MEDINFO 2007
HISA Ltd Australia
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The Development of an Information System and Installation of an Internet Web Database for the purposes of the Occupational Health and Safety Management System

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Abstract

This paper is based on the research of the possible structure of an information system for the purposes of occupational health and safety management. We initiated a questionnaire in order to find the possible interest on the part of potential users in the subject of occupational health and safety. The depiction of the potential interest is vital both for the software analysis cycle and development according to previous models. The evaluation of the results tends to create pilot applications among different enterprises. Documentation and process improvements ascertained quality of services, operational support, occupational health and safety advice are the basics of the above applications. Communication and codified information among intersted parts is the other target of the survey regarding health issues. Computer networks can offer such services. The network will be consisted of certain nodes responsible to inform executive persons on Occupational Health and Safety. A web database has been installed for inserting and searching documents. The submission of files to a server and the answers to questionnaires through the web help the experts on their activities. Based on the requirements of enterprises we have constructed a web file server. We submit files so that users can retrieve the files which they need. The access is limited to authorized users and digital watermarks authenticate and protect digital objects.

Keywords:

occupational health and safety, workflow management, computer networks, World Wide Web, file submission, questonnaries

Introduction

The management of occupational health and safety constitutes a field which concentrates the interest of enterprises. Particularly the enterprises with a modern concept of management, not only care to comply with the legal obligations as far as it concerns the occupational health and safety, but also they implement a health and safety management system, in order to improve the work conditions. Quality management systems are developed and implemented to enterprises following some standards. For health and safety management, ISO 18001 is widely applied. For the development of such systems the workflow and information management between experts and enterprises is very important and interesting. The use of computer networks and the whole infrastructure is significant for this purpose. Such a system can be administered via the WWW. An external expert can handle the information in a way to correct and to intervene to improve the quality of occupational health and safety services. We have developed such a system in order authorized users, of each enterprise, mainly the responsible for the occupational health and safety, can communicate and submit files. On the other hand, we can use comments for each submission to explain in a more executive way the files and retrieve them. For the purpose of managing and detecting some very important workflows we use questionnaires; the processing of which are very useful for management and decision making in this field. The depiction of interest is important because we adopt new technologies and methods in order to accommodate the procedures for the occupational health and management system.

The interest of the potential users responsible of the occupational health and safety is included on the analysis cycle of the software. At the second phase we are searching about the requirements of the enterprises analyzing the answers of the questionnaires. The evaluation of the results by the experts will lead us to create pilot based applications for communication between enterprises and selected branches.

At the second phase of the implementation work we are developing a system which will be responsible to inform the interested parties about the subjects of occupational health and safety management system. On the other hand

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this system is going to store information about educational issues. A relational database is a scientific tool for the purposes of storing and retrieving useful information.

We insert new technologies to depict the daily situations on the working conditions and in order to support the work of the administration and the work of the employees. We initialize a measuring system based on ISO 18001 in order to evaluate and shape new working conditions. The instability at the working conditions forces us to initiate some rules to protect and promote health and safety of the employees. We are trying to develop a system which will be useful to the users. Such a system after the frequent use must be improved in order to keep the practical features and be more operational. The improvements of such a system is not an easy task. We must find the principle components which support our system and follow some equations to intervene to improve the state of the system. We should pose some limits for the states of the system. In case we exceed them we must enable some actions to correct and to prevent the unsafe conditions. We should restore to the initial regular state the system in case we find that we have exceeded the initial parameters.

In order to achieve the above ideas we should install some means of communication between enterprises. The internet support this communication. The protocol which the internet is based is the TCP/IP[9]. The address IP is a 32-bit number fundamental to Internet addressing and routing. It is also used for addressing the servers and clients. The TCP/IP provides a realiable transport service which is used by most Internet Applications. Examples of applications are the electronic mail (e-mail), the File Transfer Protocol (FTP) and the access of Web Pages through the World Wide Web via HTTP. The evolution of the e-mail was the incorporation into the web.

Some issues on computer networks

Interconnection networks play a major role in the performance of modern enterprise management. There are a lot of factors which can differentiate the design of each network.

- Performance requirements (on time and reliable decisions from the informations we collect): All operations are usually performed by explicit message passing or by accessing shared variables. To reduce the message latency, we reduce the idle time of processes and memory access time to remote memory locations [6]. The delay of information trasmission between two points is a very important aspect in case we take some useful decisions. The validity of information is also important, if we can collect information from all the enterprises we have reliable data, otherwise the latency of communication between the enterprises and the experts may cause an unreliable source of information.
- Scalability: As we add more enterprises in the network, we should proportionaly increase the network bandwidth, the I/O bandwidth and the memory bandwidth. If we are not able to use a scale factor for all the above requirements, at the network, it may become a bottleneck for the rest of the system decreasing the overall efficiency accordingly[6].
- Incremental expandability (example of ISPs): Customers are unlikely to purchase a computer network with a full set of computers and other electronic devices. More enterprises may be involved in the network until a system's maximum configuration is reached. We should find a way that the new nodes we add, do not decrease the performance. For example if we have 10 enterprises and we want to install an internet service provider we may not use a provider exactly for 10 enterprises, we should predict that after a long time we may provide our services to 15 enterprises, so we must use a provider with incremental expandability in order to reach the new requirements.
- Partition ability: It depends on the work we want to do. We devide the work in several partitions and then we dedicate certain tasks to computers of network [7]. This partition is very efficient for the performance of the network. We can use it also for the design of the network, we configure a network for the requirements of our work and we do not configure the work to the requirements of the network. For example we can use one node of the network as file server, another as database server, another as network server etc. Partition ability may also be required for security reasons[6].
- Simplicity: It is useful for the customers who understand the design and can easily exploit their performance. Otherwise the network may not be so efficient [6].
- Distance span, Locality: There are appropriate mechanisms which can reduce the noise during the transmission of the data, but there are a lot of constraints mainly on the distance between nodes on this domain. The use of optical links solve these problems equalizing the bandwidth of short and long links up to a much greater distance than when copper wire is used[6]. The locality is a very importat parameter, we must know where the enterprises are placed in a map in order to design a network.
- Physical Constraints: The operating temperature control, the wiring length limitation and the space limitation are constraints for the network design. We must be careful in case we put together a lot of wires, the overheating may cause damages to the wires [6].
- Reliability and Repairability: It should be able to transmit information reliably. In addition interconnection

networks should have a modular design allowing upgrades and repairs [6].

- Expected Workloads: The network design should be robust. The performance should be efficient independently of the wide range of traffic conditions [6].

Cost Constraints: We should find an optimal solution between the cost of the implementation and the performance of the network. A solution which is probably expensive it is not necessery and efficient [6].

Interconnection networks

At the design of a network we should predict its connectivity with other networks, such as wide area networks [17]. We may need to connect our network with a network of an enterprise and to communicate with an establishment of the enterprise, in order to find useful informations for our work. We can connect our network with leased lines of the telephone network, in order to use services such as voice over ip, teleconference, video conference etc. Interconnection networks exist between parallel and distributed systems[3], [4], [7]. In general purpose the usage of the above systems is the efficient solution of a problem. The network design help us to devide our work into small tasks and try each computer to solve these small tasks. Then we combine the solution of each node to the final[7]. For those systems the network should reduce the message latency in order to be efficient[3]. A decomposition technique based on interconnection network should care for the load balancing of the work between computers. A central unit can recursively divide the work, sending partition of work to nodes and control the overall work.

Meanwhile an application can not use general rules, the services we want the network offer to their users and the quality of services determine the parameters of a network. There are a lot of issues in network design[6], [25], [26]. First issue is how many routers we are going to use. Having a topological map of the whole network where shall we put them? The connections are going to be wireless (data links), which routing algorithm we are going to use, Dijkstra or smth else. There are also some challenging issues such as the network bandwidth and the time delay of packets. Computer networks individual for enterprises are crucial for their speeds in transfering data and for the internal communication.

Programming and configuring an internet web database

For the purpose of installing a web database we used the Apache Server Program and a Database Management System. The apache server enables some files of the host computer to be accessible from the Internet via the HTTP. For the communication of the database we use some script programs written in PHP language. The accessible files via HTTP are HTML forms which communicate with PHP programs[27]. For safety reasons we used some global variables (sessions) on php scripts in order only experts and executive persons from enterprises could administer the internet web database. The information on the Internet Site is accessible to everyone. On the site we can find which enterprises are interested on the domain of Occupational Health and Safety. We can find the executive persons of each enterprise which are responsible to communicate with us. We install a communication between the database and one program in java [8] in order to compute some interesting statistical values from the dataset. The internet web site which host a part of our work is located at the address http://healthandsafety.nurs.uoa.gr/sdyaergasia.php.

In order to construct an Internet Web Site, we find the system requirements and the users requirements. Then we design the web site in order every user to find easily whatever he wants on the domain of occupational health and safety. Then we configure the web site in order to achieve a communication between the site and the database. The updates for news on research in occupational health and safety are appropriate. The updates on the software are also important. The file management we present[27], uses the classic way of FTP. We insert documents, files, data and multimedia[20] in a directory which is structured in such a way for displaying into the www. Using some additional attributes to the above attributes we can cluster the data into groups[19]. The development of an Internet Web Site for efficient storing and indexing documents is a pioneering research work on the domain of Occupational Health and Safety. These attributes help the users to retrieve the data easily. They are inserted by the system administrator or by the composer of digital data. The metadata are all the appropriate elements which describe the uploading documents. Some operations that a system administrator can do are the uploading of a document and the updating of metadata using a simple web interface.

We develop this internet web site in order the executive person of an enterprise be informed about the issues of Occupational Health and Safety.

We are heading the semantic web[16]. This means that the internet can support workflow models. Workflow models are abstractions revealing the most important properties of the entities participating in a workflow management system. The workflows are 3 types, Human – Oriented (a person is responsible to execute a workflow), System – Oriented (we use databases and decision support systems,[15],[21] in order to find answers to our queries) and Transactional workflows (consisted from a mix of tasks, some performed by humans, others by computers and support selective use of the transactional properties for individual activities or for the entire workflow). The workflow models consist from entities which interact with

others in an Interconnection Network and they are participate in a management system[1], [16].

Administration by authorized users

The administration of internet web site could be performed via the web. The web interface is quite familiar to everyone who want to use it. We use html forms to upload documents. We insert metadata and documents in a database using php scripts. Experts on the domain of Occupationl Health and Safety are responsible to update the site with news and with the latest scientific research. The web interface which supports the administration can be seen at figure 1.

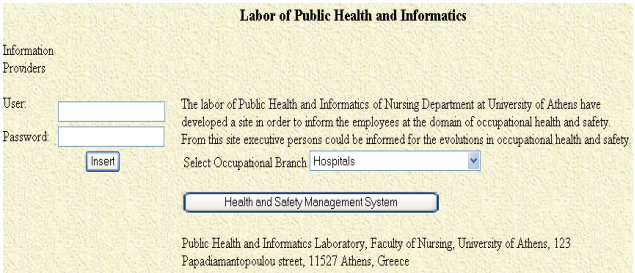

Figure 1 - Web Interface for administrating and presenting information on Occupational Health and Safety

There are some constraints at the insertion of data. We can insert only text documents, Microsoft Word Documents, and documents which can be read by the Adobe Acrobat Reader. Meanwhile we may need to insert files for educational reasons, such as power point files, video and images. On multimedia files we can insert a digital watermark in order to authenticate the constructor of the object [14]. We can insert a list of notes for each document in order to have a dialogue about certain ideas[27]. This dialogue is important for improvements in work.

The data we insert at the internet site are peer reviewed in order to be reliable. We also protect the authenticity of the digital objects inserting to them digital watermarks resistant to attacks such as compression, smoothing and geometric transforms[14] (mainly for multimedia data).

In the web site http://healthandsafety.nurs.uoa.gr/sdyaergasia.php, figure 1, developed in the Department of Public Health in the Nursing Department, University of Athens, we have configured the server to be able to find all the relevant information useful to this task. We can search the documents[19] placing keywords. There is also the possibility of browsing in all data lists.

Services provided by the system and applications on distant learning

The transmission of multimedia data in real time is critical for designing this system. We also search the number of clients a video server can serve with certain criteria of quality of services. The video on demand has as target to inform enterprises about the subjects of common interest. The subjects will be registered electronically among all the speakers and finally the revised lectures will be inserted in the information system in a corrected form. Meanwhile there are some difficulties on the transmission of multimedia data: firstly the subject about the quality of service second the decompression of the data and finally the removal of the jitter.

Another issue is that the system can provide training packages for the protection and promotion of health at the workplace and the implementation of safety procedures[24]. These packages are disseminated through the network or applied by e-learning techniques[2]. The function and the effectiveness of those packages will be evaluated at the ability of installing integrated solutions and applications to support experts on Occupational Health and Safety.

Conclusion

At this paper we have described a web application, which is administrated by authorized persons only. We intend to inform executive persons of each enterprise for the evolutions in Occupational Health and Safety. This site will inform and allow communication among enterprises. Documents and data based on ISO 18001 will be submitted, processed and presented in appropriate format in order to be useful to the interested executive persons. The corrections and the control of the whole infrastructure is significant to our work. Our target is to improve occupational health and safety, to find new policies, to design new systems, to control new procedures and finally to review the whole structure in order to be comprehensible to the users. An application has already been installed at hospital “Agios Savvas”. The application will be evaluated continuously in order to achieve the standards of ISO 18001.

Acknowledgement

The present study was funded through the Operational Programme for Education and Initial Vocational Training (O.P. “Education”) in the framework of the project “PENED 2003 – Support of University Research Groups” with 75% from European Social Funds and 25% from National Funds.

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