

Environmental, Quality and Health & Safety Management On-line:

The Efficiencies, Performance Improvements and Cost-Effectiveness of Web and Intranet-based EQS Software Solutions

1. Introduction

The sustainability imperative

The 'Global 2500' company spends £56 million on all aspects of environmental management and likely up to three times that for environmental, health, safety and quality management. Of this, as much as 64% relates solely to the costs of information management. Consequently, for every pound spent on environmental, health and safety or quality management, another £1.75 is spent managing the information behind it. Consequently, environmental, quality and health and safety (EQS) managers spend two thirds of their time gathering, analyzing, storing or sharing information and little of this time is value added. Obviously, therefore, whether an organisation is a Global 2500 company or a small or medium scale enterprise, EQS management efficiency and performance can be improved by as much as 56% simply by improving information management practices.

Given that most EQS managers are faced with endless resource constraints, and given that at present EQS management is primarily a business of information management, if long term global sustainability through improved EQS performance is to be at all possible, reducing the time and cost involved in EQS information management and improving the efficiency of EQS management practices, is an obvious, fundamental and absolute necessity.

In situations, such as these, where inefficiency is so pronounced and conspicuous, the solutions are often not as obvious as the problems. However, in the case of EQS information management, the roots of the inefficiencies are obvious.

A recent study involving more than 300 EQS managers at top industrial companies in the USA indicated that the costs of EQS information management are incurred in four areas. These are:

1. Ad hoc and duplicative processes in place to support EQS information management;
2. Informal and individual, independent, non standardized, EQS information systems;

3. Diversity and complexity of sources of EQS information;
4. Rework due to a lack of quality control and quality assurance applied to EQS management processes.

Consequently, if a tool or technology was able to tackle at least these four problem areas, there is significant hope for change.

As is becoming more and more evident, this tool is the Internet and Internet-based technology. The Internet represents an unparalleled opportunity to not only improve EQS data management significantly, but to actually change the management process to drive cost savings and improve performance management and ultimately increase the long term potential for sustainable business practices.

The Internet as a tool for EQS performance improvement

The late 1990's and even the early days of this new millennium have been synonymous with rapid advancements and worldwide uptake in the use of the

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Internet, Internet technologies and Web applications for business purposes. The fundamental reason for this is that businesses today recognise that Internet technology, the use of networked applications and data stores, can be used to more effectively access and exchange information with customers, clients, suppliers, investors, partners, shareholders, employees, etc. worldwide. Thus communication, competitiveness, management performance, efficiency will be radically improve and ultimately enhance the possibility of long term corporate survival and sustainability.

In short, Web technology is changing the way companies do business. Organisations that adopt this new technology, whether it be for corporate-wide communication or even on-line EQS management, are enjoying clear business advantages by becoming more efficient, more responsive and ultimately more sustainable.

Using the Web and/or Intranet EQS management solutions to improve performance

Clearly, and as indicated above, one way of improving EQS performance is through the use of Web and/or intranet technology. Like the Internet itself however, the possibilities for use and abuse are endless and as such an unqualified proclamation that 'using the Internet is the answer' is in itself vague and likely unhelpful. To that end, and for the purposes of this paper, the solution of focus will be the use of the Web and/or a corporate intranet for the provision and use of standardised EQS management system applications.

Therefore, and in answer to the aforementioned problems commonly associated with EQS information management inefficiency, an effective EQS information management solution would:

- be a client-server application whereby users (client PC's) would connect to a single, central server where the application and all data is stored;
- be accessed in real-time and allow multiple users to simultaneously access and use a common and single application;
- provide a common framework or 'template' for site-specific and independent EQS management system development while simultaneously providing areas for shared and corporate-wide resources; and,
- provide the ability to link to other Web and/or intranet-based applications and information.

Consequently, the characteristics of a tool or application

that could be employed to provide such solutions and thus assist in alleviating the four problem areas identified above, are as follows:

- it would be a Web and/or intranet application accessed using a traditional web-browser;
- it would be 'modular' and thus enable integration and streamlining of any combination of environmental, health and safety and/or quality management systems components; and,
- it would be scaleable to the extent that new sites and users could be added as and when required.

2. Benefits of a Web and/or intranet-based applications for EQS management – The site perspective

The following is an exploration of some of the more salient areas where individual sites could improve EQS management efficiency by using a Web and/or intranet-based tool.

"I have known us to get a site from 'zero' to certification in 10 working days!"

Dr. Miles Watkins, Head of Quality & Environment, Aggregate Industries UK Ltd.

System

implementation: One of the most significant benefits of such a solution is the reduction in time and cost of system implementation. With the provision of a standard system framework and thus management system template for each site, the time required for system implementation is reduced enormously.

Additionally, when using a networked solution, all management systems are 'connected' by virtue of that fact that they are all contained within the same application and all data is (generally) stored in the same database. In such an environment, it is possible to 'cut, paste and modify' management system information from one site to another. Consequently, EQS managers can quickly and easily develop their own EQS management system by either copying and modifying an 'example EQS management system' developed by the organisation for implementation purposes or by copying and modifying EQS management system information already developed by other sites in the group.

Case Study 1: Increased efficiency through reduced time and cost of system implementation

Company: Aggregate Industries UK Ltd. 160 site across UK.

Note: For consistency and quantification purposes, all case studies in this paper refer to Aggregate Industries UK Ltd. or organisations with similar operational characteristics.

1) Time and cost saved by using 'example' sites as a starting point for site system implementation

By using an intranet solution, it is possible to create 'example' sites that new sites are subsequently able to use to implement functional EQS management systems. "This means that many elements of a site's system can be imported from a functional 'example' site. If you look at the work instructions required by a single management system at a single site, it would take approximately 5 days to write the 20 or so work instructions required. Using our intranet-based EQS solution with a functional example site, this now takes about 5 minutes" Dr. Miles Watkins, Head of Quality & Environmental, Aggregate Industries UK Ltd.

A) Time and cost saved for initial environment, health and safety and quality assessments

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| Time required to assess 10 aspects without intranet solution | 45 minutes |
| Time required to assess 10 aspects with intranet solution | 6 minutes |
| Assume that average site has 25 (conservative) environmental aspects | |
| Assume that average site has 25 (conservative) health and safety risks | |
| Assume that average site has 25 (conservative) quality control issues | |
| Total time required for full EQS initial assessment without intranet solution | 5.625 hours |
| Total time required for full EQS initial assessment with intranet solution | 0.75 hours |
| Total time saved when using intranet EQS solution | 4.875 hours/site |
| Person day cost | £200 |
| Total savings per site | £122 |
| Total corporate savings at all sites for EQS assessments | £19,500 |

B) Time and cost saved for preparing work instructions

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| Time required to prepare 20 work instructions without intranet solution | 5 days |
| Time required to prepare 20 work instruction with intranet solution | 5 minutes |
| Person hour cost | £25 |
| Cost to prepare 20 work instructions without intranet solution | £1000 |
| Cost to prepare 20 work instructions with intranet solution | £2 |
| Total savings per site | £ 998.00 |
| Total corporate savings for work instructions at 160 sites | £159,680 |

Summary of saving when implementing an intranet-based EQS solution:

The time involved in system implementation will clearly vary depending on the size of site and the nature of its operations. However, and as is indicated below, the potential for increased EQS management efficiency using a Web and/or intranet-based EQS are significant.

"Experience has shown that by using our intranet-based EQS solution we are able to reduce the time required for system implementation by at least 40% - 50%."

Dr. Miles Watkins, Head of Quality & Environment, Aggregate Industries UK Ltd.

Single management system implementation (i.e. environmental management system only) takes a minimum of 30 person days.

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| Cost of implementing one paper-based management system at one site | £6,000 |
| Cost of implementing paper-based EQS system at one site | £18,000 |
| Cost of implementing paper-based EQS system at all 160 sites | £2,880,000 |

Summary of savings using intranet-based EQS solution:

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| Intranet solution saves at least 40% of time required for implementation. | |
| Minimum implementation savings for corporate EQS system | £1,152,000 |

System maintenance: As with initial system development and implementation, when using a Web and/or intranet-based solution for EQS management, there are considerable efficiencies to be realised with respect to on-going system maintenance.

Although there is a relentless debate about the pros and cons of implementing certifiable management systems, one area of consensus appears to be the fact that the on-going and regular maintenance of these systems is arduous and time consuming. Consequently, it is argued that system management itself actually inhibits performance improvement – the very purpose of EQS management systems. Whether it is managing documents, tracking overdue action items, preparing reports, or any other of the many requisite system maintenance tasks, traditional methods EQS system maintenance are too time intensive to be effective. However, with electronic and networked EQS systems solutions, virtually all traditional ‘system maintenance’ is either done automatically (i.e. document control and versioning) or done in real-time at the press of a button (i.e. tracking and reporting).

"With upwards of 160 sites and only 6 environmental staff the effective management of information is critical. Our EQS intranet provides a consistent framework into which the essential data can be entered and accessed by all with zero time delay".

Dr. Miles Watkins, Head of Quality & Environment, Aggregate Industries UK Ltd.

Case Study 2: Reduce time and costs of multi-site system maintenance

Company: Aggregate Industries UK Ltd. 160 site across UK.

Given that management system maintenance is virtually eliminated when using a Web and/or intranet-based solution, the following outlines the costs that can similarly be eliminated.

‘Our intranet-based EQS solution virtually eliminates time required for on-going maintenance’. Dr. Miles Watkins, UK Environment Manager, Aggregate Industries UK Ltd.

Single management system maintenance (i.e. EMS) takes a minimum of 1 person day per month.

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| Person day cost | £200 |
| Annual cost of maintaining one paper-based system at one site | £2,400 |
| Annual cost of maintaining paper-based EQS system at one site | £7,200 |
| Annual cost of maintaining paper-based EQS at all 160 sites | £1,152,000 |

Summary of savings using intranet-based EQS solution:

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| Maintenance savings for corporate EQS system | £1,152,000 |
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Documentation and document control: One factor that contributes significantly to more efficient system development, implementation and maintenance in general and better information management in particular is the dramatic improvements in document control enabled by using a Web and/or intranet-based EQS management solution. One such improvement is the ability to automate document control and document versioning.

Clearly, with this tedious and time-consuming task out of the way, EQS managers are able to spend less time managing the EQS system itself and more time managing environmental, health and safety and quality performance improvement. Furthermore, and as such a system is ‘electronic’, it is possible reduce or altogether avoid the costs of document printing and distribution.

Case Study 3: Avoid printing and distribution of system documentation

Company: Tarmac Plc. 5 Business Units with approximately 250 sites in each Unit

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| Cost of printing and distributing each paper-based EQS Manual | £90.00 |
| Cost of distribution to 1000 individuals in all Business Units | £90,000 |
| Major revisions and updates every second year | |
| On-going annual cost | £45,000 |

Costs of time to print and distribute EQS management system documentation

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| Time for printing and distribution approximately 30 person days per Business Unit per distribution | |
| Person day cost | £200 |
| Cost for distribution to each Business Unit | £6,000 |
| Cost per distribution to all Business Units | £30,000 |
| Major revisions and updates ever second year. | |
| On-going annual cost of printing and distribution | £15,000 |

Summary of savings using a Web and/or intranet EQS solution:

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| Initial savings by eliminating of paper-based EQS manuals | £120,000 |
| On-going annual savings | £60,000 |

System reporting: If an EQS management system is electronic and in a Web or intranet environment with integrated system modules, all system information is contained in the same location (typically a single database).

Consequently, reporting all or any EQS management information simply becomes an attribute of the application rather than a management task. As a result, when using such solutions, users can easily report system information instantly and be guaranteed that any reports generated include the very latest information in the system.

Additionally, if system information is contained within a single database, new and/or custom reports are simply a matter of redefining and presenting data correlations between the existing data information in the system. To this end, with such a solution the different combinations and permutations for system reports are virtually endless and can be defined and presented virtually instantly. Whether it is sub-categorizing, combining, consolidating, or re-grouping information, tasks such as data interrogation, or root cause analysis reporting become a 'query' rather than a job description.

Improved use of time and time

management: In addition to the aforementioned efficiencies attributable to a Web and/or intranet EQS management system, one significant contribution to EQS information management efficiency is the improved use of time and time management afforded by such solutions. With a solution housed in a single database, management system information only ever needs to be entered once for subsequent use and view by other users of the management system. This prevents data entry duplication and thus avoids the time wasted on such duplicative efforts.

Additionally, as all system data is stored centrally and as such contiguous, users can automatically track and report overdue action plans, responsibilities, active non-conformance, overdue audits, etc. and as a result much more time can be spent improving performance rather than tracking and reporting. Furthermore, and as identified above, if users are able to run reports instantly and in real time based on the efforts of others who have entered that data, there is no need to waste time collecting, collating and re-presenting information already collected.

Knowledge retention and transferability:

With Web and/or intranet-based systems, all system data is stored and in one location. As such, all EQS

management information vital to on-going system management and performance improvement (action plans, procedures, work instructions, best practice case studies, etc.) is retained within the system and not with the people who operate it. This retention of knowledge enables all to have indefinite access to a continually growing knowledge base of information developed from years of management experience. Conversely, if the intellect of a management system is not recorded and accessible, when those who have access to that information leave (as they inevitably will in the long run) so do leaves that experience and knowledge.

Customizable user-interface, access and privileges:

With traditional management systems, system information is often in the form of ring binders on a shelf somewhere or in a folder on the site's computer network. In such cases, for users to tend to the management tasks allocated to them, it is likely that they have to first find and then browse through those binders or folders to locate the documents and information that is relevant to them. If, however, a Web and/or intranet-based solution is in place, a user's interface, access and privileges can easily be customized to provide them with only the information they need. Whether you need full access to key performance indicator (KPI) information or require read-only privileges for the site's health and safety management system, with a browser-based solution access and privileges can be tailored quickly and easily to streamline or even change a user's view of the system.

3. Benefits of a Web and/or intranet-based application for EQS management – The corporate perspective

As discussed in the previous section, there are numerous site-specific benefits for adopting a Web and/or intranet-based EQS management system. However, given the networkability of Web technology, there are a number of additional benefits that can be realised by a multi-site 'corporate' organisation when developing, implementing or maintaining an EQS management system.

Consistency and comparability: One clear benefit of a single 'networked' application is the multi-site consistency and comparability of site-specific management system data. Given that all sites work within an identical framework but are able to enter

management data specific to their own site and circumstance it is possible to present effective and meaningful comparisons - on a like-for-like basis - across any number of sites within the company. Additionally, in this situation, all users share a common understanding of the management system components, terminology, methodology and practices of EQS management.

"A recent survey of business decision makers by the Tellus Institute found that comparability – over time, across products, within a company and across an industry sector – was identified as the most important key performance indicator characteristic".

Furthermore, when an understanding of the EQS management system is site unspecific, an organisation can transfer people across sites either temporarily or permanently with little or no disruption to either the system or the people. Quite simply, by using a Web and/or intranet-based EQS template common to all sites,

all sites understand each other, can help each other, can report and compare results easily and can ultimately speed and streamline the process of management system development and administration.

Key Performance Indicators and organisational benchmarking:

In addition to being able to compare management system components (such as action plans, objectives and targets, non-conformances, etc.) across sites, when using a networked application that provides a common system framework for all users, it is similarly possible to establish and set requirements for the monitoring of key performance indicators across the organisation. Standard KPIs provide the basis for regular, systematic and consistent approach to data collection and presentation and thus improves the credibility, reliability and usefulness of KPI data.

Consequently, by being able to stipulate and set corporate KPI parameters such as units of measure, frequencies of measurement, reporting intervals, benchmark values and indeed performance indicators themselves, while simultaneously providing a mechanism

"The need for an IT solution for SHE management systems and Key Performance Indicators has been identified as a strategic issue by management across the group".

A. C. Crawshaw, UK
Environmental Manager.
Tarmac Plc.

for sites to quickly and easily enter performance data, there is increased quality, comprehensiveness, comparability and confidence in the information available and thus a greater ability to implement effective performance improvement both at the site and across the organisation.

Communication: Although networked solution enables EQS managers to communicate quickly and easily at the site level, the true power in such an application lies in the ability to communicate on a broader scale and facilitate easy and instant communication between sites, people and indeed all EQS stakeholders. Whether it is the sharing of best practices, providing consultancy support, or chasing an individual's overdue action items, networked solutions provide a framework for instant communication between all and any of your organisation's stakeholders.

Corporate Reporting: In addition to the phenomenal reporting capabilities inherent in an electronic or computer-based solution, if such a solution is networked, corporate reporting across any number of sites becomes an amazingly powerful management tool. With all system information stored centrally, reporting and interrogation of virtually any component of any or all your sites' management systems is possible at the press of a button. Such a solution clearly obviates the need to collect, collate, prepare or distribute regular management reports as they are all 'in the system', available instantly and provide real time information. Whether it is reporting all active non-conformances in a single business unit or reporting energy use per employee across the entire organisation, the transparency of and access to information using a Web and/or intranet solution is staggering.

Improved time management: As identified above, with a central data store, data is only ever entered once which avoids duplicity while simultaneously providing other users (with suitable access privileges) to instantly view information entered. Thus, whether it is 'corporate-wide' information for all to access or independent 'site-specific' information, it is possible to provide 'remote access' to anyone connected to the network anywhere in the world. Clearly, therefore, multi-site managers, auditors, external certifiers or corporate representatives are able to view system information wherever they are and thus can significantly reduce the time, costs and environmental impacts of travel by simply 'logging on' to the network to view, review, audit, assess or simply browse for management system information of interest.

Stakeholder involvement and input: If a site or corporation uses a Web and/or intranet EQS solution, not only do they improve the way they do business but they are then able to allow others who interact with their EQS to improve theirs. Whether it is suppliers completing their own on-line evaluations, certifiers conducting audits and assessments of your sites, legislators accessing your compliance status or waste hauliers completing their own waste transfer notifications, with a Web and/or intranet-enabled application, extending the scope of stakeholder participation throughout your supply chain is simply a matter of issuing a new username and password.

Case Study 4: Corporate tracking and reporting of audits and non-conformances

Company: Aggregate Industries UK Ltd. 160 sites across the UK.

As networked solutions allow instant reporting and data interrogation, such applications eliminate the administration involved in regularly tracking and reporting audit findings, and non-conformances.

'Our intranet-based EQS provides a method of finding answers quickly. The numerous reports that the package includes means that we can rapidly assess where we are on any number of issues. The biggest time savings are to be had with the tracking of non-conformances and the communication module which allows easy access to people with specific duties related to them'. Dr. Miles Watkins, UK Environment Manager, Aggregate Industries UK Ltd.

Time involved in traditional audit tracking and reporting is 2 day per audit

Time involved in audit tracking and reporting using our intranet solution is 1 day per audit

Aggregate Industries conducts 350 audits per year

Person cost = £200 per day

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| Annual cost for traditional audit tracking and reporting | £140,000 |
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| Annual cost for audit tracking and reporting using intranet solution | £70,000 |
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Time involved in non-conformance tracking. 'To prepare a report of all active non-conformances raised between June 3rd 1999 and the 6th of March 2000, for example, would normally take me 30 minutes at a minimum. Using our intranet EQS system this same task took me 7 seconds!' Dr. Miles Watkins, UK Environment Manager, Aggregate Industries UK Ltd.

Although savings are difficult to quantify, for organisation the size of Aggregate Industries it is assumed that tracking non-conformances and action plans using their intranet solution has saved at least £70,000 per annum.

Summary of savings using intranet-based EQS management system:

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| Annual saving for tracking and reporting audits and non-conformances | £140,000 |
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Economies of scale: Additionally, as all sites develop their management system in the same framework as all other sites, it is possible to take advantage of a number of economies of scale when providing system implementation and maintenance training and support.

Third party certification: As previously identified, with a Web and/or intranet-based application, access can be provided to anyone anywhere in the world (as long as they can connect to the Web or your corporate intranet). Therefore, certifiers can easily audit much of the system from a distance and thus audit faster and at a lower cost.

Additionally, because third-party certifiers can be guaranteed that all sites use the same application and thus use an identical management system framework, corporate certification can be based on the assessment of a random sample of the organisation's sites rather than an assessment of every site to be certified. Naturally,

therefore, using a Web and/or intranet-based EQS solution can significantly reduce the cost of certifying multiple sites.

"Owing to our single corporate certification to ISO 14001, we need to track the site management programmes centrally. Review and target dates are quickly accessible in our intranet-based EQS system and therefore we can spend more time on environmental improvements and less time on the phone."

Dr. Miles Watkins, UK Environment Manager,
Aggregate Industries UK Ltd.

Case Study 5: Increased speed and decreased cost of system certifications

Company: Aggregate Industries UK Ltd. 160 sites across the UK.

Although the costs of and requirements for certification vary between certifiers, by using their intranet-based EQS and allowing their certifiers to conduct documentation reviews from their own offices and certify the entire organisation based on a random sample of 25% of their sites, Aggregate Industries was able to significantly reduce the cost of and simultaneously improve the quality of both their initial certification audits and their bi-annual surveillance audits.

"Using a our intranet solution meant that we were able to reduce the time and thus cost involved in third-party certification and certify of all our sites under one corporate certificate to ISO 14001". Dr. Miles Watkins, UK Environmental Manager.

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| Certification using intranet EQS eliminated all 'Stage 1' reviews | |
| Resulted in £10,000 saving per 25 sites | £64,000 |
| Certification using intranet EQS allows for random sample for surveillance bi-annual audits | |
| Cost of bi-annual surveillance audit | £400.00 |
| Number of surveillance audits using traditional system | 320 per year |
| Total cost of traditional surveillance audits | £128,000 |
| Intranet EQS surveillance on random sample of 20% of all sites | |
| Cost of surveillance audits using intranet EQS | £25,600 |

Summary of savings using intranet-based solution:

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| Savings on initial certification | £64,000 |
| Savings on surveillance audits | £102,400 |

4. Barriers and limitations to Web and/or intranet-based EQS solutions

As has been identified above, using Web and/or intranet technology can radically improve EQS management performance. However, and like most things, if it was that easy everyone would be doing it. To that end, while there are undeniable opportunities for improvement through the use of this technology, it is essential to also note that there are barriers, pitfalls and constraints that if not addressed will retard or scupper even the best intentions and efforts.

Firstly, given the fact that a networked solution is one that all sites and individuals in an organisation have access to, when an organisation opts for an intranet solution, it is likely that such a solution will impact a tremendous amount of people. Therefore, when buying or building an intranet-based EQS solution, everyone from the site level EQS Managers, to corporate representatives for EQS management, IT management, financial management and even the board of directors will, in one way or another, be affected and thus to some extent be involved in the decision-making process.

Consequently, and in the case of intranet rather than Web applications, the time involved in deploying an intranet-based applications, EQS or otherwise, can often run into months or even years.

Secondly, for a Web and/or intranet solution to be effective, it is paramount that the organisation in question has either a functional intranet or effective Web access and the resources available to support the use of this technology.

Thirdly, and perhaps most importantly, is the fact that for a Web and/or intranet-based EQS solution to be effective, there has to be unswerving commitment to its success at both the site and the corporate level. At a minimum this will include a commitment to providing all users with functional computers and effective access to the Web and/or intranet as well as the commitment, where necessary, to providing computer literacy training to all those who need it.

Lastly, although using Web and intranet technology can have powerful effects on a business it is essential to recognise that using this technology will change the way

an organisation does business. Consequently, if users are not capable, willing or motivated to change, change simply won't occur and the benefits of this technology will be diluted or missed altogether.

5. Conclusions

Without doubt, effective EQS management and performance improvement is a fundamental pre-requisite of global sustainability. As a result, and in the long run, it is undeniable that all businesses whose activities (and products) have environmental and/or health and safety impacts will be required, whether by regulation, international trade requirements or public pressure, to track, report and improve EQS management performance. Consequently, and given that EQS managers presently spend a majority of their time managing EQS information rather than improvement EQS performance, improving EQS information management should be seen as a paramount and almost primary step in the right direction.

To that end, and as identified above, in any context whether it be the Global 2500 or the SME, there are phenomenal opportunities to increase the efficiency of EQS management practices and ultimately improve EQS management performance through the use of Web and intranet technology. Ultimately therefore, increasing the efficiency of EQS information management through the use of Web and intranet technology must be recognised as both an essential component of corporate and global sustainability but also a solution that will provide both enormous short term rewards as well as unparalleled and wide-spread long term benefits for all stakeholders affected by EQS performance.

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