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Jianhong Zhou
Xiaoxiao Zhou

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Session 14

Effectiveness of E-Learning System

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1. Abstract

Web sites have become a mission critical component of the organization as more and more businesses have come to rely on it. In this paper, a framework has been introduced to be used to evaluate the quality, completeness of the monitoring and to measure effectiveness of e-learning web site which has three areas of focus infrastructure, applications, and business functions. Each area is different; they cover the system aspects of the Web site. The infrastructure aspect concentrates on the operating system, server and network hardware, and other devices such as fire wall. The application aspect pays a specific attention on the database, middle-ware, and the application itself. Business functions deals with the comprehensive management [2,6] of a collection of applications. We suggested a plan to manage and address deficiencies [10] of actual online site operation. We proposed a performance management policy, some security question have been answered and evaluated.

Keywords: e-learning, web site quality, performance, management and monitoring.

2. Methodology

In support of the framework, advantages & disadvantages of e-learning compared to traditional learning given in **Table 1**, also research work have developed a systematic methodology that uses certain issues to drive and support the analysis. These issues are used to clearly identify and document the monitoring and management components, processes, and tools that are the focus of the various system activities of e learning.

2.1 Infrastructure issue

Concerning site's infrastructure we create a table with as many specific components to be the index to the health of the infrastructure. A good starting point should include the operating system, server hardware, network hardware, and other devices like fire wall [7] and load-balancing servers. Derive the list of infrastructure components from the documentation for the web site. For each specific component, identify a set of detailed components. For the operating system, this should include detailed components like CPU utilization, file systems, paging space, memory utilization, etc. These detailed components will become the focus of the monitors that will be used for ensure the availability of the infrastructure. **Figure -1** contains index examples of infrastructure specific components and component details. The application & business issues also will be included.

Table 1 Advantages & disadvantages of e-learning compared to traditional learning

	E-learning	Traditional Learning
Advantages	1-Time & location flexibility 2-Cost-effective for learners 3-Global &unlimited access to shared information 4-Self- paced	1-Immediate feedback 2-Familiar to both students & Instructors 3-Cultivation of a social community 4-Motivating students
Disadvantages	1-Lack of Immediate feedback in asynchronous e-learning 2-Increased preparation time for instructor 3-Non comfortable, anxiety frustration , & confusion to some people.	1-Instructor –centered 2-Time & location constraints 3-More expensive to deliver.

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Performance Management of E- Learning System oriented to 3 research directions: infrastructure, applications, and business functions.

Four components Infrastructure identification phase

Specific Component	Component Details Monitoring to ensure availability
1.Operating System	CPU utilization, File systems, Paging space, Memory utilization
	OS processes monitoring (Virus alert, log service, etc.)
	Interface status, Network utilization, Packet loss, Network collisions, Network processes monitoring, External access.
2. Server	RAID array disk failure, CPU failure, Disk drive failure
3.Network Hardware	Switch and hub status, Router status
4.Other Devices	Load balancing device status, Firewall status, Caching server status

Application identification phase

Specific Component	**Component Details**
Application	Application processes (service) monitoring
Database	Database processes (service) monitoring
	Communication support monitoring
	Backup success monitoring
Middle-ware	Middle-ware processes (service) monitoring
	Queue monitoring, Channel monitoring

***Business identification phase**

Specific Component	**Component Details**
Business system view(s)	A view or views that contains related applications and components
Business system monitor(s)	Checks all application interfaces, checks availability of queues between applications, and run a test transaction .
Business system command(s)	Shutdown, Startup, Restart, Display all (or selected) (services) of a business system

Figure -1 Contains index examples of infrastructure, application & business specific components

2.2 The application & business issues

For the Web site's application focus on the database, middle-ware, and the application itself **Figure -1** contains index examples of application specific components and component details. For the business aspect of the system perspective, the focus is on relating the applications as business systems. To relate applications as business systems, components are grouped and taken as a whole. Views are used to visually manage the business systems. Business system monitoring is more inclusive than regular monitors are. For example, a business system monitor could have a monitor called all business system interfaces. Web-Site Business contains e-registration, online courses, lectures, grades, web-mail & voting feedback form that suggested to be added to web sites to measure level of staff and students satisfaction in order to improve system performance [3].

3. System Support

The key components of the support perspective are team, process and tools. These components are explored in the context of four disciplines -- change, problem, performance, and security. Change, problem, performance, and security management are widely practiced disciplines in the industry. The scope of the support perspective is both broad and narrow. The broad scope has to do with the readiness of change, problem, performance, and security teams to handle the Web site's needs. The narrow scope is how monitoring, command, and control interact with the specific functional perspectives. For example, during a change window, how is monitoring handled to avoid a flood of false alerts [6].

3.1 Management issue

Management is a process whose goal is to provide defect-free implementation of changes to the system environment. This process includes planning and documentation of the change, real time management of the change, verification of completion or, in the case of failure, verification of restoration back to the original state, and follow-up analysis and reporting.. From a system-monitoring viewpoint, we see the following three important issues:-

- How to reactivate the monitoring system follows a change activity to verify that all systems and services are functioning normally.
- How to convert problem management activities into change activities
- How prepared to change tools, and processes are to handle the Web site better.

3.2 Problem management

Problem management is the successful awareness of and response to all monitoring tool alerts and other manually reported or detected problems and the resolution of any events, conditions, failures, etc indicated by this information. The entire set of activities is focused on ensuring that the site is available and functioning in the manner in which it was designed. The 7x24 nature of e-learning web sites and the number of systems used in the typical web site indicate that in order to scale the problem management system and control costs some degree of automation is required. Automation can insure a rapid response to simple problems regardless of when they occur.

3.3 Performance management

Performance management is focused on the measurement and reporting of system resources by the application and its users. Performance management can be used to report problems in real time but is generally used to determine performance trends and to plan for necessary resources upgrades or modifications.. **Table 2** is an example of a completed performance evaluation table contains four parts team, tools, process and overall evaluation [2,9].

Table 2. Performance evaluation Table

Specific component	Component details	Evaluation
1.Team	Who are the team members?	Performance team is in place with two members
	What skills, experience, training does the team posses?	Performance team is experienced and well trained with performance tools
	What coverage is provided by the team? Is this adequate?	Team works normal business hours. Most performance management is done after the fact -- most tools are not real-time
	Are there any performance measurements that can used to evaluate the effectiveness of the team? If so, what data?	Few measurements exist at this time. Team consults with Web administrators and shares performance information
	What are the strengths and weaknesses of the team?	Team understands tools and does a good job in its consulting role. Team is not equipped to deal with "emergency" performance problems.
	What other teams are key to the success of this team? Are there any issues?	Performance team works with Web administrators and teams working problems
	Based on the above evaluation, what are the primary issues? What is the action plan to resolve?	Action items include -- • Recommendation: performance team needs a methodology to work emergency performance problems
2.Tools	What is the primary tool for investigating performance problems?	Team uses utilities that are part of OS and records statistics to log files
	What are the strengths and weaknesses of this tool?	Tools are well-known and easy to use and interpret. Tools require systems administration level skills.
	What other tools are used to manage performance?	Just scripts and basic reporting tools like SAS
	What specific performance metrics are collected	CPU utilization, page space, memory, and disk utilization
	What is the time frame for the collection of performance data	Data is stored for the past 6 months
	Evaluate and develop action plan to address deficiencies.	Action items include -- • Recommendation: Real-time tool is needed to support emergency performance problems
3. Process	Is there a document, which defines the organization's performance management policies and procedures?	No, performance management is not a core discipline
	Is this consistent with actual practice, if not, where are the gaps	Team just provides consulting-level assistance
	Evaluate and develop action plan to address deficiencies	Action items include -- • Recommendation: It is unclear if performance-management focus need to be more formal as performance of the site is handled carefully by the administration and performance community
4. Overall	What reports are available to review site performance? Are they adequate?	Real reports, just ad-hoc reporting
	What is the leading cause of performance problems? What is being done to address this?	Should be tracked

3.4 Security management issue

Some security policy questions that must be answered are [1,5]:

- What components are most critical but vulnerable?
- What information is confidential and needs to be protected?
- How will confidentiality be ensured?
- Will the confidential information be encrypted?
- Who is authorized to access or modify information?
- What authentication system should be used?

- What intrusion detection systems should be installed?
- Who has authority and responsibility for installing and configuring system?
- What incident handling measures should be in place?
- What plans need to be in place to ensure continuity or minimum disruption?

It is expected that the outcome of fulfillment above questions will be a security policy with the following characteristics:

- The policy is clear and concise
- The policy has built in incentives to motivate compliance
- Compliance is verifiable and enforceable
- Systems have good control for legitimate use: access, authentication, and authorization
- There is regular backup of all critical data
- There is a disaster recovery and business continuity plan

4 Summary

This paper described a framework and supporting method to evaluate performance management tools and methods for online service of e-learning web site. Two perspectives are the basis of the framework system and support. Methodology is used for proactive planning which involves three steps: preplanning, analysis, and review. **Figure -1** were used to support the analysis associated with the methodology. The developed systematic methodology uses a series of Tables to drive and support the analysis. These Tables are used to clearly identify the monitoring and management components and focus on the used tools of the system activities, so system perspective has a focus on hardware and software grouped by infrastructure, application, and business components. The support perspective is centered on four processes, problem, performance, and security. **Table 2** is based on perspectives that incorporate tools, processes, organizational structure, and staff skills to evaluate system performance. The developed whole methodology focused on improvement of availability, performance, consistency, and reliability of E-learning system.

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