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Development Of MVC-Based Social Networked Journal Management System With Secured Deep-Link Access Mechanism

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Abstract— **In this paper, a Model View Controller (MVC)-based Social Networked Journal Management System with Secured Deep-Link Access Mechanism is presented. The MVC-based journal management system with secured deep-link access mechanism is focused on addressing the limitations of the existing systems, namely; inconveniencies of accessing article status by the authors after submission, accessing review invitations by the reviewers, inefficient real-time notification system and ineffective collaborative and knowledge sharing platform. In effect, the journal management system with secured deep-link access mechanism is designed to be more user friendly, foster collaborations and provides more convenient access to required resources through secured deep-link mechanism. The system was developed using ASP (Active Server Pages) .Net Core 3.1 framework, CSS, HTML, VueJs framework and Microsoft SQL (MSSQL) server database hosted on an Internet Information Service (IIS) server. An Iterative-Incremental Software Development Model (IISDM) was adopted. The use of MVC architecture help decoupled the application into layers of abstractions, making the system more scalable, maintainable, modifiable and SEO (Search Engine Optimization) friendly. The deep-link mechanism provides a context-based direct access to submissions and peer-review invitations. From the comparative evaluation of the user acceptance tests result, it was observed that the new system has demonstrated the ability to considerably improve work efficiency by providing easier access to submissions by authors and quicken peer-reviews by the reviewers through the use of secured deep-link mechanism, improve information timeliness using Short Message Service (SMS), Email and in-app notification system and provided an in-built social network services – the discussion forum that response to the growing need for collaboration and knowledge sharing between the journal users.**

Keywords— Journal Management System, Model View Controller (MVC), Access Mechanism, Secured Deep-link, Social Network, MVC architecture

I. INTRODUCTION

Developments in information and communication technologies (ICTs) have impacted positively on all domain of human endeavor, including teaching, learning, and research [1,2,3,4,5, 6,7, 8,9, 10,11,12,13,14,15 ,16,17,18,19]. These developments have remarkably influenced industries, private and governmental organizations to advance their web presence and services leading to emergence of several online applications and systems including journal management system [20, 21,22,23, 24,25,26, 27,28, 29,30,31,32]. Journals and conferences constitute the current vehicles of new ideas, information, and breakthroughs in scientific development [33]. They have been used in academic and scholarly works for decades solely as a most important means of disseminating current, relevant, and reliable research outputs [34].

Several electronic publishing systems also known as journal management systems have been designed and developed in the past decades, some as commercial applications usually offering premium or freemium models, others are available as open-source or bespoke solutions [35]. Also, some have been developed as a Software-as-a-service (SaaS) solutions leveraging on the cloud infrastructures [36]. Journal management system covers the whole process of journal publishing from manuscript submission through to final publication enabling each

participants of process such as author, editor, reviewer, editor in chief, and administrator perform their responsibilities efficiently. Notably, many authors have agreed that these systems are designed with the aim of addressing the complexities, administrative workload and other time-consuming processes inherent in the traditional publishing model which requires significant prior investment in time and personnel technical expertise, thus, serving in switching the focus of the publishers more onto the quality and novelty of the journals themselves and addressing the challenges of providing global discernibility of research outputs [36,37,38,39]. Although journal management systems at different levels have proven to lessen the difficulties, overheads and workloads associated with the classical journal publishing, some core features of a modern day system are still lacking such as SMS to supplement email notifications, in-built social network services that response to the growing need for collaboration and knowledge sharing between the journal users - editors, reviewers, authors and intending authors, and quicker means of accessing submission statuses by authors and accessing review invitation by reviewers.

This research focused on addressing the inconveniencies of accessing article status after submission by authors, accessing review invitations by the reviewers by employing the secured deep-link mechanism, inefficient real-time notification system by supplementing email with SMS and ineffective collaborative and knowledge sharing platform by incorporating a discussion forum.

II. RELATED WORKS

Model-View-Controller (MVC) is an architectural software pattern conceived by Trygve Reenskaug while visiting the SmallTalk group at Xerox Parc in 1970s [40]. It is probably the most well-known software development pattern and it's widely used to create 'data-intensive' online applications [41]. MVC architecture is made up of three parts: Model (business layer), View (presentation layer) and Controller (control layer). The model is in charge of the application business logic and all data-related tasks such as data validation, data persistence and data retrieval, the view represents the frontend or graphical user interface (GUI) which serves as the output for the model component and the controller manages the exchange of data in the form of requests and responses between the model and the view, manages events which can be triggered by the user or system process, etc. These parts allow for separation of concerns which not only simplifies the process of developing complicated applications but also helps to organize the data and code, encourages code reusability and enhances application maintainability and security [42].

Several studies have been conducted on this subject by a number of researchers. As a result, in light of the topic being covered in this paper, a number of research papers were reviewed generally in the areas of MVC-based software systems for journal management and journal management software systems which are based on the classical software development patterns". In any respect, research gaps in the current works were found, and these were discussed.

A. MVC-based journal management systems

First, a study by Bhattacharyya [43] presents a double-blind peer review web-based data management system for scientific electronic journals that provides support to all participants in the journal management process including authors, editors, reviewers, and other editorial staff. Here, an MVC architecture provided by a PHP framework CodeIgniter was used to implement the business logic and MySQL was used as the persistence storage. In addition to automating the publishing process, their system incorporated an automatic mechanism for publishing hard copies of the proceedings by combining vetted papers for a given issue, adding a cover page, generating and adding a contents page, and paper and author indices. However, no mechanism was provided for easily accessing submission status by the authors. Unlike the issues to be addressed in this paper, a social network feature such as the discussion forum was not incorporated in the system.

Another study by Siddiqui et al. [38] presented MVC-based automated software system for journal management targeted for the academia and industr. In their study, Laravel an MVC-based PHP (PHP: Hypertext Preprocessor) framework and JavaScript were used to developed the system and hosted on an open-source server XAMP (cross-platform, Apache, MySQL, PHP and Perl). The data generated by the system was stored in a MySQL database. Their work was able to meet the objective of dealing with the challenges of classical journal publishing by replacing the manual and semi-automated processes with a fully automated processes. However, the work did not factor in a secured and more convenience way of accessing submission status by the authors and reacting to and/or completing peer-review invitations by the reviewers without having to go through login process.

B. Journal management systems using other software development patterns

A study by Malami et al [44] presents "Implementing Online Submission and Publication for Journal Systems" aimed to use the computer's powerful ability to tackle the various issues that the existing manual system of journal and publication procedures faces. In their work, the user interface was designed with HTML, Cascaded Stylesheet (CSS) and JavaScript. Raw PHP or traditional pattern of software development was employed to implement the server-side logic riding on the data provided my MySQL database management system and hosted on an apache server. In their work, they were able to achieve numerous benefits such as automation of the submission process, review process, publication process and online payment system. However, their did not incorporate social network services such as discussion forum and authors and reviewers had to go through the regular authentication procedures before accessing their submission status or peer-review invitations.

Auto-responder SMS notification system was incorporated by Ekanem [45] in his work "Development of Web-Based Automated Journal Management System for Akwa Ibom State University". Here, a Participatory Incremental Process (PIP) model was adopted and the system was developed using PHP, CSS, Java Script, HTML, MySQL, Asynchronous JavaScript (AJAX) and was hosted locally using WAMP servers. The SMS notification supplemented the regular email notifications and was triggered in response to certain activities on the system such as manuscript submission, payment notification, manuscript assignment, peer-review recommendations and final

editorial decision. Apart from automating the entire publication process from article submission, online payment, through to publication, his system was able to facilitate easier tracking of processes and activities by the system stakeholders. However, the work did not include collaboration platform that enhance knowledge and information sharing among the journal participants and the general research community.

Deep-Linking

Deep linking originated from the context of search engine optimization (SEO). Deep-linking is a technique used by search engines to crawl web pages and map search results to appropriate landing pages. According to Brindle [46]. "As an SEO strategy, deep linking allows site users to more easily find the specific content they're looking for while simultaneously improving a website's relevancy in search engine results by connecting keyword-rich hyperlinks on one interior site page to keyword-rich content on another internal page". In a deep link, the URL is embedded in emails, SMS, notifications, etc. and contains all the information needed to point the user to a particular item hence providing a high-quality experience to the user that needs to quickly access a particular application or website in order to complete certain tasks or view certain data. However, deep-link security is worthy of note, however, thanks to domain name server (DNS), which ensures the deep link's uniqueness, preventing or lowering the possibility of hijacking. Albeit this, anyone with access to the link can have authorized access to the information thereby leading to information disclosure.

III. METHODOLOGY

The research conducted in this work entails the design and development of an MVC-based journal management system which incorporate discussion forum, SMS notification sub-system and a secured access mechanism using web deep-link. An iterative-incremental software development model (IISDM) is adopted for the development of the journal management which guarantees quality by integrating testing throughout the lifecycle and enabling regular inspection of the working product as it develops thus leading to early identification and resolution of issues. High level requirements were gathered, elicited using the use-case approach and the observational technique. From the requirement analysis, the users of the system are classified into six group or roles such as the reader, author, reviewer, section-editor, editor-in-chief, and admin as shown in Figure 1 with their respective access rights.

The system implements two types of access controls: Role-Based Access Control (RBAC) and Attribute-Based Access Control (ABAC) of which the former is applied across the user groups and the latter through the discretion of the administrator or Editor-In-Chief. The system functionalities were decomposed into nine core modules viz; reader, authentication, author, admin, reviewer, editor, notification, and forum.

Reader Module: This module handles unauthenticated (visiting) users of the system. These users can search, view, read and download published articles on the system.

Authentication Module: User authentication and authorization is provided by this module. This module is build atop ASP.Net core 3.1 role-based identity management service which makes the system extremely secured.

Author Module: Registered users who have confirmed their email address are automatically placed in the author group and are entitled to a lightweight dashboard where new article can be submitted, and status of the previously submitted articles can be access.

Reviewer Module: This module enables reviewing and giving comments/recommendation to an assigned manuscript. In order to become a reviewer, a normal registration as authors is needed, then the user is required to apply as a reviewer, upon confirmation by the editor-in-chief, the reviewer is then presented with their private dashboard. The dashboard has features which enable the reviewer to carry out the peer-review assignment effectively.

Editor Module: This module is specifically designed for editors and the editor-in-chief to manage the journal. Editors need to register on the system similarly to reviewers and be approved by the editor-in-chief.

Much the same as other two modules, editors have their own dashboard but with a wider range of functionalities. The editor dashboard allows editors to received submitted manuscript, assign and manage the reviewing process, take final editorial decisions on reviewed manuscripts, manage editions/issues and publications.

Admin Module: This module enables the admin user to manage the journal information and settings such as altering the predefined e-mail content, and management of deadlines, etc. The contents of some HTML pages on the journal website are supplied from the database so administrator can easily modify those contents as required.

Notification Module: In this module, events triggered by system, submission/review deadlines, and other actions are handled and appropriate notifications sent to the user through email, SMS and in-app notifications.

Forum Module: The forum module handles all the activities on the journal discussion forum. Activities such as displaying the different topics and their respective threads, enabling users to respond to threads and the thread creator to mark response as solution to their questions or issues.

Figure 1: A use-case diagram describing the interaction of the users on the system

A. System Flowchart

The flowchart of the system editorial process is shown in Figure 2. The editorial process commences after manuscript submission by the author.

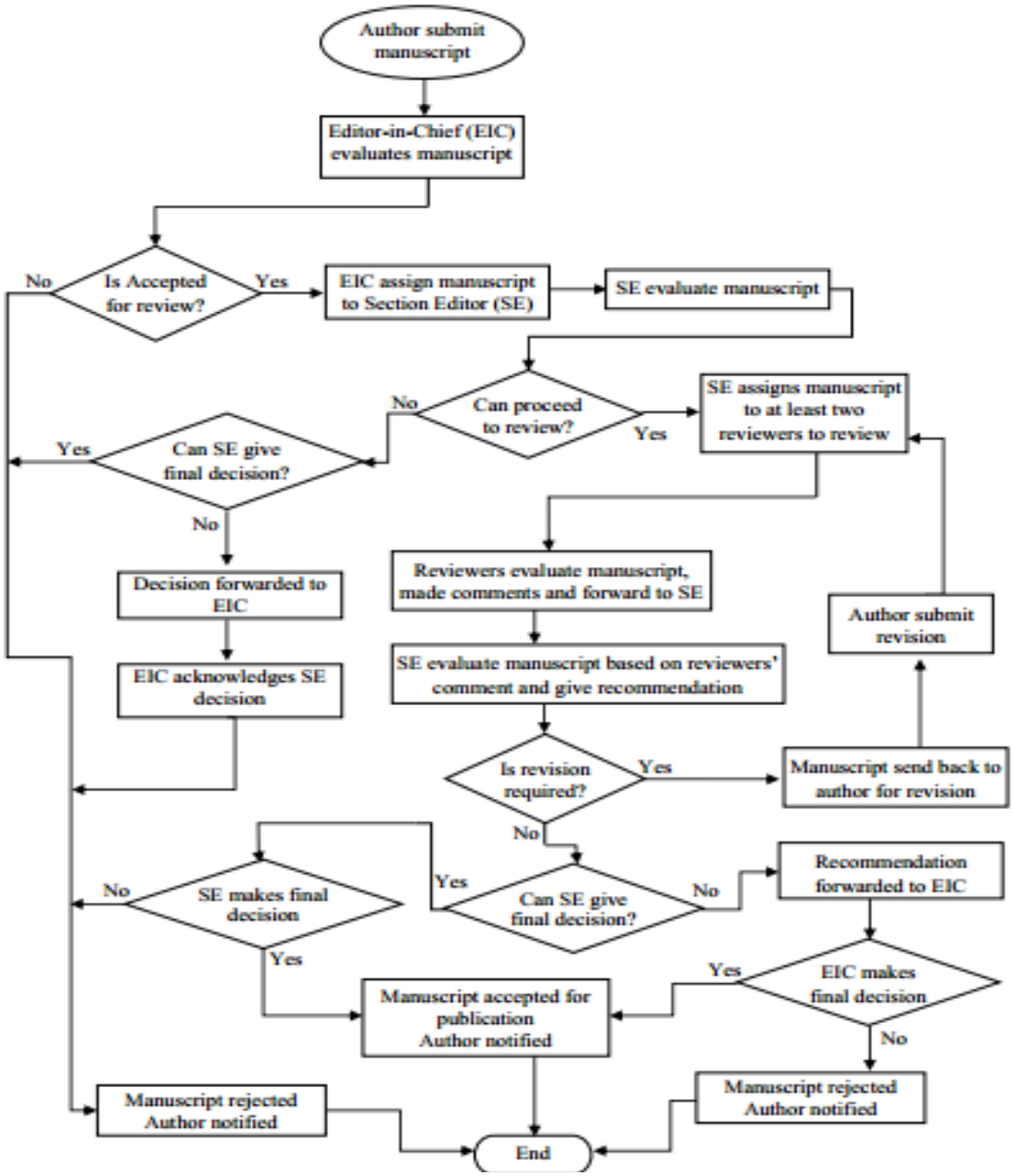

Figure 2: System editorial process flowchart

The author and the editor-in-chief (EIC) are notified through email and SMS. The EIC is required to perform initial evaluation of the submission, reject outrightly or accept for review. After it has been accepted for review, the EIC assign one or more section editors (SE) to preside over the peer-review process. SE in turn assign at least two reviewers who return the manuscript with comment to the SE after evaluation. The SE evaluate the reviewers' comment and depending on the outcome may recommend revision from the author or forward the manuscript back to the EIC for final editorial decision (accept or reject). Depending on the discretion of the EIC, SE may be permitted through RBAC or ABAC to take final editorial decisions on manuscript assigned to them. Manuscript accepted and scheduled in an issue are published immediately if it was scheduled in a back issue or published along with the issue if scheduled in a future issue. At each point in the process, the participants are duly notified through email, SMS and in-app notifications.

The IISDM enables each of the modules to be develop incrementally and for each of the increments, the software development life cycle (SDLC) phases – requirements, analysis, design, build and testing are iterated. The product of the increments is then integrated and integration test performed to ensure no part of the system got broken during the integration.

B. Discussion Forum

The discussion forum consists of difference forums which are created by users which the right permission for discussions on specific subject matters or disciplines. Users can ask related questions or open new threads in each of the forums as well as engaging in an existing discussion by replying to the appropriate threads.

The discussion forum is designed in such a way it rewards and promotes active participation, asking and

answering clarifying questions, and providing a central location for all types of cooperation and interaction. Badges and points are awarded to users whose reply have been marked as answer or solution to the original question or issue.

C. Deep-link Access mechanism

Deep-links are generated and send in an email when author has successfully submitted his/her manuscript for review and also when a reviewer is assigned to peer-review a particular submission. The deep-link flow for an author is depicted in Figure 3.

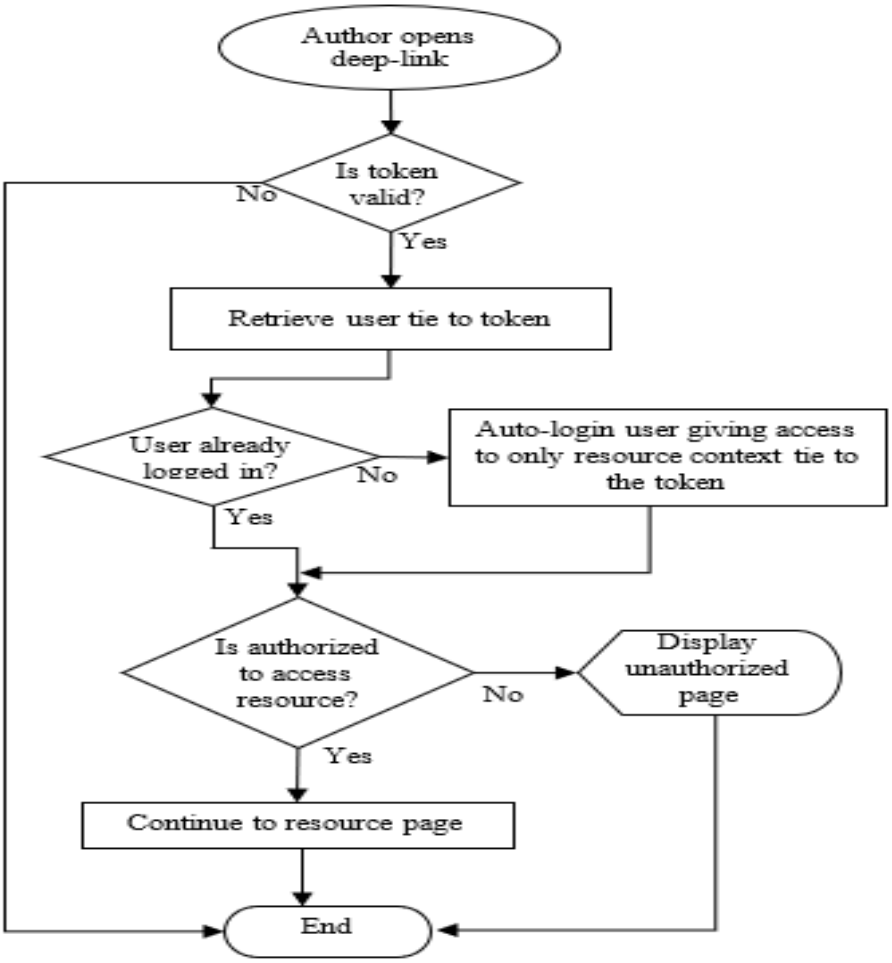

Figure 3: Deep-link flow

Similarly, reviewers receive deep-link whenever they have been invited for per-review. In the case, of the reviewer, the deep-link cease to function once the reviewer has submitted his/her comments. Authors and reviewers has the choice of accessing their submissions and review invitations through the deep-link or from their respective dashboards. In order to reduce the chances and the impact of threat associated with deep-linking, the deep-link generated by this system is secured with an encrypted token. The token is encrypted and decrypted on the server with a dynamically generated encryption salt hence making it tamper proof. The token contain reference to resources that are to be accessed with the link and the system is designed to block access to other resources not tie to the token.

The entire system is developed with an open source ASP.Net core 3.1 framework. C# is used to implement the business logic; data access layer is based on the Entity Framework (EF) core and persistence storage using MSSQL server express edition. The user interface is designed with HTML/CSS, Razor templates and Vuejs JavaScript framework.

IV. RESULT

An MVC-based journal management system was build which incorporate journal discussion forum and deep-link access mechanism. The fully functional system was deployed on an IIS server. The home page is shown in Figure 4.

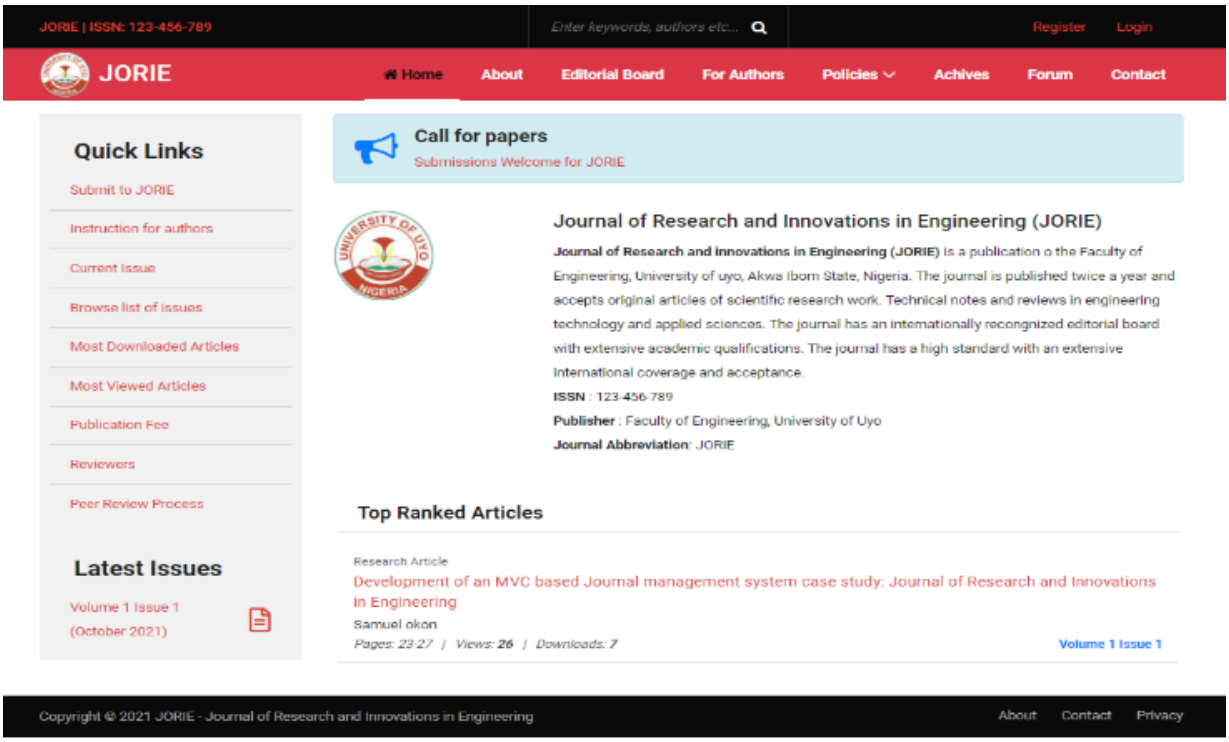

Figure 4: Journal system home page

The system automates the editorial and publishing process right from manuscript subscription through to publication and edition management with an appreciable level of system usability, friendliness and flexibility hence shifting the focus of the editors and reviewers more into research quality and novelty. On manuscript submission, acknowledgement notifications (SMS and Email) are sent to the author and deep-link is generated which enables the author quicker access to submission without need for authentication procedures. Similarly, when an editor invites reviewer for per-reviewing, deep-link is also generated which enables the reviewer direct access and to act on the invitation without authentication.

In Figure 5 is shown the deep-link embedded in an email sent to an author after manuscript submission. When the deep-link is clicked, it directs the user to the deep-link controller which function as a reverse proxy performing some operations such as token validation, user mapping, auto-login, access control check before redirecting the user to the right resource page. At the end of these process, the user is granted an access right to the resource (submission) page. In the case of an author, the access is read-only but for reviewers, a popup is shown at the point of review submission requesting their password. These checks are put in place to ensure that the user accessing the system through the deep-link has a valid token and can access only the resource the token was generated for hence preventing using the same deep-link to access different submissions on the system.

In Figure 6 is shown the journal discussion forum landing page. Here authentication is required to access the forum. Different forums can be created on different subject matter and managed effectively by the system. This saves the younger authors and other users unnecessary stress as it provides the enabling environment to collaborate, share ideas, and learn, and also makes the work easier for journal managers as one answer to a question is available to all unlike when such was done using email where the journal managers would have to repeat the same answer severally as response to different email enquiries.

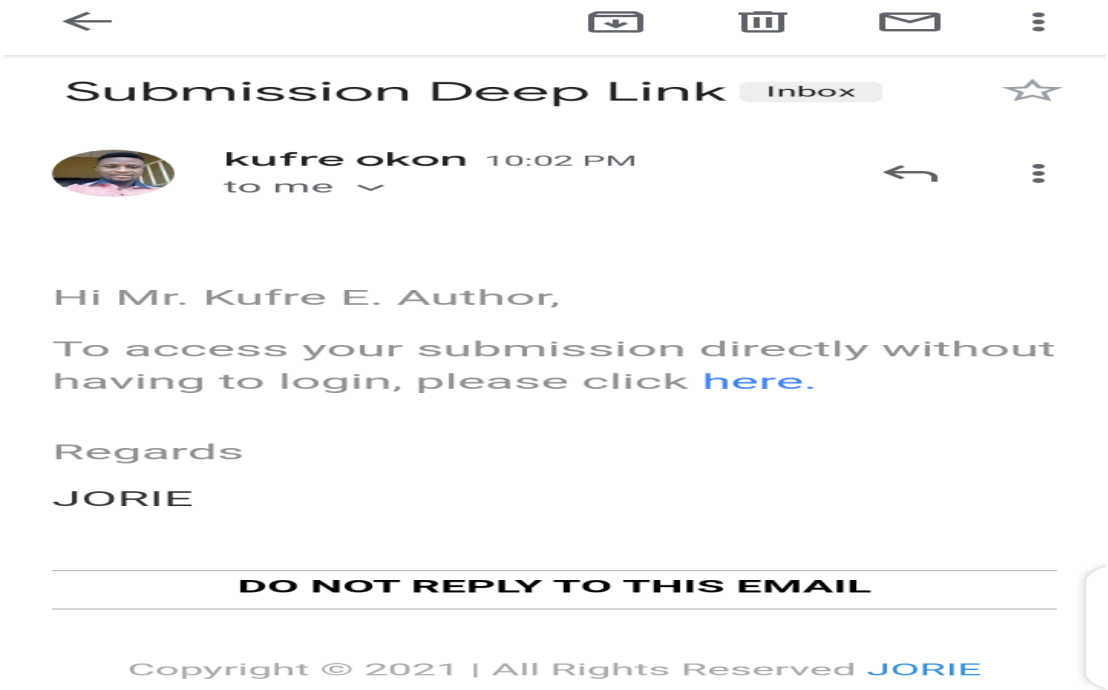

Figure 5: Deep-link embedded in submission email

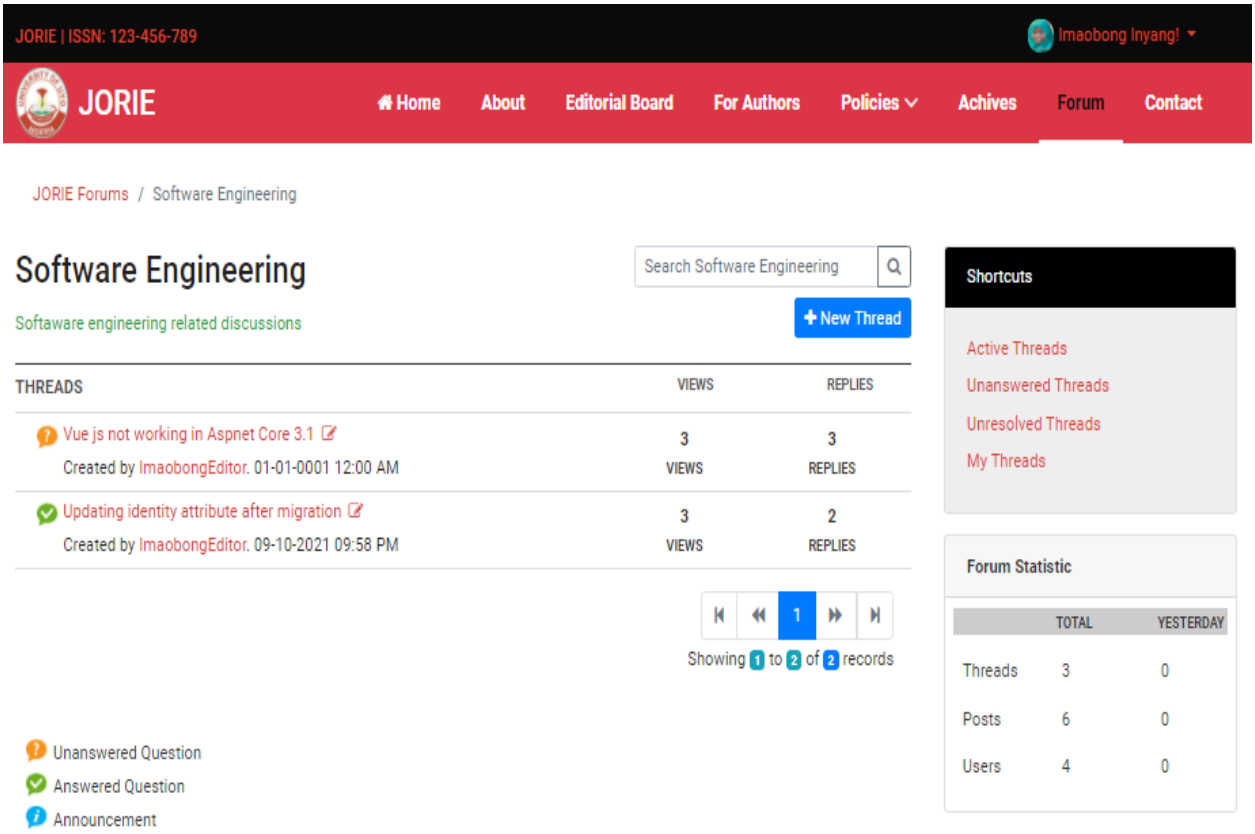

Figure 6: Journal Discussion Forum

V CONCLUSION

Researchers and journal managers use journal management systems to submit and process research publications, respectively. This work is set to address the bottleneck associated with accessing the status of articles submitted by the authors, performing peer-review

assignment by the reviewers, inconveniences of accessing notifications through emailing system, unavailability of integrated platform for discussion and knowledge sharing within the research community. The first objective which is to develop a secured deep-link access mechanism for the MVC-based Journal management system. This was achieved by providing a secure link to the authors and reviewers upon article submission by the authors and peer-review assignment by the editors respectively. The deep-link enables secure access to only the particular resource with which it was generated for. The second and third objectives are the integrations of a journal discussion forum and SMS notification into the journal management system. These was done by integrating an SMS application programming interface (API) provided by a third-party service provider into the system. This eliminates the time waste associated with tracking processes/activities in current systems, particularly when the user is offline or an email address is not continuously monitored. The discussion forum integrated enables the large number of crowds including readers, authors, reviewers and editors to gain benefits from not only from the automation of the editorial processes but also the social network society established. Therefore, with the use of the journal management system, all stakeholders can achieve the win-win.

However, the system can be extended in the future by incorporating push notification service which is a very handy way to re-engage past visitors and notify authors, reviewers and editors of time-sensitive and useful information.

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