

**ASSESSING THE USE OF PROJECT
MANAGEMENT MODELS IN WEB DESIGN
PROJECTS: A CASE OF UNIVERSITIES IN
NAIROBI**

BY

ESTHER N. MUCHAI

**A research project submitted in partial fulfilment of the
requirement for the award of degree of Master of
Business Administration, School of Business, University
of Nairobi**

November 2008

DECLARATION

This management research project is my original work and has not been presented for a degree in any other university.

Signed _____ Date _____

Esther N. Muchai

D61/P/7380/05

This management research project has been submitted with our approval as the university supervisors.

Signed _____ Date _____

Lazarus Mulwa

Department of Management Science

School of Business

University Of Nairobi

Signed _____ Date _____

Nixon Muganda

Department of Management Science

School of Business

University of Nairobi

DEDICATION

I dedicate this work to my husband, Wahome Thuku, my daughter, Wambui Thuku and my mother, Margaret Muchai

ACKNOWLEDGEMENT

I would like to acknowledge all the people who made this work a success and thank my supervisors Lazarus Mulwa and Nixon Muganda who worked with me tirelessly through various drafts giving me guidance, suggestions for improvement and were extremely patient with me.

I also wish to acknowledge my family members and especially Wahome Thuku for his patience and immeasurable encouragement when I had to work long into the night to meet deadlines and even for his emotional and financial support and to Margaret Muchai for her prayers, support and encouragement when I felt like giving up.

A big thank you to all my colleagues who had to work extra hours in my absence to ensure that all my work was in order and to my friends who constantly told me that I could do it.

Lastly, to all my questionnaire respondents who took their time to answer them as without them, this work would have been a total failure.

ABSTRACT

The purpose of the paper was to study whether the traditional and conventional project management tools and models are adequate in the management of web design project in spite of the dynamism of Information Technology and to explore the kind of challenges faced in web design project due to their unconventional nature and intangibility of both inputs and outputs in spite of numerous projects planning and development tools with reference to the universities within Nairobi.

The study adopted a descriptive approach and employed the use of a cross-sectional survey method with 40 questionnaires sent to ICT center staff and a few recommended key stakeholders in the development or maintenance of particular university web sites. A total of 35 usable questionnaires were returned which translated to a response rate of 87.5% and a few follow-up interviews were conducted for purposes of further understanding.

The findings of the research revealed that in the modern web design project management environment many developers prefer to use the system development methodologies instead of the traditional project management tools although the PERT method for project planning is still relatively popular. The use of SDM that are meant for web design projects for instance Web site development methodology and information engineering were still very low among universities within Nairobi. The three interviewees indicated that the tools being used were adapted on a project basis. Despite acknowledging the merits of using these tools for instance allowing for better project control and increasing

the likelihood of the project being delivered on time. The respondents also indicated challenges associated with their usage as, the high level of detail required for use was prohibitive, that they involve a high level of complexity in use and they consume too much of the developers' time.

It was further recommended that based on the benefits that seem to be derived from the use of these project management tools and models; it would be prudent for web developers to avoid using the rule of thumb or their perceived expertise and integrate the use of such tools to improve on their work. Furthermore, it was also recommended that the developers of these tools look into the fact that most users don't regard these tools when they are planning for the web quality and thus something needs to be done to improve on the models and tools to accommodate the quality aspect.

TABLE OF CONTENTS	PAGE
DECLARATION.....	i
DEDICATION.....	ii
ACKNOWLEDGEMENT.....	iii
ABSTRACT.....	iv
LIST OF FIGURES	viii
LIST OF TABLES	ix
LIST OF ACRONYMS	x
CHAPTER ONE: INTRODUCTION.....	1
1.1 Background.....	1
1.2 Challenges in the management of web projects.....	3
1.3 Project planning tools	4
1.4 Universities in Kenya.....	5
1.5 Problem Statement.....	7
1.6 Objectives	9
1.7 Importance of the study	9
CHAPTER TWO: LITERATURE REVIEW.....	11
2.1 Introduction.....	11
2.2 Project life cycle	11
2.3 Project dimensions and management.....	13
2.3.1 Time	14
2.3.2 Cost	14

2.3.3 Quality.....	15
2.3.4 Personnel/skills	15
2.4 Project management tools and models.....	16
2.5 Web projects management and development	20
2.6 Empirical Review.....	26
2.7 Research Gap	29
CHAPTER THREE: RESEARCH METHODOLOGY	30
3.1 Research Design.....	30
3.2 Population and Sampling	30
3.3 Data Collection	30
3.4 Data Analysis	31
CHAPTER FOUR: DATA FINDINGS, ANALYSIS AND DISCUSSIONS.....	32
4.1 Introduction.....	32
4.2 Profiles of respondents.....	32
4.3 Use of web design tools and models.....	37
4.4 Challenges in web design projects	43
CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS ..	46
5.1 Summary.....	46
5.2 Conclusion	47
5.3 Limitations of the study	48
5.4 Recommendations for theory development and future research.....	49
REFERENCES.....	51
APPENDICES.....	57

LIST OF FIGURES

Figure 1: The project lifecycle.....	12
Chart 1: Conventional tools and SDM use	37

LIST OF TABLES	PAGE
Table 1: University representation	32
Table 2: Level of education in ICT.....	33
Table 3: Level of education in project management.....	34
Table 4: Years in project management environment	35
Table 5: Role in creation and maintenance of web site.....	36
Table 6: Tools used for specific tasks.....	38
Table 7: Extent to which models are used.....	40
Table 8: Value of tools in managing project variables	41
Table 9: Perceived benefits of using project tools	42
Table 10: Perceived challenges in web design projects	43
Table 11: Perceived challenges in the use of project management tools	44

LIST OF ACRONYMS

WSDM	WEB SITE DESIGN METHODOLOGY
OOHDB	OBJECT ORIENTED HYPERMEDIA DESIGN METHODOLOGY
SSADM	STRUCTURED SYSTEMS ANALYSIS AND DESIGN METHOD
IEM	INFORMATION ENGINEERING METHODOLOGY
WBS	WORK BREAKDOWN STRUCTURE
SDM	SYSTEM DEVELOPMENT METHODOLOGY
PM	PROJECT MANAGEMENT
PERT	PROGRAM EVALUATION AND REVIEW TECHNIQUE
CPM	CRITICAL PATH METHODOLOGY
KWUST	KIRIRI WOMEN UNIVERSITY OF SCIENCE AND TECHNOLOGY
USIU	UNITED STATES INTERNATIONAL UNIVERSITY

CHAPTER ONE: INTRODUCTION

1.1 Background

The Internet has revolutionized business all around the globe. Almost every competent new or existing business wishes to exploit the incredible potential of the Internet, and the first step is to have a web site designed and maintained by a professional web site designer or built and maintained inhouse. Most business owners today know that having a web site is an essential component of marketing. If you operate, manage or own a business, you surely must appreciate the increase in e-commerce taking place today. Many businesses find themselves searching for the best way to increase their exposure on the Internet, and for most a website is the first course of action (Ringler, 2008).

In today's world, it has become accepted that an organization, association, business, or other institution will have a web site. They can serve a wide range of purposes for an organization. For example, a university web sites can be used to promote the university and its services, provide current information about the university to the current and prospective students, provide online registration, cancellation of course units and reference sources such as databases and examination results, provide remote access to the college library catalogue and other databases created by the university, assist students explore the Internet and serve as the basis for community projects; among other purposes. However, not all these purposes are appropriate for every institution, and the different purposes may suggest that different kinds of web sites would be appropriate for different institutions (Clyde, 2004)

However, web sites are not always developed or managed in such a way that they help institutions to achieve their mission or goals. As with any other project, the development and maintenance of a web site can be managed so that resources are used to further the aims of the institution (Clyde, 2004).

For this, institutions and organizations cannot avoid web design projects and it's crucial to know that the actual site "content" continues to be essential to the success of a website. More often than not though, visual appeal is the determining factor as to whether or not a client or customer will remain on a website long enough, to actually see the product or service the business is providing (Ringler, 2008).

As a discipline, project management stems from engineering, decision sciences, and operations management and currently draws from management theory for its theoretical foundation (Koskela and Howel, 2002). Project management is a set of practices applied to a project to deliver a result, product, or service based on tangible and intangible assets (Ferne et al., 2003). Tangible assets are based on codified or explicit knowledge while intangible assets are based on tacit knowledge. Codified and tacit knowledge have also been labeled as "know-what" and "know-how" (Nonaka, 1994). To date, most of the project management literature has focused on the tangible assets and codified knowledge shared through project management offices, methodologies, databases, documents, tools and techniques. The past decade has seen substantial growth in interest in project management techniques, primarily as a result of increased uncertainty within the business environment. Many industries can no longer expect tomorrow to be like today, and they are turning to project management techniques as a way to cope with such changes.

1.2 Challenges in the management of web projects

Time, quality and cost are the three most crucial variables that matter in project management. Everything else can be summed up within these three words. Inevitably there is a tension between them: the time scale can be reduced, but only by providing additional funding (prejudicing cost) or by delivering less (prejudicing quality) Conversely, quality can only be increased by increasing cost or increasing time scale (again usually both) (Kerzner,2003). In environments where change is rapid (e.g. software, computer technologies) it is very common for events subsequent to the agreement of the objectives to necessitate a reappraisal of the time/cost/quality triangle during development. Sometimes this occurs many times as the project develops. The challenges encountered in the management of web design projects are centered on these variables among other constraints.

Usually there will be insufficient funding, a unrealistic deadlines, the challenge of finding proper resources to support technical programming, artistic design, content development and maintenance, and purchase adequate hardware infrastructure and software tools (Lin, 2004). Clarity of the specification is another major challenge especially in software projects as most customers will not know what they really want from the beginning and as the project progresses, specifications may keep changing. This affects the time schedule for the project and other resources like finances too. Other challenges include: lack or inadequate training in project management skills, communication deficit between the project manager, the project team and the stakeholders, the project manager laying more emphasis on the completion of project

activities visa vie the project progress may pose a challenge. Another challenge would be inadequate planning for the project which may be caused by inadequate usage of planning models and tools or the lack of knowledge on the project management tools and thus poor resource planning (Ford, 2004).

1.3 Project planning tools

A number of expressions and acronyms commonly occur in any basic discussion of project management. Most refer to techniques used in formal project planning and evaluation. These include: Network analysis, critical path method (CPM), programme evaluation review technique (PERT), Gantt charts and system development methodologies/models (SDMs) Network analysis is a method of task scheduling within a project, whereby task dependencies can be identified. A task network can then be built up and time tolerances identified. Network analysis is in fact a collective term for two different approaches to project planning: CPM and PERT.

Critical Path Method (CPM) is a procedure for using network analysis to identify those tasks which are on the critical path: i.e. where any delay in the completion of these tasks will lengthen the project timescale, unless action is taken. PERT (programme evaluation review technique)-relies fundamentally upon probabilistic techniques. The Gantt chart is a basic means of presenting visually a project programme. Essentially a bar chart, it is a useful aide memoire of where the project stands, but is only in fact a static representation of a dynamic situation. System Development Methodologies/Models (SDM) is a collection of procedures, techniques, tools, and documentation aids which will help the IS developers in their effort to implement a new IS. A methodology will consist of phases,

themselves consisting of sub-phases, which will guide the systems developers in their choice of techniques that might be appropriate at each stage of the project and also help them plan, manage, control and evaluate IS projects.

The literature of IS revealed that there were very few reported research that address the use and evaluation of the effectiveness of models for web design projects. Previous studies that addressed on models usage for web development were from Carstensen (2001) and Barry (2001) and it's important to study the same with a bias for Kenya and in particular web design in the universities within Nairobi.

1.4 Universities in Kenya

A university is an institution of higher education and research, which grants academic degrees at all, levels (associate, bachelor, master, and doctorate) in a variety of subjects. A university provides both undergraduate education and postgraduate education. In Kenya we have both private and public universities. A public university is a university that is predominantly funded by public means through a national government. In Kenya, all of the public universities are under the control of the Ministry of Education. Students are enrolled after completing the 8-4-4 system of education and attaining a certain cut-off marks. Students are given a loan by the government through the Higher Education Loan Board (HELB) if they are government sponsored and meet the criteria upon application. They are expected to pay back after completing higher education. Private universities generally do not receive direct operational funding from national governments and thus rely on private sources of funding, such as tuition fees and alumni donations.

According to Nichani (2006), university websites tend to be more complicated than corporate websites and thus compromising quality. He pointed out the following as reasons for this: Difficulty in defining a common vision: unlike corporate websites, it is difficult for a university to get all of its schools, divisions, centers, etc., to agree on a common vision for communicating on the web. This is a classic example of a house-of-brands or a branded-house conflict. Only the administrative offices are under the fold for obvious reasons. Thus, it is not uncommon to come across a school or a division crafting their own vision, often citing the hyper competitive education marketplace as their main reason (e.g. business schools). He also cited that web design tends to fall into the hands of many different local webmasters who make decisions based on local directives – usually motivated by one-upmanship hence the 'not invented here' syndrome. This results in the unfriendly interface that users finally get to see, and unfortunately, to experience. His third reason was the lack of knowledge in user-centered design, which is very crucial. Because the needs of the user does not take center stage, as the above two points show, design decisions are based on varying principles and random rationales leading to haphazard design outcomes. Unless there's common understanding of user needs this is going to be a problem area for some time to come.

In Kenya, most universities are situated in the capital, Nairobi but they serve clients across the countries through affiliations and distant learning. This necessitates good information flow from lecturers, administration to and from students and thus making university web sites very crucial in the dissemination of information and learning materials.

1.5 Problem Statement

University department web pages are the focal point for prospective students, current students, parents, staff and Alumni who want to explore the university. Users visiting these sites expect to find particular pieces of information, perhaps most notably contact information for various people within the department, but also a wide range of information. One would want to use a university's website for many reasons including looking up a staff member's phone number, getting directions to a building, application materials and procedures, and much more. People are visiting university department websites in large numbers. With so many people using the Internet, it is important for university departments to provide the right information to their users who are increasingly online. There currently is a wide divergence in styles and content of university department sites. This could be due to a difference in department philosophies and the wide range of tasks each department must support.

It has becoming increasingly important to come up with well designed and competitive sites whose content is up to date, easily accessible, and easy to navigate and download information. There is also an increase in demand for the universities to create maintainable sites that have up to date information if they have to attract a student 'shopping' for an institution of higher learning. This calls for good web design and management technique having in mind that web projects, unlike conventional projects have an intangible end product-the website itself and that web design is influenced by the dynamism of Information Technology. The known project planning tools mostly address issues related to task dependencies in a project, time spent or to be spent on each task and resource management with a strong inclination to tangible resources. On the other hand,

web design projects are intangible projects with few tangible resources: money and human resources. It's a challenge fitting all the different variables as discussed earlier in the project planning models effectively.

While research into the use and effectiveness of project planning models and SDMs for more traditional IS has been enormously reported in the IS literature, little is known about the use of the same for developing web sites. Against this background, it becomes important to do an exploratory study on how effective this project planning models enable designers in the management of web design projects and to investigate the use and perceived benefits of these models and how effective they are in addressing the major challenges faced in the management of web design projects i.e. time, cost and quality constraints in spite of the dynamism of IT and changes in the client's specifications.

Related web studies have been undertaken in the Kenyan context by Muyoyo (2004) who did a study on the factors influencing the adoption and implementation of e-business technologies in companies. In his research, he found out that many companies shy from the cost of building and maintaining web sites as web sites have becomes tools for competitive edge. Even though their studies did not concern themselves with the relative challenges of managing web design projects, they provide insight on the importance of web technology and why we cannot do without such projects. The focus of the current study is on why it's important to manage web projects efficiently to mitigate the challenges such projects pose and how the available models have aided in achieving this goal

1.6 Objectives

The following were the objectives of this study:

- i To study whether the traditional and conventional project management tools and models are adequate in the management of web design project in spite of the dynamism of Information Technology.

- ii To explore the kind of challenges faced in web design project due to their unconventional nature and intangibility of both inputs and outputs in spite of numerous projects planning and development tools.

1.7 Importance of the study

The findings of this study may be of interest to researchers, practitioner community and academicians interested in project management and web design as a basis for future studies in the management of other IT based projects.

The findings open up new ideas and technologies in the management of web design projects and further enrich project management as an area of study within the context of computerized project management tools and methodologies.

From the findings Institutions would have better comprehension about the potential benefits or costs that SDMs as a way of managing IT projects can offer to their systems development effort. Also, they can equip their knowledge on the prospective constraints and limitations should they decide to adopt SDMs for web design projects. Further,

practitioner community can also enhance their knowledge on how best practices for web-design are being applied in practice.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter involves gathering of written matter that is vital and relevant in the research study of the challenges encountered in the management of web based projects in different institutions and businesses, the models in use and their relevance to the same. The sources of literature reviewed included books, journals, reports, thesis, websites, and publications by professional bodies. This wealth of literature though primarily useful for issues relating to the management of conventional projects and traditional IT projects, is also relevant to a great extent in the study of web based projects which are relatively new as most businesses and organizations are using web sites for competitive advantage. The researcher is looking at the various models that have been in place to aid in project management, any studies that have been carried out of the effectiveness of these models in addressing the key variables in a project: time, cost, quality and any weaknesses that have been identified by others especially in the management of web design projects.

2.2 Project life cycle

A project is a carefully defined set of activities that use resources (money, people, materials, energy, space, provisions, communication, motivation, etc.) to achieve the project's specific goals and objectives (Wikipedia). The project management framework is divided into five standard phases, as defined in the project management body of knowledge, PMBOK Guide 2000 (pp 30-31), and each phase has associated activities, but, additionally, the phases overlap.

Initiating processes –Is the first project phase and is usually represented by the conceptualization or formulation of the project. The purpose of this phase is to specify what the project should

accomplish, preparing a notification followed by a project proposal, then, gaining approval and reserved funding for the project. The end to end life of the project must be taken into account at the proposal stage, for example, recognizing that the information for an activity completion report at the end of the project should be considered at the proposal stage and throughout subsequent stages of the project (Williams, 2007).

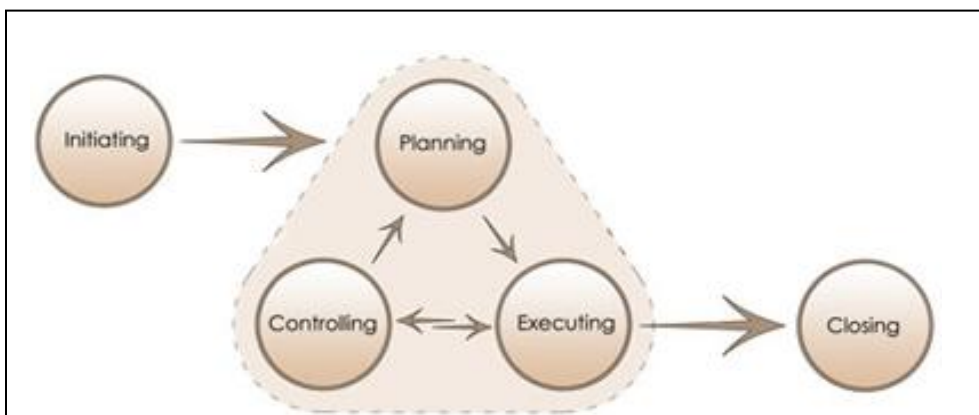
Planning processes – It's the most important phase in project management. The effort spent in planning can save countless hours of confusion and rework in the subsequent phases. This phase involves scope planning, preparation of the work breakdown structures, resource planning, project schedule preparation and budget planning then gaining final allocation of funding. This is the phase that is most essential for the project's success as it helps team members identify their responsibilities and expectations and identifies scope, tasks, schedules, risks, qualities and staffing needs (Williams, 2007).

Executing processes – Project execution is characterized by the actual work on the tasks planned and project control involves the comparison of the actual performance with the planned performance and taking appropriate corrective action to get the desired output. Activities involved may include; implementing the project plans; coordinating people and other resources to carry out the project plans. Typically, this is the longest phase of a project (Williams, 2007).

Controlling processes – ensuring that project objectives are met by monitoring and measuring progress regularly to identify variances from the plans; taking corrective action when necessary; tracking the variances and changes. Controlling has much overlap with other phases (Williams, 2007).

Closing processes – Is the last phase of the project life cycle. The commencement of the project closure phase is determined by the completion of all project objectives and acceptance of the end product by the customer. It involves, bringing the project to an orderly end: formalizing and communicating the acceptance or conclusion of a project, handing over to the ongoing accountable area, completing an activity completion report and, for major projects, holding a post implementation review (Williams, 2007).

Figure 1. The project lifecycle



Source: Meri Williams, (June 13th 2007). Effective Project Management for Web Geeks pp 13

2.3 Project dimensions and management

A project is a finite endeavor—having specific start and completion dates—undertaken to create a unique product or service which brings about beneficial change or added value. This finite characteristic of projects stands in sharp contrast to processes, or operations, which are permanent or semi-permanent functional work to repetitively produce the same product or service (Longman, 2004). In practice, the challenges and management of these two systems is often found to be quite different, and as such requires the development of distinct technical skills and the adoption of

separate management. Project management is then the discipline of planning, organizing, and managing resources to bring about the successful completion of specific project goals and objectives (Anumba, 2008).

Like any human undertaking, projects need to be performed and delivered under certain constraints. Traditionally, these constraints have been listed as "quality," "time," and "cost" (Goodwin-Jones, B. 2001).

2.3.1 Time

For analytical purposes, the time required to produce a deliverable is estimated using several techniques. One method is to identify tasks needed to produce the deliverables documented in a work breakdown structure (WBS). The work effort for each task is estimated and those estimates are rolled up into the final deliverable estimate. The tasks are also prioritized, dependencies between tasks are identified, and this information is documented in a project schedule. The dependencies between the tasks can affect the length of the overall project (dependency constrained), as can the availability of resources (resource constrained). Time is not considered a cost or a resource since, the project manager cannot control the rate at which it is expended, (Goodwin-Jones, B. 2001).

2.3.2 Cost

Cost to develop a project depends on several variables including (chiefly): resource costs, labor rates, material rates, risk management (i.e. cost contingency), Earned value management, plant (buildings, machines, etc.), equipment, indirect costs, and profit. But beyond this basic accounting approach to fixed and variable costs, the economic cost that must be considered includes worker skill and productivity which is calculated by variation to project cost estimates. This is important when companies hire temporary or contract employees or outsource work, (Goodwin-Jones, B. 2001).

2.3.3 Quality

Quality can be defined as meeting the customer's expectations or exceeding the customer expectations achieved by way of deliverables and/or activities performed to produce those deliverables. Quality may also refer to the overall definition of what the project is supposed to accomplish, and a specific description of what the end result should be or accomplish. The amount of time put into individual tasks determines the overall quality of the project. Some tasks may require a given amount of time to complete adequately, but given more time could be completed exceptionally, (Goodwin-Jones, B. 2001). Over the course of a large project, quality can have a significant impact on time and cost (or vice versa). Nichani (2006) pointed out that quality is compromised for universities web sites because its usually difficult to define a common goal and that there is lack of knowledge in the user- centered design such that the needs of the user take center stage. Together, these three constraints have given rise to the phrase "On Time, On Spec, On Budget" (Goodwin-Jones, B. 2001)

2.3.4 Personnel/skills

Scholars have argued that personnel/skills available impacts on the project progress and this in turn impacts on the project constraints (Goodwin-Jones, B. 2001). Projects usually involve different types of skill coming together to work. Cultural differences are inevitable. Architects and drainage engineers may work together on a construction project; University Arts professors and software programmers may work together to develop computer based learning materials. In both cases, interpretation of the objectives will be influenced by the skill background and culture of the various parties. Misunderstandings embedded at an early stage may only become apparent well into the project - by which time easy resolution of differences may be very expensive.

The following skills, among others, are needed at various stages of the Web site planning and development process: Management and planning skills, writing and /or journalism skills, editing skills, skills of information organization and presentation, visual, photographic, and/or graphic design skills HTML and other Web page development skills (including, if necessary, skills related to particular software packages for Web page/site design), skills in maintaining a Web server (which involves system, software, and hardware skills) and interpersonal skills, (Goodwin-Jones, B. 2001).

2.4 Project management tools and models

The 1950s marked the beginning of the modern project management era. Again, in the United States, prior to the 1950s, projects were managed on an ad hoc basis using mostly Gantt Charts, and informal techniques and tools. At that time, two mathematical project scheduling models were developed: (1) the "Critical Path Analysis" (CPA) developed in a joint venture by both DuPont Corporation and Remington Rand Corporation for managing plant maintenance projects, and (2) the "Program Evaluation and Review Technique" or PERT, developed by Booz-Allen & Hamilton as part of the United States Navy's (in conjunction with the Lockheed Corporation) Polaris missile submarine program. These mathematical techniques quickly spread into many private enterprises (Leavitt and Whistler, 1958). At the same time, technology for project cost estimating, cost management, and engineering economics was evolving, with pioneering work by Hans Lang and others. In 1956, the American Association of Cost Engineers (now AACE International; the Association for the Advancement of Cost Engineering) was formed by early practitioners of project management and the associated specialties of planning and scheduling, cost estimating, and cost/schedule control (project control). AACE has continued its pioneering work and in 2006 released the first ever integrated process for portfolio, program and project management (Total Cost Management Framework) (Anumba, 2008).

In 1969, the Project management institute (PMI) was formed to serve the interest of the project management industry. The premise of PMI is that the tools and techniques of project management are common even among the widespread application of projects from the software industry to the construction industry. In 1981, the PMI board of directors authorized the development of what has become A Guide to the Project Management Body of Knowledge (PMBOK Guide), containing the standards and guidelines of practice that are widely used throughout the profession. The International Project Management Association (IPMA), founded in Europe in 1967, has undergone a similar development and instituted the IPMA Competence Baseline (ICB). The focus of the ICB also begins with knowledge as a foundation, and adds considerations about relevant experience, interpersonal skills, and competence. Both organizations are now participating in the development of an ISO project management standard (Anumba, 2008).

The advantages of using these network analysis models include; time management as thorough identification of all major activities requiring time and resources must be made during the planning process, the logical sequencing of these activities made, and the time required for each activity estimated or determined; they provide ongoing data for assessing progress, as the overall research or planning project is scheduled according to the estimated times, resulting in a determination of the most efficient plan for carrying out the various activities; they give the researcher or program planner considerable information for decision-making allowing for continuous evaluation of the planning and implementation progress according to a predetermined schedule necessary for decision-making (Hiemstra, 2000).

System Development Methodologies/Models (SDMs) have also been in use as tools to aid in software projects. This is a collection of procedures, techniques, tools, and documentation aids

which will help the IS developers in their effort to implement a new IS. This includes: *Information Engineering Methodology (IEM)* - is an approach to designing and developing information systems. It is an architectural approach to planning, analyzing, designing, and implementing applications within an enterprise. It aims to enable an enterprise to improve the management of its resources, including capital, people and information systems, to support the achievement of its business vision. It is defined as: "An integrated and evolutionary set of tasks and techniques that enhance business communication throughout an enterprise enabling it to develop people, procedures and systems to achieve its vision" (Roberts, 2000). *Structured Systems Analysis and Design Methods (SSADM)* - is a systems approach to the analysis and design of information systems used in the analysis and design stages of systems development. SSADM is a waterfall method where each phase has to be completed and signed off before subsequent phases can begin and it represents a pinnacle of the rigorous document-led approach to system design (Stevens et al., 1974). *Soft Systems Methods (SSM)* - remains is the most widely used and practical application of systems thinking and its primary use is in the analysis of complex situations where there are divergent views about the definition of the problem — "soft problems". dynamic systems development methods are commercially available and the proponents claim that IS built with their SDMs reduce complexity, facilitate project management and control, and produce high-quality systems that require less maintenance efforts.

However, with the arrival of Internet and WWW, IS using web-technology as a platform, i.e. by internet, intranet or extranet are now prevalent almost everywhere and this presents new challenges that are not normally encountered with the development of "traditional" IS (Russo, 1999). As a result of this, new SDMs exclusively meant for web-based applications have emerged promising and assuring sound development process. Examples of these new SDMs are *scenario-based object*

oriented hypermedia design methodology (OOHDM) - is a model-based approach for building hypermedia applications and thus also for engineering web-sites. Schwabe et al., (1995) introduced it to meet the growing interest in hypermedia design approaches. This design method comprises a four-step process, namely requirements gathering, conceptual design, navigational design, abstract interface design, and implementation; *web site design methodology* (WSDM); is audience-driven because it gives consideration to the fact that the target audiences of a web site may be composed of different "kinds" of visitors/users. It is based on the fact that different types of users have different kind of needs. And fulfilling these needs leads to better tailored web sites, higher usability and greater satisfaction. WSDM takes the requirements of the users of the web site as a starting point and uses this as a basis for structuring the data and the site. *Web Modeling Language* (WebML) – Is a visual notation for specifying the composition and navigation features of hypertext applications. It is like OOHDM ad it is model driven with three different models working together, i.e. data model, hypertext model and presentation model.

The perceived benefits of these SDMs include: They facilitate communication among developers, allow for better project control, ensure that systems meet user needs better, increase visibility of systems development process, improve the quality of the system developed, help ensure that documentation is produced, facilitate interchangeability of developers among projects, increase likelihood that systems will be delivered on time, reduce maintenance of systems and increase likelihood that systems will be delivered within budget.

On the contrary, according to Mohammad,(2008) in his study of usage of project management models and tools in web projects in Malaysia, he pointed out that some web developers do not apply these models due to the level of complexity involve, the cost of buying and running some of them,

the level of difficulty in usage and understanding, the high level of detail that some models require so as to work well, the fact that some models are relatively new in the market hence not widely known and that some are already obsolete.

2.5 Web projects management and development

Web design is a branch of IS projects that deal with “WWW”, an information sharing technology that was developed in the 1990’s and become the single most important software technology advancement that made it possible for firms to use on-line information systems in all facets of business (Hartman et al., 2000). In 2005, it was estimated that the Internet represented more than 5 per cent of total marketing spending by organizations, and that this proportion was expected to double by 2010 (Parsons et al., 2005). The internet is becoming an indispensable tool for organizations that emphasize a customer-service orientation. A study conducted in Singapore found that three of the top four major commercial uses of the internet were services-related – including conducting electronic transactions, gathering feedback from customers, and providing customer service and support (Levenburg, 2005 found that if customers have multiple channels (including the internet) for interaction and purchase, they are much more likely to be satisfied and loyal. Because perceived value influences the satisfaction, retention, and loyalty of customers, this is of significant strategic importance to most shoppers.

It has been established that retailers who are more optimistic about the internet's ability to enhance sales and profits attach greater importance to the use of e-commerce applications, and retailers who make more extensive use of internet applications are more likely to reap e-commerce benefits, especially increased net profits (Levenburg, 2005). Apart from its utility in conducting transactions, the internet is also used by customers and businesses for information and research. Indeed, a survey

by the Pew Internet and American Life Project (2005) found that the internet was most frequently used by consumers as a primary source of information. An overwhelming majority (97 per cent) of internet users said that they expected to find the information they sought online. Moreover, even if a retailer did not sell products through its web site, the provision of product information online would induce nearly half of all those surveyed to go to the physical store to buy the product (Pew Internet and American Life Project, 2005). Similarly, in a survey of small and medium enterprises (SMEs), Levenburg (2005) found that the internet was most frequently used to find information about new sources of supply; indeed, three of the top five applications of the internet among this group of businesses were research-related.

Carton (2007) observed, that many consumers are going online expecting that information they want will be there. This rapid growth in online shopping has also seen a rise in the use of well managed and designed web sites as a source of competitive advantage for many organizations and institutions. The uses of IT have significantly expanded in the last few decades, driven in part by the massive cost/performance improvements of the technology. The early impetus for adoption of simply speeding up the existing manual processes has given way to ideas such as using IT as an enabling technology to change fundamentally the way businesses operate and as a strategic weapon in an increasingly competitive world and as a means to improve interaction with customers (McFarlan, 1984). Web sites are primarily created for firms to position themselves, their goods and services at the reach of customers and to facilitate communication between the firm and the customer. If the trends continue, this will consume an increasing proportion of a firm's management resources (Gregory, 1991). It is also argued that the newest and perhaps the most promising strategy for firms faced with business pressures are doing business electronically using web systems. The use of web technologies to conduct business can provide the needed transformation of business practice in

relation to supplies, customer management, production processes, cooperation with other firms and other markets (Lesjak et al., 2005).

Although the commercial advantages of having a corporate web site have been established, Grewal *et al.*, (2004) found that the dominant attitude among businesses when deciding to develop an internet presence appears to have been ‘we need to be on the internet’. This desire to be on the internet” coincided with a view in the mid-1990s that the internet had fundamentally altered the rules of competition, and that the traditional strategies that had been used to create, capture, and maintain value were now obsolete. Thousands of organizations were thus drawn onto the internet by a fear that they would be left behind by online-only competitors (known as e-tailers). However, many organizations have met the challenge of the e-tailers by integrating online retailing and information dissemination into their existing operations. Thus, what started out as a separate form of innovative retailing in the exclusive domain of new entrepreneurs has become part of a multichannel strategy for established organizations (Grewal *et al.*, 2004).

It’s for the same reasons institutions invest in web sites for competitive advantage among other benefits: keep up with competitors, meet customer (stakeholder) expectations, reduce cost, better information for management, increase operating efficiency and align IT to strategy. For a web site to serve an institution or firm well and for the firm to feel the positive effect of having a web site it must be a well operational site that allows for ease of use. For this, the designer must adhere to the some design principles to ensure the clients realize a return on their website investment. These design principles include: usability, when making decisions about features, layouts, interfaces, data structures etc., one must keep in mind that being easy-to-use is the most important motivator; cross browser functionality, as much as possible, one should design websites that will look good in

multiple browsers; interoperability clients often need to integrate third-party components, so the developer should ensure that code is modular and interoperable; scalability, the clients want to grow easily and economically, so one must ensure that the software is easy and economically scalable; W3C accessibility, site must follow World Wide Web consortium accessibility standards (widely regarded as the international standard) to ensure that all users, regardless of disability, can use the website effectively and efficiently (Lewis, 2005).

Web sites should always be designed with the target audience in mind, not one's own personal preferences. Colors have meaning. Professional designers understand the psychology of color and the use of white space to best project the image the target audience wishes to see (Parmanto et al., 2003). Understanding the products/services and information one's target audience is searching for is paramount to designing and maintaining an effective web site. When a site is launched, one might have to make an educated guess as to what the target audience wants. After that, tools such as site statistics software and reporting from site searches tell you exactly what your visitors are looking for. Then content and marketing strategies can be adjusted accordingly (Yu, 2002).

Narayan, 2001 identifies three levels of technology development and activities that may equally apply to the development of web project technologies. Firstly, individuals develop ideas, theories and perspectives that are known only to them and their colleagues or groups to which they belong. Such tacit or intuitive knowledge may derive from one's experiences, experimentation or imagination. Secondly, this tacit knowledge is coded and verified through a scientific process of experimentation. Then formalized and put into a language that can be communicated and understood by others. Thirdly, the knowledge or technology is adopted and implemented by being put to use or physically embodied into products, services or procedures. This stage reflects the outcome of human

beings making choices as a result of perceived opportunity for improvement due to either intrinsic or economic reasons (Narayan, 2001). Individuals will pursue technology developments only to the extent that there is reasonable assurance that the fruits of their labour will flow back to them (Muyoyo, 2004).

Developing and implementing software engineering practices is the best mechanism to ensure that the project achieves the highest quality results (Jennifer, 2005). The following seven stages are carried out during the project:

- Requirement analysis and review. Identify project vision, standard baseline requirements and common navigation architecture.
- Prototype. Develop a set of web design templates and a set of content development templates.
- Design and review. Program the design and navigation system of the templates, develop content, review and approve content.
- Implementation and review. Program the site according to the content, review by both the development team and project owner.
- Test. Web site review online via an intranet environment by stakeholders.
- Install. Upload the Web site from intranet to its designated Web server.

File management- Every web site has its own designated project folder on the file server which includes sub-folders of current site (source codes and images), prepared docs (templates holding the developed contents), and support documents (for storing all change requests). All updates are done on the current site folder and are uploaded to the web server after validation and approval, (Jennifer, 2005). The use of web based technologies lies at the source of cost reduction, quality, efficiency and

customer satisfaction because they enable scalability, interactivity, flexibility, branding and customizations (Castells, 2001)

The literature on the IS development and models usage seems to agree that development of web sites is different from development of “traditional” IS projects (Paynter, 1998). He explained the differences in terms of speed of change in the technological basis, i.e. the accelerating pace of continuous evolvement of tools and features of web-technology is far too extreme and thus has lured people away from recognizing the need for a systematic design approach. Russo (2000) argued the differences in terms of the purpose and audience for which they are developed, i.e.: many web-based applications are created simply to have a presence on the web rather than to replace any existing traditional information systems or to provide new functionality; and the users of web-based applications are likely to be outside of the organizations and often cannot be identified in advance, thus it becomes more difficult to solicit the views of users when determining the information requirements.

Other differences are in the communication technology (internet, intranet and extranet), the requirement for multi-platform accessibility, and the non-sequential nature of the site content due to a reliance on hypertext links to other web document (Russo, 2000). The differences between web projects and traditional IS projects introduce managerial and technical challenges and require new approaches to design and development. Because of the aforementioned differences, web projects development processes are poorly understood and the poverty of concepts currently underpinning web projects is cause for concern (Spindler, 2002),

2.6 Empirical Review

Regardless of the type of information technology software project being undertaken, whether it's for a bank, hospital, or college, the methodologies do not differ much and the challenges are similar i.e. meeting deadlines and customer specifications. Studies have been done with respect to efficiently managing IS projects.

Mohammad, (2008) did an exploratory study on system development methodologies for web based projects in Malaysia. His major concern was on how organizations in Malaysia have adopted SDMs for their web based projects and to investigate the use of project techniques and tools for web development. His study found out that the use of SDM that are meant for web-based applications is still very low among Malaysian organizations. The majority of respondents indicated that the SDM being used were adapted on a project basis. Malaysian systems developers were more inclined to use techniques that were much suited for traditional applications. Nevertheless, the use of systems development tools was quite overwhelming. Despite acknowledging the merits of using SDM, respondents also indicated problems associated with their usage with a majority sighting the level of complexity as their major concern while agreeing that project tools and models allow for better project control and management

Lin, (2004) carried out a research on the successful approach in college-wide web sites development. The major concern in his research was how to develop an appropriate Web presence for the College of Humanities, Arts and Social Sciences (CHASS) at the University of California, Riverside (UCR), the largest college on the UCR campus, with nineteen academic departments, four formal research centers, offering 55 majors and more than 40 minors. There were two major challenges: to meet all stake holder's different needs for a unique web presence, distinct features, and functions. Second,

with only one newly hired IT professional in the college, there was limited funding, and on a tight schedule, it was a challenge to find proper resources to support technical programming, artistic design, content development and maintenance, and purchase adequate hardware infrastructure and software tools.

Clyde, (2004) carried out a research on the strategic planning approach to web site management. She discussed a number of issues and tasks associated with creating and maintaining a professional web site, identification of aims and objectives, analysis of user needs, selection of content and services to be included, writing or developing the content, developing the information architecture, navigational aids, visual design of the site. She also pointed out that for success to be achieved in website management, personnel (and skills), facilities and equipment, software, financial investment, time commitment, should be synchronized if the project is to be successful in spite of the constraints experienced. She also highlights the fact that web site development and maintenance are ongoing activities (not a “one-off project”) for which resources and personnel (time) are needed on a continuing basis and thus this should be factored in from the onset of the project.

Ford, (2004) did a research on the top project management challenges and even went a step ahead to suggest solutions and ideas to help overcome those challenges. The challenges include; unrealistic deadlines such that majority of projects have “schedule slippage” as a standard feature rather than an anomaly. Communication deficit between the project manager, team and stakeholders, scope change is another challenge he cited as most customers may not know what they exactly want from the beginning and hence keep changing their mind as the project progresses. Resource competition is yet another challenge (people, money, time), insufficient team skills as many team members are assigned based on their availability and he also pointed out that the customers and end-users not

being engaged during the project also pose as a challenge as the project team may get wound up in their own world of internal deliverables, deadlines and process and the people on the outside do not get to give added input during the critical phases. Ford lastly points out that project management is a skill that takes time to develop and achieving success requires analyzing setbacks and failures in order to improve.

Lilly, (2001) while doing a research on what makes a web site fully accessible pointed out that the design of the site has to be meticulous, and the developer must strive to achieve universal design and accessibility- universal design is "... the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design." The principles of universal design, when utilized in the development of any products or services, ensure that they may be used by people of varying abilities and when applied to web design, implementation of the principles of universal design, help web designers create more than just web sites accessible to all people even those with disabilities. She also pointed out that identification of the potential users of a web site will help to determine the kind of information and services that will be provided through the web site. No site can be "all things to all people".

It is probable that the potential users of an organization's web site will be very similar to the users of that organization's services in real life, though the geographical distribution of the users might change. There are three main sources of content for any organization's web site: content created within the organization for other purposes; content created within the organization specifically for the web site; and content developed or provided by others (Lilly, 2001).

2.7 Research Gap

From the available literature, empirical studies carried out regarding the advantages of web sites and the different methodologies that have been in use in specific projects unique in their styles of management and scope being addressed i.e. webs for strategic advantage, college wide webs and general project challenges. Thus solutions were tailor made for those respective problem areas and organizations. However, to the best of my knowledge, the I could not trace any empirical study on the challenges encountered in the design of web site for the universities within Nairobi and how this projects are managed with a view of investigating the effects of using the conventional and relatively new project management tools and models to manage the time, cost and quality constraints. It's for this reason that this research work will be undertaken.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Research Design

This study adopted a descriptive approach. According to Schinder and Cooper (2004), descriptive studies are more formalised and typically structured with clearly stated investigative questions. It serves a variety of research objectives such as description of phenomenon or characteristics and trends associated with a subject population, estimates of proportions of a population that have these characteristics and discovery of associations among different variables.

3.2 Population and Sampling

Purposive sampling was used as it was very useful for situations where one needed to reach a specific predefined group and where sampling for proportionality was not the primary concern but possession of certain characteristics by the subjects (Nachmias, 1996). The research covered all ICT centers and other stakeholders in the development and management of web sites for universities within Nairobi i.e. University of Nairobi, Kenyatta University, Kenyatta University, Aga Khan University, Catholic University, Daystar University, United States International University (USIU), Strathmore University and Kiriri Women's University of Science and Technology.

3.3 Data Collection

Given the nature of the study that was carried out, primary data was used for the survey. The data was obtained from five (5) respondents from each university within Nairobi by use of both open-ended and closed questions. The respondents in the study were any five members of an ICT centre of the selected universities in Nairobi and who had been involved in designing, development and managing web design projects and would therefore provide detailed responses for the study. The

data collection instrument used was a questionnaire (Appendix 1) and the administration of the questionnaire was through drop and pick later method. The questionnaire was structured in several sections. The first section captured personal information of the respondent with respect to ICT and project management skills. The second section captured the knowledge and use of project management tools and models. The third section captured the challenges encountered in both project management and the use of the available tools and models.

3.4 Data Analysis

Quantitative data was obtained from both the closed and open-ended items in the research instrument. The data was coded and entered in the computer by use of the Statistical Package for Social Sciences (SPSS) program. The data was analyzed using correlation analysis which served as an empirical indicator of possible relationship between variables and also using simple descriptive statistics such as percentages, means and frequencies (Cohen, 1983). The focus in this study was the use of project management models and how they related in meeting the cost, time estimates and quality constraints of the project. The study also established the relationship between the use of the models on one hand and the perceived benefits and challenges on the other. The data was presented in form of tables, notes and graphs.

CHAPTER FOUR: DATA FINDINGS, ANALYSIS AND DISCUSSIONS

4.1 Introduction

This chapter presents results of findings obtained from the questionnaires. It's organised on the basis of the research objectives and summaries of data findings together with interpretations presented by use of tables and charts indicating their frequencies and percentage with respect to the total respondents for each question. A total of 40 questionnaires were distributed, i.e. 5 questionnaires for each of the universities under study.

4.2 Profiles of respondents

Out of the 40 questionnaires distributed, 35 were comprehensively completed and returned. This translated to 87.5% response rate among the respondents. The questionnaire covered the objectives of the study which were; to study whether the traditional and conventional project management tools and models are adequate in the management of web design projects in spite of the dynamism in IT and also to explore the kind of challenges faced in web design projects due to their unconventional nature and intangibility of both inputs and outputs in spite of the numerous project planning and development tools.

Table 1: University representation

The study sought personal data and part of it was an indication of the university where the respondent worked from the list provided in the questionnaire. The information collected was presented in table 1 below.

University	Frequency	Percentage %
University Of Nairobi	5	14.3
Kenyatta University	3	8.6
Catholic University	5	14.3
Aga Khan University	5	14.3
Daystar University	3	8.6
USIU	4	11.3
Strathmore University	5	14.3
KWUST	5	14.3
TOTAL	35	100

Data source: Primary data

There was a very good response rate from five universities (14.3%) where all the five questionnaires dropped were completed and returned. Kenyatta and Daystar universities recorded the least with only three (8.6%) questionnaires returned. On average, the response rate was very good.

Table 2: Level of education in ICT

As part of personal data, it was crucial for the study to establish the level of ICT education of the specific respondents. The data collected was presented in the form of frequencies and percentiles as shown in table 2 below.

Level of education	Frequency	(%) of total responses
Certificate	0	0
Diploma	0	0
Higher diploma	8	22.8
Undergraduate	16	45.7
Postgraduate	3	8.6
Professional course	5	14.3
No response	3	8.6
TOTAL	32	100

Data source: Primary data

From the responses 32 out of the 35 who responded had ICT qualifications this translating to 91.5% of the total responses and with some of them having both ICT and project management qualification. It was evident that most of the respondents had undergraduate degrees in ICT related courses. It was also established that a fraction of those with undergraduate and postgraduate degrees had also done other professional courses for instance, Professional web design in html and dream weaver which are coding languages used for web creation. It was noted that none of the respondents had only done a professional exclusively without having done either an undergraduate or post graduate degree.

Table 3: Level of education in project management

The level of education in project management of the specific respondents was also sought. The data collected was presented in the form of frequencies and percentiles as shown in table 3 below.

Level of education	Frequency	(%) of total responses
Certificate	2	5.7
Diploma	2	5.7
Higher diploma	11	31.4
Undergraduate	0	0
Postgraduate	1	2.9
Professional course	0	0
No response	19	54.3
TOTAL	16	100

Data source: Primary data

From the responses only 2 out of the 35 had only project management qualifications with the rest of them were having both ICT and project management qualifications making the total of respondents who answered this part 16. Most of them had done a higher diploma in project management giving us a 31.4% of the total questionnaire respondents.

Table 4: Years in project management environment

The number of years a respondent had been in a project management environment was sought and the responses were as represented in table 4 below.

Years in PM	Frequency	Percent
Less than five year	31	88.6
Five to ten years	4	11.4
Total	35	100

Data source: Primary data

Most of the respondents (88.6%) only had an experience of up to five years in a project management environment with four of them having been there longer than five years but only up to ten years. None of the respondents had been in projects for more than ten years. This was the expected trend as most of the people in web design projects are relatively young.

Table 5: Role in creation and maintenance of web site

It was important to know the roles of the respondents in the creation and maintenance of their university web sites. The findings were tabulated in table 5 below.

Web design roles	Frequency	Percent
System Analyst	15	42.9
Coding Programmer	5	14.3
System Analyst/graphic designer	5	14.3
System Analyst/ Coding Programmer	5	14.3
Project manager/quality assurance/requirements sourcing	5	14.3
Total	35	100

Data source: Primary data

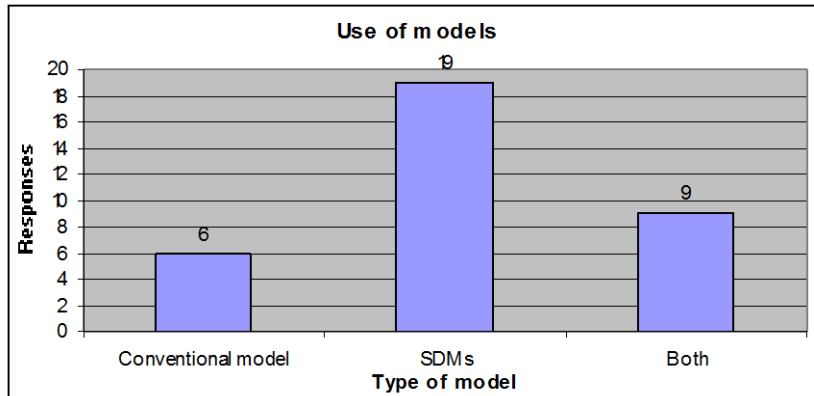
A single person in IT would do more than one role in the creation and maintenance of the web site with a bigger percentage saying they were system analysts (42.9%). Some of those responsible for requirements sourcing had no other qualifications in ICT but were well qualified in project management enabling one to make the assumption that they had only been used as consultants in the project process. Nearly all the respondents had participated in quality assurance and from a follow-up interview conducted with one of the respondents, it was clear that in most web design project teams there is hardly any segregation of duties such that its common to find the same person doing systems analysis, designing the graphics, coding and testing for quality with respect to user specifications.

4.3 Use of web design tools and models

The questionnaire was also used to look at what different respondents would say about the usage of the project management tools and models and this was in respect to both the conventional models and the relatively newer system development models. The section was also used to establish the respondent's knowledge of individual models and how they were used to manage the three main project constraints: time, cost and quality.

Chart 1: Conventional tools and SDM use

Conventional models as discussed in this document included CPM, PERT, Gantt charts, milestone charts and WBS. SDMs included IEM, SSADM, OOHDM, WSDM and WEBML. The question sought to find out the usage of the models from the respondent and the findings were represented in the chart below.



Data source: Primary data

System development models seemed to be more popular than the other more conventional models for web design projects. Some respondents however, indicated that they used a blend of the two to manage time, cost and quality. For the sake of establishing the respondents' knowledge of these models, questions 7, 8, 9 and 10 were used to establish the appropriateness of the answers given in this question on the usage of conventional models or SDMs.

Table 6: Tools used for specific tasks

As the study sought to further understand the usage of the project management tools and models, it was important to identify which models were used in the various phases of the project lifecycle i.e. initiation, planning, executing and controlling. The phases were represented in form of the specific characteristics to make it clearer for the respondents and the responses presented in table 6 below.

WEB DESIGN TASKS	CPM	PERT	GANTT	MILESTONE	WBS	IEM	SSADM	OOHDM	WSDM	WEBML
Creating goals for the web site					4		10		15	6
Breaking down tasks to be undertaken during the project	6	10	3		10		6			
Establishing information media to use (Sound, moving or still images)					10		10	5	10	
Identifying the target audience		1					10	4	20	
Establishing the site structures	5	6	3		4		13		4	
Designing the navigational schemes	12			12		6	12	6	18	6
Developing the site content						5	20			10
Ensuring project was within time schedules	7	15		10		2				1
Managing budget allocation/avoiding cost overruns	10	12	7	4			2			
Ensuring user requirements were met		4		2		4	10		12	3
Measuring and assessing objectives		6		2	6	4		4	10	3

Data source: Primary data

From the data collected, it was observed that the more traditional tools were popular mostly for tasks that related to time and cost. This could be due to their nature of allowing for forecasts and estimation of time, cost and resource allocation. They are also very crucial in planning time crash for the project. PERT seems to be the most commonly used tool. The SDMs seem to be popular with

tasks that deal with the quality of the web site i.e. requirements sourcing, measuring the objectives and developing the web content. On a general front, most respondents seem to agree that it was not possible to use a single model or tool for a task.

Table 7: Extent to which models are used

This section of the questionnaire was used to test the extent to which each of the tools and models could have been used for web design projects in the different universities. The results were summarized in table 7 below.

Model	Mean	Std. Deviation
CPM	3.00	1.63
PERT	3.86	1.07
GANTCHART	3.29	0.95
MILESTONE	3.14	1.21
WBS	3.71	1.25
IEM	2.71	1.38
SSADM	4.71	0.49
OOHDM	2.00	1.53
WSDM	3.57	1.13
WebML	3.43	1.27

Data source: Primary data

Most of the respondents had used more than one of the tools listed and thus gave responses with respect to each model they had used. Out of the 35 responses that were received, PERT seemed to be the most known conventional tool with a mean of 3.86 of the extent of usage. On close scrutiny of

the questionnaire, most of those who indicated that they had used PERT to whatever extent also indicated that they had used the milestone charts and work breakdown structures too. As for the system development methodologies, SSADM, WSDM and WebML seemed to be the most popular with means of 4.71, 3.57 and 3.43 respectively. During a follow –up interview with a respondent from Strathmore University, it was noted that SSADM was popular with many web developers as it allows one to use many different techniques during the design and analysis phase, for instance prototyping techniques and User mark-up language (UML) that use visio diagramming support for resource planning.

Table 8: Value of tools in managing project variables

It was crucial to find out how what the respondents thought on how valuable the models were in the management of web project variables. The findings were compounded and presented in table 8 below.

Project variables	Mean	Std. Deviation
Time	3.0	0.0
Cost	2.7	0.5
Quality	2.3	0.5
Resource allocation	2.9	1.1
Monitoring project progress	2.7	0.5

Data source: Primary data

From the data collected, it was clear that most of the respondents found the tools and models very valuable in time management. They were also relatively valuable in resource allocation and in

monitoring the project progress. It was also very evident that a majority of the respondents found the tools least valuable in the management of web project quality.

Table 9: Perceived benefits of using project tools

A list of the perceived benefits as mentioned by other scholars was used to establish whether the respondents thought that the tools and models were beneficial in web project management. The results were as shown in table 9 below.

Perceived benefits of tools and models	Mean	Std. Deviation
Increases likely hood that systems will be delivered on time	4.9	0.8
Allow for better project control	4.8	0.2
Facilitate communication among developers	4.5	0.8
Increases likely hood of the systems being delivered within the budget	4.2	1.0
Increase visibility of system development process	3.9	0.9
Facilitates interchangeability of developers of developers among projects	3.8	1.5
Ensures that systems meet user needs better	3.7	0.8
Helps to ensure that documentation is produced	3.7	1.5
Reduce maintenance of systems	3.4	1.0
Improves quality of system development process	3.1	1.1

Data source: Primary data

There was a similar trend in the responses for perceived benefits as there were for the how valuable the respondents felt the tools were. Most of them acknowledged that the tools were crucial in managing project time and thus a high likelihood that the web site would be delivered on time and

that the tools allowed for better project control. Most of them were of the idea that the tools did not have much to do with improvement of the development process.

4.4 Challenges in web design projects

This section of the questionnaire was used to investigate the second objective of the study which was to explore the kind of challenges faced in web design projects due to their unconventional nature and intangibility of both inputs and outputs in spite of the numerous project planning and development tools.

Table 10: Perceived challenges in web design projects

Perceived challenges	Mean	Std. Deviation
Frequent changes in user specifications	4.9	0.9
Insufficient funding	4.8	1.1
Ill defined user specifications at the project initiation phase	4.8	0.8
Lack of project management skills	4.6	1.3
Difficulties in resource planning	4.4	1.0
Rapid changes in software	3.6	1.3
Unrealistic deadlines	3.4	1.2
Lack of technical skills in the project team	3.4	1.3
Inadequate assistance offered by project management tools	3.3	1.0
More emphasis laid on project activities than project progress	3.1	1.1
Communication deficit between project team and stakeholders	2.9	0.7
Inadequate knowledge on the project management skills	2.8	1.4
Difficulties in designing	2.5	1.6

Data source: Primary data

From the data collected for this question it was evident that the major challenge that was faced in most of the institutions had to do with the user specifications either not being well defined from the beginning or changing so much during the project lifecycle. This would conversely affect the planning of time and resources. It would therefore be crucial to use the project management tools and models which have embedded capabilities to handle changes in resource allocation, time crashing, planning within time deadlines and generating progress reports to ensure that the development team was well updated on its progress. It was also noted that most of the respondents agreed that they lacked project management skills and thus plan and carry out their work with little regard to professional project management.

Table 11: Perceived challenges in the use of project management tools

These were perceived challenges in the use of the tools. This was to give an insight as to why the respondents would or would not use the web project management tools and models. Results were as shown in table 11 below.

Challenges related to the tools	Mean	Std. Deviation
High level of detail required	4.7	0.9
Consuming too much time to use	4.6	1.3
Obsolescence	4.1	1.0
High level of complexity in use	3.7	1.6
Difficulty in understanding	3.6	1.1
Prohibitive costs	3.0	1.4
Not widely known by the project team	3.0	1.3
Difficulty in use	2.9	1.2

Data source: Primary data

The data here enabled me to understand why the respondents perceived the different challenges in managing web design projects yet there are various project management tools that could mitigate such challenges. It was evident that most thought that the tools were a waste of time and that they required too much detail for them to work efficiently. From an interview conducted to further understand the responses it was found out that most of the conventional tools are deemed to be obsolete and as they are rarely used in their absolute nature but as a combination of them in such programs as Ms Projects. In conclusion of the data analyzed, most respondents agreed that the project management tools actually helped to mitigate most of the project challenges and they also facilitated better project control.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The objectives of the study were to study whether the traditional or conventional project management tools and models are adequate in the management of web design project in spite of the dynamism of Information Technology. It was also to explore the kind of challenges faced in web design project due to their unconventional nature and intangibility of both inputs and outputs in spite of numerous projects planning and development tools.

The findings showed that the relatively new system development methodologies were more popular as web project management tools and were used to a greater extent than the more conventional tools. This was because most of the respondents thought that that the conventional models were obsolete and also because most SDMs had integrated the conventional models and hence there were fewer instances where web developers would need to use a discrete conventional model. However, it was evident that such traditional models like PERT and WBS were still very popular among the developers of web sites especially in the management of time, resource allocation and cost overruns.

The findings also showed that in spite of the numerous models and tools, web developers still encountered challenges in web project management. This could have been due to project variables that could not be fully taken care of by the models like insufficient funding because not all costs could be integrated in the cost planning model and lack of technical skills in the project team or it could have been due to the challenges the developers experienced with the tools like the level of complexity being too high and the some models requiring high level of detail for them to be efficient

hence the developers opting to manage web development projects without involving some of this crucial models.

5.2 Conclusion

The findings of the research revealed that in the modern web design project management environment many developers preferred to use the system development methodologies instead of the traditional project management tools although the PERT method for project planning was still relatively popular. This could be due to the flexibility of time estimates provided by PERT and the fact that it's currently automated into the Ms Projects software that aids in planning, resource allocation, documentation and monitoring project progress. PERT could also be used alongside many other models like the work breakdown structure which also seemed to be popular. The SDMs were more popular as they were more up to date with the technological trends and had embedded features that lacked in the network analysis. For instance the SSADM had integrated the use of user markup language (UML) which uses visio diagramming in the designing of the page and content orientation of a web page. SDMs had also integrated more recent developments in the requirement sourcing by use of prototypes at the analysis and design phases of the project therefore mitigating the challenge of badly defined specifications where the users were not sure of exactly what they wanted and thus it can conclude that from the findings, there seemed to be a relationship between the quality of the web site and the use of SSADM as a project management tool. There also seemed to be a link between the project cost and time with the appropriate use of WBS and PERT methods. The research revealed that there was a moderate use of the project management tools in managing web design project although there was a strong inclination in the use of SDMs more than the more conventional project management tools.

The findings also revealed that the major challenges that were faced in web design projects were unrealistic deadlines and the inadequacy of the project management tools in the management of quality. It became clear that the conventional tools and models were better structured to manage the project time and resource allocation throughout the project lifecycle but were least useful in requirements sourcing which forms the backbone of a quality web site. Although no data provided a direct relationship between the project tools and the cost of the project, it could be inferred that because the tools were useful in resource allocation and costs come about from project inputs, then the models played a crucial role in ensuring the costs were within the budget. As we use the tools to monitor project resource usage so do we monitor the project the costs.

5.3 Limitations of the study

The research design adopted by this study was based on a survey that further adopted a descriptive nature that aimed at investigating the characteristics of web design project stakeholders within a university ICT center. These approach had a shortcoming as it laid more emphasis on the IT personnel who were directly involved in the university web site creation or maintenance and yet there were many other university staff members involved in the whole process as the user representatives. Surveys are also based on perception and perceptions are very dynamic and change daily. There was also the issue of private and public universities whose economic status were different and while some tools would seem expensive for some universities, they seemed to be very popular with others especially the private universities

5.4 Recommendations for theory development and future research

The findings revealed direct relationships between certain models and time for instance PERT, CPM and milestone charts. Although most respondents pointed out these three conventional models, it was also notable that SSADM has been used to some degree to manage time. The cost variable was also covered although not adequately because not all project expenses can be accounted for in a model and thus estimates are used. Some costs that can be directly factored in the planning phase include the human resource cost, consultation cost, feasibility study costs, initial prototyping costs among others, however, such costs as pertains unplanned change of user specifications that necessitate reworks may not be adequately factored into the models as they are adhoc. However there was no absolute model that could be used to improve or manage the quality of the project but a combination of them. This shows that the way forward would be in the use of integrated methodologies that incorporate features of both conventional models and SDMs for instance Ms Projects which kept coming up in the follow-up interviews instead of discrete models in their absolute nature and features.

It would be my recommendation that based on the benefits that seem to be derived from the use of these project management tools and models i.e. increased likelihood of system being delivered on time, allowing for better project control and facilitating communication among the developers; it would be prudent for web developers to avoid using the rule of thumb or their perceived expertise and integrate the use of such tools to improve on their work.

My other recommendation would be to the developers of these tools. They need to consider the fact that most users don't regard these tools when they are planning for the web quality and thus some

improvements on the applicability and usability of the tools would be necessary in order to accommodate the quality aspect.

Future research could employ a case study to establish whether there was any relationship between the inclination to use certain tools and whether the institution was economically endowed or not. Furthermore, research could be carried out in other areas too where web sites have become very critical competitive tools for instance within the banking industry to establish how the development projects of such sites are managed to ensure there is ease in the maintenance of the same and high quality is maintained.

REFERENCES

Amtmann, D., Johnson, K., Cook, D. (2000), "Making web-based tables accessible for users of screen readers", *Library Hi Tech*, Vol. 20 pp.221-31.

Aoyama, M., Weerawarana, S. (2002), "Web services engineering: promises and challenges", paper presented at the 24th International Conference on Software Engineering, Orlando, FL, .

Barry, E.P., Lang, A., Potter, R.F., Grabe, M.A. (2001), "Formal features of cyberspace: relationships between web page complexity and site traffic", *Journal of the American Society for Information Science*, Vol. 50 No.13, pp.1246-56.

Block, M. (2002). Doing it right: How some universities encourage the creation of prime research web sites. *Searcher*, 10(8), 1-8. Retrieved November 18, 2002, from infotoday.com/searcher/sep02/block.htm

Cadle, J., Yeates, D. (2000). *Project management for information systems*. Prentice hall 4th edition. Pp 138-140.

Carstensen, P.H., Vogelsang, L. (2001), "Design of web-based information systems: new challenges for systems development?", in Smithson, S. (Eds), *ECIS 2001*, pp.536-47.

Carton, S. (2007), "Not walls, windows: capturing value in the digital age", *Journal of Business Strategy*, Vol. 25 No.3, pp.15-25.

Clyde, L.A. (2004), "School library web sites: 1996-2002", *The Electronic Library*, Vol. 22 pp.158-67

Chen, Y., Ma, W.-Y., Zhang, H.-J. (2003), *Proceedings of the 12th International Conference on World Wide Web, Budapest*, pp.225-33.

Chisolm, W., Vanderheiden, G., Jacobs, I. (2001), "Web content accessibility guidelines", *Interactions*, Vol. 8 pp.34.

Coda, F., Ghezzi, C., Vigna, G., Garzotto, F. (1998), "Towards a Software Engineering Approach to Web Site Development", *Proceedings of 9th International Workshop on Software Specification and Design (IWSSD)*, Ise-Shima, Japan, .

Cohen, J. & Cohen, P. (1983) *Multiple Regression/Correlation for the Behavioral Sciences* 2nd ed.: Hillsdale, NJ: Erlbaum Associates, 67-69, 490-497.

EC (2008), "Synopsis of the new projects funded under FP7 in the field of ICT security", available at: http://cordis.europa.eu/fp7/ict/security/projects_en.html (accessed January 2008).

Fernie, S., Green, S.D., Weller, S.J., Newcombe, R. (2003), "Knowledge sharing: Context, confusion, and controversy", *International Journal of project management*, Vol. 21 pp.177-87.

Goodwin-Jones, B. (2001), "Emerging technologies – accessibility and web design why does it matter?" *Language Learning and Technology*, Vol. 5 pp.11-19.

Grewal, D., Iyer, G.R., Levy, M. (2004), "Internet retailing: enablers, limiters and market consequences", *Journal of Business Research*, Vol. 57 pp.703-13.

J. Cox. (2002), "Key quality factors in web site design and use", *International Journal of Quality & Reliability Management*, Vol. 19 No.9, pp.862-888.

Kerzner, Harold (2003). *Project management: A systems approach to planning, scheduling, and controlling*, 8th Ed., Wiley, pp 16-24

Koskela, L., Howell, G. (2002), "The underlying theory of project management is obsolete", in Slevin, D.P., Pinto, J.K., Cleland, D.I. (Eds), *Project management institute*, Seattle, WA, .

Lesjak, D., Vehovar, V. (2005), "Factors affecting evaluation of e-business projects", *Industrial Management & Data Systems*, Vol. 105 No.4, pp.409-28.

Levenburg, N. (2005), "Delivering customer value online: an analysis of practices, applications and performance", *Journal of Retailing and Consumer Services*, Vol. 12 No.5, pp.319-31.

Lilly, E.B. (2001), "A World Wide Web for everyone: creating accessible Web sites for persons with disabilities", in Nixon, C. (Ed.), *Internet Librarian International 2001: Collected Presentations*, Information Today, Medford, NJ, pp. 123-33.

Lin, M., Henderson-sellers, B. (2004), "Adapting the OPEN methodology for Web development", *Proceedings of 6th International Conference on Information Systems Methodology*, Salford University, Manchester, pp.117-29.

Longman, A. (2004). *Project management: key tool for implementing strategy*. *Journal of Business Strategy* Vol. 25, pp. 54-60

- Mc Farlan, A. (1984), "Case study research: a multi-faceted research approach for IS", *Information Systems Journal*, Vol. 6 pp.227-420
- Mohammad, N M, (2008), "An exploratory study on systems development methodologies for web based applications" *International journal of Information Management and computer security* Vol. 16 No. 2 pp. 137-149
- Muyoyo, J.L. (2004). *Factors influencing the adoption and implementation of e-business technologies in companies*. Unpublished MBA project, University of Nairobi.
- Nachmias, V.F. & Nachmias, D. (1996). *Research methods in the social sciences, 5th edition*. St. Martin's Press, USA.
- Nichani M, (2006), "The changing face of university websites" San Francisco, Morgan Kaufmann Publishers. Pp. 128-140
- Nonaka, I. (1994), "A dynamic theory of organizational knowledge creation", *Organization Science*, Vol. 5 pp.14-37.
- Parmanto, B., Zeng, X. (2003), "Metric for web accessibility evaluation", *Journal of the American Society for Information Science and Technology*, Vol. 22 No.3, pp.47-51
- Parsons, A., Zeisser, M., Waitman, R. (2005), "Organizing today for the digital marketing of tomorrow", *Journal of Interactive Marketing*, Vol. 12 No.1, pp.31-46.
- Paynter, J., Pearson, M. (1998), "An analysis of WWW-based information systems", in Chow, W.S. (Eds), *Multimedia Information Systems in Practice*, Springer, Singapore, pp.53-63.

Pew Internet and American Life Project (2005), "Counting on the Internet: Most People Find What They Need, Expect", available at: www.pewinternet.org.

Roberts, G. (2000), "Designing a database-driven Web site, or, the evolution of the InfoIguana", *Computers in Libraries*, Vol. 20 No.9, pp.26-32.

Russo, N., Graham, B. (1999), "A first step in developing a Web application design methodology: understanding the environment", *Proceedings of 6th International Conference on Information Systems Methodology*, Salford University, Manchester, pp.24-33.

Spindler, T. (2002), "The accessibility of web pages for mid-sized college and university libraries", *Reference & User Services Quarterly*, Vol. 42 pp.149-54.

Vidgen, R. (1998), "Using the Multiview2 framework for Internet based information systems development", *Proceedings of 6th International Conference on Information Systems Methodology*, Salford University, Manchester, pp.389-403.

W. Stevens, G. Myers, L. Constantine, (1974) "Structured Design", *IBM Systems Journal*, Vol. 13 No. 2, pp. 115-139

Yu, H. (2002), "Web accessibility and the law: recommendations for implementation", *Library Hi Tech*, Vol. 20 pp.406-19.

Zeng, X., Parmanto, B. (2004), "Web content accessibility of consumer health information web sites for people with disabilities: a cross-sectional evaluation", *Journal of Medical Internet Research*, Vol. 6 pp.e19.

A Guide to the Project Management Body of Knowledge (PMBOK™ Guide), Project management
Institute, Newtown Square, PA,

APPENDICES

APPENDIX 1: QUESTIONNAIRE

Please be so kind to provide general information about yourself.

PERSONAL DETAILS

1. Which university do you work for?

- | | |
|---|--------------------------|
| University Of Nairobi | <input type="checkbox"/> |
| Kenyatta University | <input type="checkbox"/> |
| Catholic University | <input type="checkbox"/> |
| Aga Khan University | <input type="checkbox"/> |
| Daystar University | <input type="checkbox"/> |
| United States International University | <input type="checkbox"/> |
| Strathmore University | <input type="checkbox"/> |
| Kiriri Women's University of Science and Technology | <input type="checkbox"/> |

2. Highest level of education achieved in the ICT field?

- | | |
|----------------------|---|
| Certificate | <input type="checkbox"/> |
| Diploma | <input type="checkbox"/> |
| Higher Diploma | <input type="checkbox"/> |
| Undergraduate degree | <input type="checkbox"/> |
| Postgraduate degree | <input type="checkbox"/> |
| Professional Course | <input type="checkbox"/> Please specify _____ |

3. Highest Level of training in project management

Certificate

Diploma

Higher Diploma

Undergraduate degree

Postgraduate degree

Professional Course Please specify _____

4. How many years have you been in the project management environment?

Less than five year

Ten to twenty

Five to ten years

Over twenty years

WEB DESIGN TOOLS AND MODELS

Please answer the following questions that will give the researcher an in-depth understanding of web design project management and the usage of available models and tools in your ICT function.

5. As a member of the ICT function, what was your role in the creation and maintenance of the university's web site?

Project Manager

System Analyst

Graphic Designer

Coding Programmer

Quality Assurance

Requirements Sourcing

Any other (please specify) _____

6. Which types of project planning models exist (documented or not) within the ICT center for cost, quality and time management

Conventional Models

System Development Models

All the Above

7. The following is a list of models and tools and features that will help you identify them. Kindly indicate by ticking the extent to which you may have used them in the management of the web design project in your institution

		1	2	3	4	5
		No extent at all	Small extent	Moderate extent	Large extent	Very large extent
1	Critical Path Method(CPM) (Network diagram that emphasizes on certainty of activity duration and overall project duration and aids in resource allocation to ensure they go the most critical activities first and allows for project time crashing)					
2	Program Evaluation and Review Technique (PERT) (Network diagram that utilizes probability to determine both the activity duration and overall project duration and allows for project time crashing too)					
3	Gantt Charts (Displays schedules graphically. A horizontal bar chart with time as the horizontal axis and either resources or tasks as the vertical axis. Show dependency relationships between activities. Assist in calculating and eliminating idle time)					
4	Milestone Charts (Utilizes timeline to monitor project progress. Overall project time is divided for all tasks and each task has a deadline set. Delays are accounted for when they happen to avoid project time being off-track)					
5	Work Breakdown Structures(WBS) (Tree-like structure that show the list of work to be undertaken during the project life cycle. Permits summing of subordinate costs for tasks and materials)					
7	Information Engineering (IEM) (A software engineering tool used in the planning, analyzing, designing, and implementing phases with integrated CASE capabilities. Uses Visio diagramming support to indicate project					

	progress)					
8	Structured System Analysis and Design Methodology (SSADM) (Used in the analysis and design phases and utilizes the waterfall method of system development. Uses the Logical data modeling, data flow modeling and entity behavior modeling techniques)					
9	Object Oriented Hypermedia Design Methodology (OOHDM) (A model-based approach for building hypermedia applications and uses a four-step process, requirements gathering, conceptual design, navigational design, abstract interface design, and implementation)					
10	Web Site Design Methodology(WSDM) (Takes the user requirements and uses them as a basis for structuring the web site and data content i.e. user-centered approach. Used at the initiation and planning stage and lays emphasis on the use of audience-driven approach)					
11	Web Modeling Language (WebML) (A visual notation for specifying the composition and navigation features of hypertext application. It uses the data model, the hypertext model, and the presentation model to come up with a website. Gives a textual representation of the web data and the general composition and navigational schemes)					

Any other (please specify)

8. Which of the tools mentioned in 7 above were crucial while undertaking the tasks below? Kindly indicate by ticking all that apply.

TASK	CPM	PERT	Gantt	Milestone	WBS	IEM	SSADM	OOHD M	WSDM	WebM L
Creating goals for the web site										
Breaking down tasks to be undertaken during the project										
Establishing information media to use (Sound, moving or still images)										
Identifying the target audience										
Establishing the site structures										
Designing the navigational schemes										
Developing the site content										
Ensuring project was within time schedules										
Managing budget allocation/avoiding cost overruns										
Ensuring user requirements were met										
Measuring and assessing objectives										

9. Are the project management tools and models valuable in managing time, cost, quality constraints and resource allocation and project progress?

	1	2	3
	Not Valuable	Moderately Valuable	Very Valuable
Time			
Cost			
Quality			
Resource allocation			
Monitoring project progress			

10. The following is a listing of perceived benefits of using project management tools and models.

Kindly indicate the extent to which you perceive them as benefits.

	1	2	3	4	5
	No extent at all	Small extent	Moderate extent	Large extent	Very large extent
Allow for better project control					
Facilitate communication among developers					
Ensures that systems meet user needs better					
Increases visibility of system development process					
Improves the quality of the system developed					
Helps to ensure that documentation is produced					
Facilitates interchangeability of developers among projects					
Increases likelihood that system will be delivered on time					
Reduces maintenance of systems					
Increases likelihood of the system being delivered within budget					

CHALLENGES

11. The following is a listing of challenges encountered during a web design project. Kindly indicate the extent to which each is faced by your institution in the web project process.

	1	2	3	4	5
	No extent at all	Small extent	Moderate extent	Large extent	Very large extent
Insufficient funding for the project					
Unrealistic deadlines					
Lack of technical skills in the project team					
Lack of project management skills					
Communication deficit between project team and stakeholders					
Rapid changes in software technology					
Difficulties in designing web content and page architecture					
Inadequate assistance offered by project management tools					
Ill defined user specification at the project initiation phase					
Frequent changes in user specifications					
Difficulties in resource planning					
More emphases laid on project activities than project progress					
Inadequate knowledge on the project management tools					

Others (please give details)

12. The following is a listing of possible problems that have been cited with respect to the use of project management tools. To what extent do you agree/disagree with each of the problems?

	1	2	3	4	5
	Strongly disagree	Moderately disagree	Neither agree nor disagree	Moderately agree	Strongly agree
High level of complexity in use					
Prohibitive costs					
Difficulty in use					
Difficulty in understanding					
High level of detail required					
Consuming too much time to use					
Not widely known by the project team					
Obsolescence					

13. To what extent do you agree/disagree with the following statements?

	1	2	3	4	5
	Strongly disagree	Moderately disagree	Neither agree nor disagree	Moderately agree	Strongly agree
The web site was developed and delivered on time					
The total cost of development was within planned budget					
The site adequately met user specifications					
Project management tools facilitated better project control					
Project management tools helped mitigate project challenges					

Thank you very much for participating in this study!!!!!!