efficiently collect and store data can save time and money, reduce the risk of prosecution and fines, assist with stakeholder engagement, and ultimately help protect the environment.

EDMS offerings sit in a specific group within a broader range of commercial off-the-shelf software (COTS), designed to assist companies in managing broader corporate environmental risk, solving specific problems or functions such as modelling, or connecting to specific pieces of equipment. There is a dizzying array of acronyms for these, such as Continuous Emissions Monitoring Systems (CEMS), Data Acquisition and Handling Systems (DAHS), and Environmental Information Management Systems (EIMS). It's therefore important, before you start, to understand your requirements, the broader landscape of solutions on offer, and how they aim to solve them.

If you've made it this far, we'll assume you are in the right place, and we'll give you some more insight into an EDMS and what makes one right for you. Once the decision has been made to adopt an EDMS, there is the (not insignificant) task of selecting the right one. The following sections will detail key areas to examine, followed by a section on a method of quantification, and finally, an example decision matrix to download and customise to suit your needs.

The EDMS Company

You will want to adopt an EDMS from a provider that is well established in its field, has a good reputation, and can support and develop the product for the expected life of your project. Some questions to ask and items to consider.

Reputation

- How long have they been established?

- What experience do they have working in your industry? (number of clients, number of countries, for how many years).
- Will they provide references or existing users to speak with?
- Do any national regulators use their systems?
- How big is their permanent development team and where are they based?
- Do they follow established development, build, and test techniques and procedures? Are the developers sufficiently experienced and certified?
- Does their system have any quality certification for the development and provision specifically for an EDMS such as MCERTS?
- Do they hold associated accreditations such as ISO 27001, 9001, etc.
- What is the background of the Implementation and Technical teams? Are they in-house or do they rely on third parties such as consultants to provide these services? Are they recruited from similar industries to yours? Do they have environmental monitoring and data management experience, and do they understand your business process intuitively, or are their backgrounds in Project Management or IT?
- Are they an ethical company in terms of employment (is development local or offshore) and consideration of the environment core in their policies? Do they have any Carbon or Environmental pledges?
- Are the staff involved in your project suitably vetted or security cleared? Does the company have robust induction processes for right-to-work, past employment, and criminal checks (for example, BPSS)?

The EDMS Product

Once you have established the company has a robust proven track record and has staff that understand your business, it's time to understand the product(s) they offer. Consider that if you are reaching out to software vendors in the market, you have decided to go with a COTS. That is, you may have to 'do things differently than before'. Buying a system shouldn't be a compromise if done correctly; it should have many benefits. However, you should accept that each application you review might solve the same problem in different ways. It's important to understand which one fits best with your current ways of working and where you are and aren't prepared to compromise. Be mindful of vendors offering customisation to suit your very specific needs, as this is likely to be more expensive than simply amending a process. Vendors should offer flexibility, but it should be possible via configuration and inherently built into the fabric of the product.

Modern products will be based around a client-server architecture. That is, the data is stored in a central database on a server, and you (the user) access the data via a client. In modern web applications, the client is simply your web browser, as the application is also on the server in the form of a website. These are by far the simplest deployment, needing no specialist in-house IT support and are the basis of almost all Software as a Service (SaaS) deployments. Older methods of delivery included Desktop applications installed on your machine, although these can also be deployed through 'thin client' tools such as Citrix or Remote Desktop Services.

Be aware of the underlying technology. Technology changes quickly, and software vendors must make good choices when selecting a technology to base their products on. If they choose poorly, you may end up with a product which they will struggle to support long term, and it may fall out of support with the technology provider during the life of your project. Vendors that use tried-and-tested technologies (such as those provided by Microsoft) are always going to be the safer bets as opposed to those who have chosen bleeding-edge technology without proven track records or long-term upgrade plans.

Features

- Know up front what features are most important to your business 'must haves' and which are discretionary or 'nice to haves'.
- Ask if these can be achieved by the vendor out of the box, through configuration or through customisation.
- Are these features modular? How does it affect the pricing? Are the applications tailored to specific users, or is all the functionality available?

Flexibility

- Will the application flex to your company's requirements, or will you have to compromise to work the way the application works?
- Can the application grow with your business needs, if you purchase a new site, your Permits are modified, or simply testing for new compounds or at new locations?
- Does the company talk about customisation or configuration? Customisation requires new code to be written; it's more invasive, generally costs more and comes with higher risks and ongoing maintenance. Configuration is the use of tools to meet specific requirements; it's typically cheaper, can often be done by the users themselves and requires no specific long-term support. If a company's sales team are telling you anything is possible, and the application can be customised to fit, be wary.
- Where customisation is offered, ensure it is discreet, well-scoped and can be supported long term. These types of enhancements are typically acceptable when producing tailored reports, exports or import routines. These are items that don't fundamentally affect the core application or are designed by the vendor to be flexible.

Ease of use

- Is the layout intuitive, and what are the training requirements for each type of user?
- Is the system well documented with a knowledge base, manual or how-to videos?
- Does it have unique selling points such as saving datasets (per user) that can auto-update or favourites for quick access?

Platform and Technology

- Is it a browser-based application?
- Is it a desktop application?
- Is there an offline handheld field sampling app?
- Will it support the language(s) that you need? Is this user-configurable, and do you need multilingual support?
- Scalability – what are some of the largest of their systems in use, in terms of numbers of locations monitored, parameters stored, and numbers of readings?

EDMS Functionality

All reasonable EDMSs will perform basic functions such as importing and exporting files, plus displaying graphs and reports; however, environmental permits can contain complex requirements and give rise to specific functionality needs. Discuss internally upfront what functionality is important to your business, is unique to your industry or is lacking in your current systems. Remember that no system will likely offer everything you need or do things exactly the way you might. Business Analysts can help define user requirements for large-scale systems and collate input from potentially large and disparate stakeholders. Remember, though, that if you ask many stakeholders for input, you may receive large volumes of requirements. It's important to then objectively categorise these in terms of importance before seeking out demonstrations or commencing to obtain responses to formal tenders or Requests for Information (RFI's).

Your company may also have other potentially overlapping systems, which can complicate issues. Departments can face conflicts with differing priorities being asked to use the same product. Larger organisations may have a range of legacy products that combine to make choosing which functionality is important difficult.

With all that considered, all good EDMS will have some or all of the following:

Workflow Management

- Does the system have API, email receipt or other means of automating routine data collection from labs, loggers and other applications?
- Can users enter their permit obligations and conditions in an asset register, and link these directly to monitoring requirements? Are there KPI reports to show status against permit requirements, such as % of monitoring done, reports sent, and compliance %?
- Monitoring workflow including in-field data collection, scheduling and laboratory management notifications, missing samples or results from the lab?
- Does it have an action centre in the event of a breach to track remediation plans?
- Will it automatically inform recipients of compliance breaches?

Security and audits

- Does the system support Single Sign On (SSO) and two-factor authentication (2FA)
- Can users be restricted to certain datasets, via Role, User Group or User?
- Can users be allocated certain functionality?
- Are there a range of roles supporting functional access restrictions?
- Is there an audit trail for edits?
- Is there an audit trail of the actions of users as they use the system and manage stale user accounts?

Input and validation

- Does it require you to provide data in a specific Electronic Data Deliverable (EDD), or is it more flexible, and can your main data providers support the format?
- For complex or non-standard files, can import routines be built to ensure seamless imports without users editing files for import?
- Can associated data be embedded and referenced, such as photos and laboratory certificates?
- Is there an aliasing and resolution system? Can it over time be taught varying names for objects, so that it can automatically resolve variations in spelling for future imports?
- How capable is the compliance management system? Some compliance or warning levels are not simply fixed levels but rely on trends, calculations or interaction with other datasets (such as up-gradient locations).
- Will it support varying locales/cultures for dates and decimal separators, or only one?
- Can it automatically extract data from data sources on a schedule, such as historians like Pi, ERPs such as SAP, and other databases or loggers?
- Can it automatically import files from network folders?
- Does it have an API for making connections to other providers' endpoints?
- Will it monitor email inboxes for seamless importing and process files based on configured rules?
- How sophisticated is the calculator? Can users set up their own calculations with functions such as interpolation, IF statements, percentiles, aggregation, factors, and constants?

Spatial Analysis

- Does it provide up-to-date and high-resolution satellite imagery and spectrum analysis?
- Does it have thematics or other means of assessment?
- Can you include areas of interest, such as boundaries and associate data with them?

Outputs

- Is output static or flexible to provide the required regulatory reports and output types?

- Will it integrate with other onward systems such as BI Tools?
- Does it allow for secure database connections to onward systems and offer a functional API?

EDMS Licensing, hosting and support

Licensing models vary from vendor to vendor, so it's important to compare like with like. Understanding your business's attitudes to self-hosting applications vs outsourcing is also an important consideration. You should find out from your IT department early in the process if there is a mandated preference, as it can significantly reduce the time and complexity of the sales process. If your company will only allow your data to be stored on-premises but you like the functionality of a SaaS only solution, then you'll be wasting your time including them in your assessment.

License model

- Is Software as a Service (SaaS) offered and is this the only offering?
- Is perpetual licensing offered?
- Is the pricing model named user or concurrent?
- Are there pack pricing or volume discounts applicable, and are you made aware of what they are?
- What are the legal and contractual requirements stipulated by the vendor? Do you retain ownership of your data?

Hosting

- Are hosting services offered?
- In which country are the servers located, and are you given an option?
- Is there an option for a dedicated or shared server (a balance of performance versus cost)?
- Is the data secure, and is the server's security backed, accredited and audited? Will the provider share this information?
- Is the hosting offering SaaS only (leased licences) or can you purchase licences but still have the vendor host (PaaS)?
- Are all associated server licensing costs included in the pricing?
- Will the vendor allow the installation of other software on the server for integration?
- Does the vendor offer a Hosting Service Level Agreement stipulating uptime and response time to outages?

Ongoing support

- Is support provided by the vendor or outsourced to a third party?
- Where is support based, and what is the skill level of the personnel responding?
- Are tickets and issues raised tracked in a dedicated ticketing system?
- Are software updates included in the maintenance plan?

- Are the levels of support that you need offered, for example, regular account manager meetings, regular training sessions included, advice or limited cover for bugs only?
- Do they have representation in the language you require?
- Do they have a Service Level Agreement (SLA) that states service levels and expectations?

EDMS Cost, Implementation and Termination

Cost

It is important to find a system within your budget. For this, there are a few things to consider – not only the cost of the software license. Consider the system cost as a whole over three years or more, including licensing, implementation, ongoing maintenance, and a budget for ongoing training if needed. It's important to factor in internal costs also and where these are budgeted. Where in your organisation are the IT costs incurred? Self-hosting on paper will always be the most cost-effective solution if the internal costs of self-hosting are themselves not considered!

- Is the pricing open and clear to understand?
- Price breaks and pack pricing options available?
- Are you comparing like with like between vendors?
- Have you factored in fair comparisons for internal costs when comparing with vendor-hosted solutions?
- Currency considerations?

Implementation

- What experience does the implementation team have with your type of system? Why not ask for a summary of their experience?
- Does the implementation follow a well-established process with good project management and quality control processes?
- Do the staff have formal Project Management certification/membership?
- Is a pre-implementation scoping exercise offered?
- How long will implementation take, and how long is any waiting list?
- What are the implementation travel and expense rates?
- Will periodic reviews be scheduled during the build process?
- Will access be given to the system for approval prior to on-site training?

Termination

If it doesn't work out, what is the situation regarding termination? You might be required to

manually export your data as .csv files. This might be time-consuming and not give you all of your information back.

How to Choose an EDMS

One way to help with the decision-making process is a decision matrix, or Pugh method. List your options as rows on a table, and the factors you need to consider as columns. You then score each option/factor combination, weight this score by the relative importance of the factor, and add these scores up to give an overall score for each option. While this sounds complex, this technique is actually quite easy to use. List your options as the row labels on the table, and list the factors that you need to consider as the column headings.

Next, work your way down the columns of your table, scoring each option for each of the factors in your decision. Score each option from 0 (poor) to 5 (very good). Note that you do not have to have a different score for each option. For all of the areas that have importance for current or future situations, assign numbers from, say, 0 to 5, where 0 means that the factor is absolutely unimportant in the final decision, and 5 means that it is very important.

Now multiply each of your scores from step 2 by the values for the relative importance of the factor that you calculated in step 3. This will give you weighted scores for each option/factor combination.

Finally, add up these weighted scores for each of your options. The option that scores the highest wins.

If your intuition tells you that the top-scoring option isn't the best one, then reflect on the scores and weightings that you've applied. This may be a sign that certain factors are more important to you than you initially thought.

Also, if an option scores very poorly for a factor, decide whether this rules it out altogether.

Authors

M. Silk and P. Ely have combined experience of nearly 60 years in environmental data management, both in industry and working to develop and implement EDMS systems. They have worked on hundreds of implementations and have designed monitoring systems and processes themselves. Their experience ranges from small-scale process clients to large multinational companies. They have been involved in developing intuitive and powerful solutions, gathering stakeholder requirements, testing, and design.