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CODEREPO: A LOCAL ONLINE REPOSITORY FOR SOURCE CODES AND COMPUTING RESEARCH PROJECTS

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ABSTRACT
Open Source Software are fast becoming popular and threatening to overtake the conventional commercial applications. The convenience offered by open source applications is ease of access, learning, download and vast communities of users who collaboratively and instinctively help other users solve issues while using software. Technology enthusiasts, practitioners, programmers, software engineers and even end users with minimal computer literacy find it easier to try out a software without the restrictions of time that come with trials of commercial software. Improving on open source software is key towards the viability of that product in the market as it progresses in time in the ever dynamic IT industry. The proliferation of users on a web-based version-control and collaboration platform for developers such as GitHub is evidence enough that even modern age software developers have moved from re-inventing the wheel by coding from scratch to forking repositories to have a starting point for their own ideas. A local repository for source codes would help local developers be more efficient in their software projects, save time on completing them and also share ideas with other like-minded developers that would help solve specific local problems or use technology to bridge gaps as well as avoid redundancy in terms of starting out on a project that has already been done by another developer and ultimately attain sustainable development. CodeRepo is a web-based repository that allows local developers to deploy a localized repository to register and post links to their code repositories or create one as well as have a forum to network local developers.
Keywords: *Open Source, Localized, Networking, Software Development*

INTRODUCTION
Libraries are filled with books and theses, there is even proliferation of books, theses and research materials in digital form disseminated in form of institutional repositories. Source Codes from open source software as well as commercial software are also being kept in such a similar manner. The only difference is that book versions do not change rapidly as source codes hence they cannot be stored and disseminated in such a similar manner. Let us clearly put the terms repository, software repository and source code repository into perspective before delving any deeper. A repository refers to a central place where data is stored and maintained. It can be a place where multiple databases or files are located for distribution over a network, or a repository can be a location that is directly accessible to the user without having to travel across a network. [1] A software repository is a storage location from which software packages. These packages can be accessed and installed on a computer. Whereas, a source

code repository is a file archive and web hosting facility where large amounts of source code for software, but also for web pages are kept, either publicly or privately. They are also often used by open source projects and multi-developer projects to handle various versions. [2]

This paper aims to explain the concept of open sourcing source code and software combined with linking them to a one-stop shop repository that undergoes multiple redundant backups and acts as a central source of computing research projects that are churned out locally by professors, lecturers and especially students. Open Source is the term that is used to denote software whose source code is freely available and accessible to anyone for assessment, enhancement and/or modification. Source code is the section of software that is normally available only to the persons who developed the software. It is the part that programmers manipulate in order to change how part or whole of the program works. [6]. The paper is a concept which can be implemented as a platform or portal to solve the multi-faceted needs of a developer and researcher in the computing field.

Motivation

Each and every year undergraduate students and researchers come up with noble pieces of software as well as concepts for great software such as the one explained in this paper. But they are just kept or stored haphazardly or using 'stone-age' methodologies of burning them onto Compact Disks (CDs) and Digital Versatile Disks (DVDs). This may have worked well a decade ago but the computing universe is dynamically changing and at a rapid pace and institutions of research and higher learning need to play catch up or else they will just be churning out graduates with multi-million ideas but end up gathering dust somewhere as they trek looking to be employed. Globally there are several top source code repository hosts such as Bit bucket, Cloud forge, Source Forge, Launchpad, Google Code, Assembla, Codeplex, Codebase just to name but a few. [3]

The M-PESA innovation which is a novel Kenyan idea [4] where cash is sent and received through mobile devices are just but a drop in the ocean of ideas that Kenyan software developers have. As at August 2013, the number of users on GitHub that listed themselves as located in Africa was 4,527 out of roughly over 3,850,000 users on GitHub then with Kenya accounting for 9.75% of the GitHub users then. [5]. Considering that GitHub is one of the most popular source code repository and version control systems that would be a warring statistics considering that was Africa alone. According to a study done in 2015, the number of users on Facebook in Nigeria and Kenya alone was nearly 20 million with Facebook posting 20% growth in the number of users from 100,000,000 users to 120,000,000 users over a period of one year. Nigeria boasts of 15,000,000 active monthly users, South Africa has 12,000,000 and Kenya 4,500,000 with 95% of those numbers accessing their profiles using mobile devices. By analyzing the percentages alone this means that Africans are spending a significant amount of time on the web, the question of constructive web time is a whole research topic in itself. [6]

Through these numbers we can infer that this concept is feasible because each year the number of IT graduates from several Kenyan universities who come out to seek employment especially in Kenya's silicon valleys can be employers by their own right as the field requires novel ideas and well-articulated software proposals, implementations and documentation.

SYSTEM DESIGN

A. Case Scenario

To demonstrate the workability of this concept, consider the following case scenario. A Computer Science student is required to actually come up with a novel software as part of the undergraduate and in some cases postgraduate degrees. In the present scenario:

1. A student comes up with a software proposal which he/she presents to the supervisor.
2. The supervisor analyzes the proposal and if he/she deems it fit for implementation allows the student to do further research and subsequent implementation of the same.
3. The supervisor periodically checks the students' progress on the student's computer and provides advice where necessary on the features to add or remove.
4. Upon successful implementation, the supervisor allows the student to come up with appropriate documentation for the software the student has developed.

5. The student then presents his/her work to a panel of lecturers for assessment.
6. After successful completion of presentation and submission of pre-requisite documentation and the software written onto a disk as evidence of work done the student can graduate.

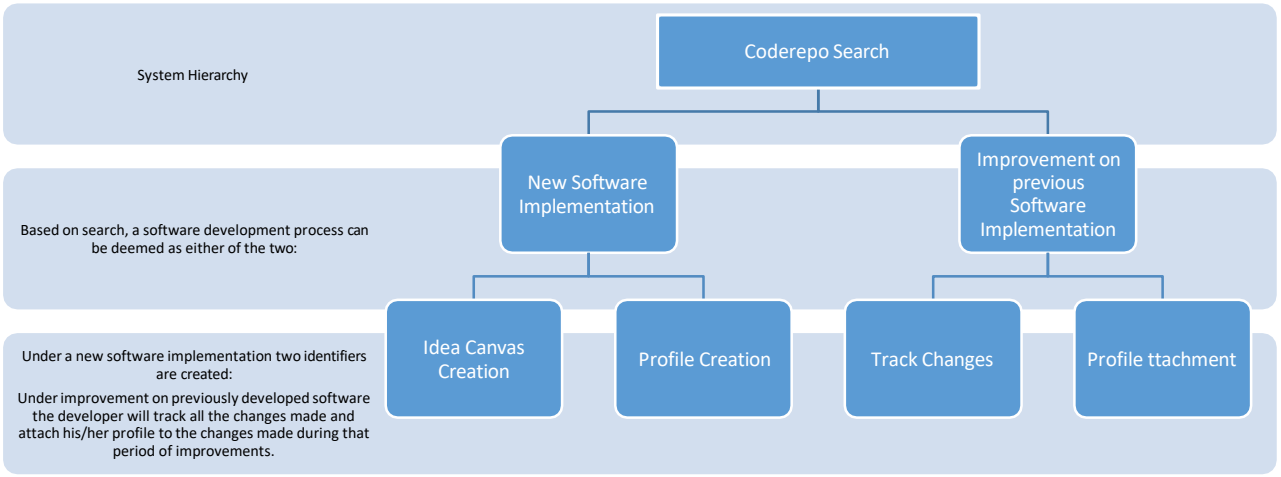
If a CodeRepo had been implemented in an institution the steps would be:

1. A student searches against various local source code repositories to check whether his/her idea has already been thought of by another researcher and/or implemented by a developer.
2. If the idea is new and unimplemented, then he or she can come up with a software proposal for the same, the supervisor analyzes the proposal and if he/she deems it fit for implementation allows the student to do further research and subsequent implementation of the same and come up with a new page on the repository as a canvas for implementing the new idea.
3. If the idea is found to have already been implemented, the student can suggest a significant improvement to the idea and hence be allowed to come up with a newer version of the code in the repository whilst maintaining the older version and under supervision
4. Upon successful implementation, the supervisor allows the student to come up with appropriate documentation for the software the student has developed and upload them together with the code that was being incrementally added onto the repo.

B. Tool Design

The CodeRepo can be initially implemented as a secure web-based database for all local software developed by an institution coupled with links to the source code repository that hosts the particular software and has the profile details of the developer who initially developed the software. This would be similar to a digital institutional repository that host the theses for all post graduate students from a particular department, faculty or institution. The next phase would actually be implemented the features of a source code repository host which are development tools, track and review changes, version control, comments on code, issue tracking, collaboration and discussion forums.

C. Hierarchy Chart Design



SYSTEM MERITS

1. *Incremental Software Portfolio Creation*
   CodeRepo users will be able to continually exercise their software development skills by not only completing a number of software projects but also improving on previously created software and attaching their profiles to it.
2. *Standardization of Software Development and Improvement Processes*
   By involving all stakeholders in the sector, privacy policies, code submission policies and code improvement policies can be development to ensure that students adhere to the standards in the software market even before they are inducted into to it and this will ensure a steady and hassle

free transition from the learning environment to the software development market.

3. *Save on Development time through code Sharing*
   By implementing CodeRepo, users within the platform will share code, get to find more efficient code than they have and eventually avoid reinventing the wheel and save on crucial development time especially on time sensitive software development projects. Users will also be able to collaborate through forums and chat widgets thus help each other solve problems and bridge the gap.
4. *Avoidance of Redundancy in Software Development*
   Just as plagiarism is a menace in other areas of education and writing so is redundancy in software development since there is no economic and intellectual gain in creating a solution that is already there. Therefore, the only brilliant move would be to improve on it significantly. Since CodeRepo would allow students and supervisors to search through software titles on software developed in institutions of higher learning and in software development companies, it would save developers from turning into what is termed in hacking as script kiddies to adding value on current software since the only acceptable redundancy is in data back up and fault tolerance.
5. *Global Availability of Code*
   Imagine being able to access source code from any device and also an online backup of what is available on the computer on which the software is being developed. Developers have been at times devastated when all their work goes down the drain due to computer crashes and power failures. But having CodeRepo integrated to popular Integrated Development Environments as a plugin would allow developers and researchers to come up with software programs and concepts that are available even when they are on the move.
6. *Ease of seeking funding*
   Through inclusion of all stakeholders, developers would not have to travel to major cities to seek startup funding, seed funding or any other kind of funding since the investors will be onboard and all they would have to do is do a search on software projects related to the area in which they provide funding, analyze its feasibility and contact the developers who create and improve on the software or research to do an online or a face-to-face pitch for funding.
7. *Ability to sustain long-term software development and refinement*
   It would be much easier to initiate students and researchers into collaborating in long-term software development without necessarily having to group them together and placing them on a short-term crash course on software development as a team. Computing researchers and developers are more likely to gel and develop chemistry with one another on a long-term software development and refinement process than in a short one. CodeRepo would facilitate a platform for such endeavours.

IMPLEMENTATION CHALLENGES

1. *Change Acceptance*
   For the success of any project especially in software development, user acceptance is key to determining the growth and success of the project. As more users get into the platform and reap the benefits that is when it would be easy to initiate change in the way the software development process is done locally. Developers are more inclined to following their intuition and drive rather than a set of standards.
2. *Copyright and Patent Issues*
   Developers and researchers would want to clearly state that any developer who would wish to copy part or all of his/her code to seek permission and acknowledge him/her as the owner of the code. This would be easy in a theoretical writing setting but what happens when the code is copied and the software is packaged in a different user interface and sold? These would deem as a non-issue for open source software though since the developers have allowed any one to copy and improve on the code.
3. *Funding the CodeRepo implementation process*
   It is evident that such a project would be enormous and would require a group of developers on a full time basis to continually update the platform, track issues and bugs and ensure that search algorithms work perfectly. Budgeting for developers, space, internet and such would require funding and thus cannot be implanted without funds.

CONCLUSION

There are many brilliant ideas that may or may not have been implemented, performing a search on a search engine would not necessarily do a search on the minds of every developer out there. Thus a platform on which developers can bring their ideas to life would be such a life saver and ultimately help in achieving Sustainable Development Goals. It will incline developers and researchers towards thinking of the local challenges that are there and using totally new or globally implemented, tested and proven methodologies to create sustainable solutions for a better future.

Strength in unity and key in diversity is what CodeRepo is pegged on. Collaborate in software development to achieve more and be unique in your own way and let other researchers and developers help refine your idea and aim it towards the 'bull's eye' of success. There is no need to recreate what has been already implemented, the real need is to customize it to solve the local problems and challenges. Kenya is a hub of innovation as a whole and there are a lot more 'innovation hubs' in the minds of young enterprising citizens ready to be tapped than in office spaces which are limited to physical locations. Therefore, ideas with such great potential require a global platform on which they will be nurtured to grow and ultimately spur Kenya and Africa towards sustainable development.

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