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ABSTRACT

The web is fast emerging as the preferred form of communication worldwide and the Western world is leading in this technology. Africa, which lags significantly in this field, needs programs that help promote computer technology and the utilization of the huge resources available on the web. One solution is the establishment of programs in schools which teach students the importance of the web while equipping them with skills which will allow them to be innovative and resourceful when using it. It is with this in mind that we propose the MIT-AITI project. This 5-week project, which will be based at Strathmore College in Kenya during the summer of 2000, will link an African school to the internet and empower its students with web technology. A budget of \$13, 955 covering the various expenses for a team of 3 people is needed to carry out the project. The MIT-AITI project hopes to achieve three goals: to enable MIT students to apply their technical expertise to enable advancement of web technology in Africa; to create an opportunity for future MIT undergraduates to develop further initiatives that help society at all levels; and to create a long-term cultural and technical understanding between the MIT community and her african counterparts.

1. INTRODUCTION

1.1 Background

When we entered MIT three years ago, our primary goal was to immerse ourselves in the cutting edge technology that thrives at the Institute and then use the knowledge acquired to help society. As seniors at MIT, we believe that we now have a great opportunity to apply our technical expertise and analytical skills to achieve this goal in Africa through the internet.

In the words of Bish Sanyal, Head of the MIT Department of Urban Studies and Planning,

*“The continent of Africa seems to lag far behind, needing the kind of assistance all developing countries required in the early 1950s”.*¹¹

However, like Asia, Africa is undergoing rapid transitions on many fronts as a result of technology. Computers are increasingly being used in the workplace and in the process are revolutionizing the way business and office affairs are conducted. This surge in computer use has opened the door for the exploitation of the internet.

The internet is a relatively new phenomenon in Africa and few people know what the word means. However in major cities such as Nairobi, Cairo, Capetown and Accra, the internet is not foreign. Both the business world and the academic world are aware of it and the potential it offers. In order for current students to exploit the internet for educational applications and for future managers to exploit it as well, students in African schools must be exposed to the web and made aware of its capabilities

The idea of empowering students in African schools with web technology was conceived after observing the highly successful *MIT-China Educational Initiative (MIT- CETI)* program which uses the internet as a medium for enabling collaborative projects with Chinese high schools. With guidance from of our mentor, Professor Paul Gray (former President and Chairman of MIT and professor of Electrical Engineering and Computer Science), we have been able to follow through on the idea. The project officially started off at the 1999 IAP *MIT Leadershape Program* in which one of our members made initial contact with Professor Gray.

Through our project, which will be based at Strathmore College in Nairobi, we want to bring the latest in web technology to Africa. Depending on the results of this initiative, we hope that this project will mark the initial phase of a strong collaborative effort between MIT and the African continent. In doing this we also hope to realize one of the propositions regarding the Institute’s international strategy made by the MIT Chancellor, Professor Larry Bacow, at the 30th anniversary celebrations of the SPURS program.

1. DUSP@MIT.now Spring 1999 Pg.3

*“In Working abroad, we (MIT) should help other nations develop their educational and research infrastructure by partnering with other universities”*¹

1

1.2 What is the MIT-AITI Project?

The MIT-AITI Project is an initiative by MIT students to introduce web technology to African schools. The project will be implemented by MIT students who will use skills earned at MIT to teach in African schools. The African students will be taught how to write simple applications that utilize the resources on the web using current programming languages such as Java. The project is meant to lay a strong foundation and inspire the students and faculty to continue exploring the potential of the web.

2. CURRENT STATUS

The MIT-AITI project was conceived two years ago at the *1998 MIT Leadershape Camp*. Since then Paul Njoroge and his colleagues, working under the guidance of his mentor, Professor Paul Gray, have been trying to make the project a realizable dream. Last summer he visited Kenya to check the feasibility of the project. He visited Strathmore College, which is one of the leading mid-level colleges in East Africa, and proposed the project to the school. The school was very excited about the project and the potential it has in bringing technology to African schools. For the history of the college and its current undertakings (see appendix I).

The school understands the need for computer education, especially that which is centered in web applications. It has pledged to help us set up the project in Kenya using its facilities. The school has the necessary facilities to implement such a program. (See Appendix A). The school's administration was also very excited at the prospects of having an educational initiative coming from students at MIT. They see the project not only as helping bring technology to Africa but also as a great opportunity for future exchange and cooperation between the two schools.

The school has two main computer labs with about 40 computers each. All the computers are networked. Most of the computers run at 300 Mhz. The faculty at the school have a base knowledge of computers and are ready to learn new technology regarding the web. They do have an internet connection provided by Form-net, a local ISP. They already have a web page (**<http://www.geocities.com/CollegePark/Residence/1956/general/genindex.html>**) running and they teach HTML. The school would like us to teach the Java programming language and how to use it to create small web applications. They would also like us to help them improve their accessibility to the web by providing resources such as gateways and faster modems.

1. DUSP@MIT.now 1999 Pg.9

We are currently learning about web technology and sharpening our skills on Java-based web applications. Paul worked with Professor Lynn Stein over the 1999 summer break developing a new curriculum for teaching introductory programming using Java. We plan to use the ideas learned from Professor Stein to model our teaching curriculum in Kenya. We are also looking for potential donors who would help us with equipment such as computers, faster modems, and gateways.

Over IAP one of our members went to Kenya to further discuss the project with the school and provide them with a report of our progress. Resulting from this trip, the school has finalized the logistics of the workshop. They have made the final arrangements to accommodate us in their teaching schedules. They are also acquiring a dedicated wireless link to the internet which will enable them to have more stable web access at higher bandwidths.

We have spoken to African Online, which is a local ISP, and they have pledged to give us about \$3000 towards the project. The KLM/KenyaAirways consortium, have agreed to subsidize each person's ticket by 600 dollars based on the market prices. We are currently pursuing other potential sources of funds through the guidance of our mentor. We are confident that we will be able to meet the excess costs that will not be covered by the Eloranta fellowship.

This project would be the first of its kind and will be warmly accepted by the school as shown by the letter the school sent to us. (See Appendix B).

3. NEXT EIGHT MONTHS (October 1999 -May 2000)

The main points of focus for the next eight months are:

- 1) Reviewing the five-week curriculum that has been developed for teaching web-based applications using Java.
- 2) Developing more software and prototypes that will be used for teaching.
- 3) Fund raising
- 4) Logistics planning
- 5) Student selection

We have a tentative curriculum but it's not yet complete and it will undergo a number of revisions.(See Appendix C). We plan to develop software for teaching while searching for tools and hardware to help improve the internet connection. We are in the process of identifying companies that deal in such products. We hope by the end of this year to have acquired the necessary tools to implement our project.

4. SUMMER PLANS (May - July 2000)

Next summer we plan to spend about five weeks at Strathmore-College teaching both students and faculty how to develop simple web-based applications using Java. We plan to teach basic programming skills that will open the way for the faculty to continue in a creative manner to pass on the knowledge to students throughout the semester.

The next section outlines the main aspects of our project that we plan to accomplish while at the college.

4.1 Java Workshop

We chose to teach java-based applications because the school offers no courses in any of the modern programming languages. Java applications and applets are increasingly being used on the web and therefore they were a natural choice for us. We also have been working with Java most of the time and are therefore well acquainted with it. We plan to teach the students how to write applications that can be used on the internet. At the end of the workshop we plan for them to be able to write simple applets that can communicate with servers. This, we hope, will help steer them towards learning more about the internet and its capabilities.

Our goal is to help them realize what they can do with such knowledge. We will, during the course of teaching, show them how to create documents like purchase forms that can be submitted over the web, how to create applets that search databases and other important applications. The following table shows a tentative outline for the course:

Table 1: Proposed Course Outline

Week 1	Introduction, Expressions
Week 2	Exceptions, Objects
Week 3	Inheritance, Interphases, Procedural Abstraction
Week 4	Events /AWT, applets
Week 5	Final Project

Our teaching will emphasize practicality. We want the students and the faculty to be able to continue learning and exploring after we leave. The workshop is not difficult and we intend to teach it in a most relaxed atmosphere so as to enhance learning. The material we will teach is best learned through doing, so we plan to have lab sessions accompanying each lesson. In these labs the students will do some hands on exercises and will explore some of the concepts taught earlier in the class. At the end of the workshop we will hand out a project that will require the students to use what they have learnt to create an applet that can be used as an order form by an E-commerce firm and then process entries entered by a user. This will be a very practical use of their skills. It will help de-mystify the internet for them.

We plan to have a class of about 40 Strathmore students and an additional 10 teachers both from Strathmore and other schools. The inclusion of these teachers will help in the long term goal of disseminating information beyond Strathmore college. This will make our project have a larger impact and act as a catalyst spurring a greater interest of the Internet in the community.

4.2 Teaching, Computer and Project Management Experience

Having worked with Professor Lynn Stein over the summer, Paul Njoroge was able to acquire the necessary skills used to develop a workable curriculum for a workshop. Furthermore, Paul is a tutor in Concourse where he has been tutoring calculus for the last two years. He also tutors 6.003 (Signals and systems) for Eta Kappa Nu Society and was awarded the best tutor award for teaching.

Martin Mbaya has participated in the MIT-CETI program and was involved in teaching HTML and other web applications to high school children in China. In addition he has taught in inner city schools in New Jersey as part of the MIT Alternative Spring Break program. He has also participated in the MIT Japan program and the Brooks-Alliance High School exchange programs.

Solomon Assefa has worked with MIT's Online Consulting (OLC) group assisting the Institute's computing community with troubleshooting and general consulting on the Athena computer network. He has also tutored classes and spearheaded book drives targeted at African institutions of higher learning.

All three have significant leadership experience. Paul and Martin are both graduates of the *MIT Leadershape Program* and have served in various leadership capacities in MIT student groups. Solomon has served as the president of the African Technology Forum.

4.3 Language & Cultural Issues

Paul Njoroge and Martin Mbaya are Kenyans and thus are well versed with the Kenyan culture. The mode of instruction in Kenyan Schools is English. This means that there will be no cultural or language barriers that will hinder the teaching. Our work will be made easier because the students and faculty understand English well and read literature written in English.

5. AFTER THE PROJECT

The project's goals are not only to introduce web programming at a college level but also to create a lasting relationship between MIT and Africa. We hope that the program will be carried out annually by MIT undergraduates. Opportunities for future undergraduates include teaching other programming languages and setting up more advanced workshops in different places in Africa.

The successful implementation of the necessary computer facilities and knowledge would give Strathmore College the ability to act as a hub for internet connectivity for various high schools in Nairobi and its environs. The college would provide services at low enough rates and also provide expertise in the form of training and resource material/people. It would also provide

an ideal gateway and feedback mechanism for participants from foreign countries to be able to contribute in various ways towards the development of the web in local schools.

The project could be used as a case study both for the Kenyan Government and other interested parties on ways the web can be used in educational pursuits at the college/high school level in Africa. It would also provide a channel for other programs at MIT, specifically MISTI (MIT Science and Technology Initiative through the MIT-CETI program), the Media Lab (through the Junior Summit) and the Urban Studies and Planning Department, to internationalize their strategy in Africa. Ideally, other African nations will be able to copy the model and through MIT and other world class Educational Research institutions, the successes achieved can be spread.

We hope that like the various programs currently hosted by the MISTI program, the MIT-AITI program over the next decade can train a generation of American professionals in dealing with issues that are unique to Africa. The power of the web and MIT's strength in computing and innovation as well as its global network, provides the potential to make this goal a reality.

6. BENEFITS

The MIT-AITI project is the first project involving Africa to be self-initiated and launched by MIT students. This project will benefit Africa and MIT, as well as the students that are involved. First of all, the type of African colleges that will be involved in this project need a means to help their students gain a computer science education. The colleges face problems because they don't have people with the necessary skills, internet connections, programming books, and a good curriculum for web-based programming. Thus, the project will try to address these needs and help to solve some of these problems.

The project is a means for MIT to reach out to society. MIT is extremely well-known for its contribution to the technological advances that have led to drastic changes in the world. Most countries in the developed world have been able to reap the benefits. However, third world/developing countries have rarely gotten their share and have not been fortunate enough to be included in these advances in technology. Through the MIT-AITI project, MIT will have a channel through which to give to the third world African countries; the participants will educate students who lack the opportunity to come here and learn about computers and programming languages. They will also teach them how to use the internet and be part of the network that is bringing the world together as we speak.

The project will help the participating MIT students grow intellectually as well as personally. They will apply the computer science and engineering classes that they have taken. Also, organizing the curriculum and getting ready to teach makes students review and become familiar with the classes that they have taken. Working on the curriculum, requesting funding from different departments and offices, and organizing the whole project benefits students by teaching them about organization and management.

Moreover, the project will also help students grow personally. The MIT participants will learn how to interact with others and express themselves as teachers. They will master communi-

cation skills by preparing to teach others. The other huge aspect of the project is going to a new society and learning about the culture. Experiencing the way other people live will be an eye-opening experience for the non-kenyan MIT participants. They will learn about the culture through the students in Africa as well as through further exploration of the society. This new experience will help them find out more about themselves, nature, and the simplicity and joy of life in Kenya; in addition, it will inspire them to use their talent and become more active in helping developing countries in the struggle to catch up with the world's fast-growing technology.

Last but not least, implementing this project would help the organizers' dreams come true. We came up with the original idea based on our dream of going back to Africa to make the people aware of the technologies available and their uses. This is our effort to create a link connecting MIT with Africa through a web of technology. Seeing the project being implemented will prove to us that the initial small stride we have taken could become a huge leap for the people of Africa and indeed of the world. The help of MIT, students and sponsors will help this dream come true.

7. SUMMARY

In summary, the MIT-AITI project is a new and innovative idea. The overall goals are to enable MIT students to apply their technical expertise to enable advancement of web technology in Africa; to create an opportunity for future MIT undergraduates to develop further initiatives that help society at all levels; and to create a long-term cultural and technical understanding between the MIT community and her African counterparts.

The project concentrates the first year on teaching students in Kenya. The three MIT students involved will teach students at Strathmore College web-based programming. Contact has been established with the college and arrangements finalized for the project to take place this summer. Based on that, a five-week curriculum has been developed to be used during this period. Logistical planning has already been done from the Strathmore end and we at MIT are in the final stages of project preparation. A budget has been developed and we are in the process of raising funds. We have already raised close to half the required amount. We are also expecting hardware and software donations from corporate sponsors.

ACKNOWLEDGMENTS

We would like to thank several people whose help made this project proposal possible. They are important contributors who through their suggestions, comments and direction inspired us to come up with this document.

We are very grateful for the guidance, inspiration and direction that has been provided to us by Professor Paul Gray through all the stages of this project proposal.

The contents of these proposal have been heavily influenced by many members of the MIT community and alumni. These members have provided assistance in terms of ideas, support and criticism. In particular we would like to thank the following people: Gordon and Kate Baty, Professor Lynn Stein, Professor Bob Rose, Dean Isaac Colbert, Professor Alan J Lazarus, Deborah Ulrich, Jake Seid, Paul Gallagher, Ron Cao, Dan Hu, Andrew Nevins, Luis Ortiz, Manas, Alfred Mutiso, Timothy Mureithi. We would also like to thank the Eloranta Committee for taking time to review this proposal.

From the Kenyan side we would like to thank Strathmore College for letting us use their facilities and agreeing to host three MIT students. We would like to thank Joe Sevilla (the Strathmore College Project Manager), Mr. George Njenga and Father Paul Mimbi, who have constantly kept in touch and made preparations at the college to enable the project to take off.

There are many others who are not named but whom we earnestly thank for their various contributions.

Appendix A

Computer Hardware Information

Table 2: Distribution of Computers at the College

Lab Name	Pc # and network connection
ITC main Lab	45 PC's -- Main network
ITC Side Lab	30 PC's -- Main network
Secretarial Lab	30 PC's -- Main Network
ITC Small Lab	10 PC's -- Main network
Corporate Lab 1	10 PC's -- Isolated, peer to peer network
Corporate Lab 2	10 PC's -- Isolated, peer to peer network

ISP: Form-Net

Modem Speed: 33Kbps or 56Kbps
realistically, it is usually below 28bps

Table 3: Specifications of the computers at the college

# of Computers	Speed	RAM	Hard Drive
85 PC's(Pentium)	300MHz	32MB	3.5GB
30PC's(486's)		8MB	700MB
the rest(pentium)	200-300MHz	16-32MB	2.1GB

Appendix A (continued)

Table 4: Hardware and Software configurations

Operating System	Windows 95
Browsers	Netscape, MS Explorer
Web design packages	HotMetal 4, MS Front Page, Claris Home Page, html editors
Graphics packages	Corel, Paint Shop, Photo Enhancer, Photoshop
Servers	two NT servers, Novell 4 server, Novell 3.12 servers, CD-ROM server

Appendix B

Approval Letter from Strathmore College

The letter will be coming in over the weekend. The faxed letter the school sent us is not legible. We will drop it at the UROP office on Monday, April 3rd.

Appendix C

Curriculum

Table 5: Projected Course Syllabus

Monday	Tuesday	Wednesday	Thursday	Friday
Introduction	Expressions and Statements	Expressions and Statements	Lab Introduction	LABS
Objects/Classes	Objects/Classes	Interfaces/ Exceptions	Inheritance	LABS
Object Oriented Programming	Object Oriented Programming	Event Driven Programming	Event Driven Delegation	LABS
Communication	Communication	Servers/Applets	Servers/Applets	LABS
Project	Project	Project	Project	project evaluation

Appendix D

Budget

The airfare from Boston to Nairobi costs approximately \$1800 per person. In Nairobi we plan to be staying at a guest house for \$60 dollars a night. Transportation from Strathmore to the guest house in Nairobi will cost about \$2 per person per day. Food is estimated at fifteen dollars per person per day. We have also included miscellaneous costs; this covers things such as airport taxes, service fees etc. The total budget is approximated for a duration of five weeks for three people.

	Cost \$	No. of People	No. of Days	Total \$
Round-trip airfare	1,800	3	-	5,400
Hotel	60	3	35	6,300
Food	15	3	35	1,575
Ground Transportation	2	3	35	210
Miscellaneous	4	3	35	420
Travel Visa	50	-	-	50
			Total	\$13,955

We are looking for funding to cover for the above costs. We already have, as mentioned in the main report, initiated talks with KLM/KQ to get subsidized airfare for the participants. We are in the process of talking to corporate sponsors. Some of them like Africa Online, have already pledged funding for the project. (More detail is given in the report).

We are depending heavily on the Eloranta Fellowship and donations from corporate sponsors to provide the bulk of our funds.

Appendix E

Background

Solomon Assefa

Solomon Assefa is a senior doing a double major in Electrical Engineering and Computer Science and Physics. He is involved in social activities such as the Africa Technology Forum and the African Students Association. Ultimately he intends to go back to Africa and teach in universities, as well as help in technological advances.

Martin Mbaya

Martin Mbaya is a senior majoring in Mechanical Engineering and concentrating in Japanese. He is also a graduate of Strathmore College. He has carried out projects in China and Japan under the MISTI program and the MIT Japan program respectively. He is also a member of the MIT African Students Association. After leaving MIT he hopes to work in the technological and educational fields. In the long run he hopes to work on joint projects between Africa, the United States and Asia with the goal of promoting technology transfer and cultural awareness among these regions.

Paul Njoroge

Paul Njoroge is a senior majoring in both Math and Electrical Engineering and Computer Science. He is also a graduate of Strathmore College. He is a member of the African Technology Forum, the MIT African Students Association. After leaving MIT he plans to use the knowledge gained in MIT to initiate social engineering projects that help improve the lives in developing and poor nations of the world.

Appendix F

Map of Strathmore's Location In Nairobi.

Strathmore is located about 15 minutes away from the city centre. The map above shows the location of the college with respect to that of downtown Nairobi -(City Centre) as shown on the map. The area is surrounded by suburban houses and is one of the safest places in the city. It is easily accessible and there is an adequate transport network.

APPENDIX G
Strathmore Lab Photos;

Above is a photo of one of the computer labs in the college.

APPENDIX H
Strathmore Lab Photo

The above photo shows another computer lab within the college.

APPENDIX I

HISTORY

Strathmore college was founded in 1961 and started as an A-level college. In 1966 the college admitted its first 25 students to begin full-time. Accountancy studies leading to the UK-based Chartered Association of Certified Accountants. The school gradually expanded to offer an O-level section in 1977, evening courses in 1982, and a primary section in 1987. In the late 80s, the Trustees made a request to the Kenyan Government which donated 5 acres of land on Ole Sangale Road, Madaraka Estate for the construction of a new campus to house the college. The European Union (EU) and the Italian Government agreed to back the Madaraka campus project whose construction started in September 1989. In January 1991, the Information Technology Centre was started in the Lavington campus to run computer courses leading to the Institute for the Management of Information Systems (formerly Institute of Data Processing Management) Diploma and Higher Diploma. In January 1992 a Distance Learning Centre was opened to offer correspondence courses in Accountancy. The college moved to the new campus in Madaraka Estate in January 1993. The complex comprises the school of Accountancy, the Information Technology Centre, the Distance Learning centre and the school of Administration and Management.

CURRENT STATUS

Strathmore college is fully private and keeps strong links with commerce and industry both in the private and Public sector in Kenya and Uganda. The current student population at the college is 2,200 and there is an alumni base of over 7000 students. The college is owned by the Strathmore Educational Trust, a non-profit charitable organization. The governing council is appointed by the board of Trustees, exercises control and determines policy. The day to day running of the college has been entrusted to a Management board appointed by the Governing Council. The aim of the college is to provide an all-round education in an atmosphere of freedom and responsibility. Admission to the college is granted to all deserving students regardless of their background. The academic calendar comprises two 17-week semesters for accountancy (CPA/ACCA) and computer (IMIS) courses and two 3-week Block release sessions. The college runs a scholarship fund and is in contact with many local and international organizations sponsoring its students to its courses. About 8% of the student population of full-time courses enjoy some kind of bursary assistance.