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Advancing Conference Experiences: Developing UP Open University's Novel and Open-Source Virtual Tri-conference Platform

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Abstract: Due to the COVID-19 pandemic, many academic conferences have moved online or become a mix of in-person and virtual events. However, the problem is that many virtual platforms for these conferences are expensive and have different features. The University of the Philippines Open University (UPOU) has taken a unique approach by creating a new and affordable virtual conference platform. Using Moodle, a free and open-source learning management system (LMS), the University pioneered an in-house-developed conference platform. This study outlines the deployment of the UPOU Virtual Tri-conference Platform (OUTriP) and the improvement of user experience by incorporating features and functionalities related to Look and Feel, Support, and Conference Participation. The participants of the first UPOU Tri-conference (Tri-con) evaluated the OUTriP. Our findings reveal a positive reception of the platform, as indicated by an SUS score of 70.86, interpreted as sound. Most participants offered favorable feedback on the platform's user-friendly nature and effectiveness. The practical implementation of our virtual conference platform holds significant implications, particularly for educational institutions on a budget looking to organize virtual conferences. This platform provides a cost-efficient and adaptable solution, and UPOU's experience showcases the practicality of repurposing Moodle to establish a functional and user-friendly virtual conference platform.

Keywords: academic conferences, Moodle, open-source, virtual tri-conference platform, usability

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INTRODUCTION

Virtual Conferences

An academic conference plays a crucial role in facilitating the exchange of information among researchers. It often spans one or more days, featuring activities like plenary speeches, paper presentations, workshops, and social events. These events gather researchers, scholars, and professionals within a specific field, offering a platform to present and discuss their scholarly work (Akhadem et al., 2023). Renowned conferences in open and distance education include the World Conference of the International Council for Open and Distance Education (ICDE), the Annual Conference of the Asian Association of Open Universities (AAOU), the National Conference on Open Distance eLearning (NCODeL), and the International Conference on Open Distance eLearning (ICODeL).

However, the COVID-19 pandemic has significantly impacted academic conferences, leading to cancellations or postponements due to travel restrictions and physical distancing measures (Medina and Shrum, 2022). In response, many organizers transitioned to virtual conferences, ensuring the continuation of knowledge exchange, academic collaboration, and interaction (Bhargava et al., 2021). Since the pandemic's onset, academic conferences have predominantly occurred online or in hybrid formats.

While virtual or hybrid conferences are generally more cost-effective than in-person ones, it is crucial to recognize that virtual conference platforms can incur expenses. The pricing of these platforms varies based on factors such as conference size, duration, included features, and required services (Wolff, 2022). Open-source platforms emerge as a compelling solution for hosting cost-effective virtual conferences, representing a significant shift. Free or low-cost options ease the financial burden on organizers, enabling more efficient resource allocation. This, in turn, allows for reduced participant registration fees, as organizers are not transferring additional costs to attendees. Beyond cost savings, open-source conference platforms offer greater flexibility than commercial alternatives, empowering organizers to tailor a personalized experience for participants. They are also more adaptable to the conference's specific needs, goals, and themes than traditional platforms.

UP Open University's Conference Experience

The University of the Philippines Open University (UPOU), known for its leadership in open and distance education in the Philippines, has been part of various local and global conferences, like ICODeL 2021. However, that year, UPOU used an expensive third-party virtual conference platform in Southeast Asia that did not fit the conference's needs well.

The University, through its Information and Communication Technology Development Office (ICTDO), decided to create its open-source platform for virtual conferences. This decision reflects UPOU's commitment to openness, collaboration, and transparency, shared by the broader open-source movement. Both aim to create environments that help people, encourage new ideas, and positively impact the world.

In 2022, UPOU successfully implemented and utilized an in-house-developed conference platform for the National Conference on Open Distance eLearning (NCODeL). It was an experience that was well-accepted by the stakeholders and gained recognition from the industry. Since the success of the virtual conference, UPOU has again pushed its limit by developing a conference platform that would house the three simultaneous conferences (also known as the Tri-conference or Tri-con): the 5th International Conference on Open and Distance eLearning (ICODeL 2023), the 1st International Symposium on Education and AI Convergence (ISEAC 2023), and the ASEANnale 2023.

These events adopted a hybrid format, leveraging various delivery modes. Plenary and paper presentations were conducted online, while face-to-face unconference sessions took place at the University of the Philippines Open University (UPOU) Headquarters in Los Baños, Laguna, Philippines, for the ICODEL and ISEAC, and at SEARCA for the ASEANnale. Unconference sessions encompass workshops, collaborative activities, festivals, hackathons, and alternative knowledge-sharing and co-creation methods. The overarching theme, "Sustainability in Education: Intersections, Ideation, Innovations," was a focal point for the ICODEL, ISEAC, and ASEANnale, guiding their collective exploration and discussion. Uniting these three conferences necessitates a platform to share ideas and best practices in technology-driven education, sustainable agriculture, and food security. This platform facilitates regional and global discussions, fostering dialogue on how education can effectively tackle environmental degradation, social inequality, and economic development. In doing so, it aims to promote sustainability within the ASEAN region and on a broader scale.

Objectives and Significance of the Study

Hence, the main aim of this paper is to present and create an innovative and budget-friendly virtual conference platform named **UPOU Virtual Tri-conference Platform (OUTriP)**. This solution leverages the adaptability of Moodle, a freely available and open-source learning management system (LMS). Although Moodle initially originated for online classrooms, its open-source design enables customized modifications to meet the specific requirements of UPOU's virtual conferences. Moreover, this study aims to evaluate both the user acceptance and effectiveness of OUTriP in elevating the virtual conference experience, specifically focusing on the Tri-con 2023.

The findings derived from this research will offer valuable insights, serving as a guiding resource for educational institutions mindful of their budget as they endeavor to create their virtual conference platforms for upcoming events.

REVIEW OF RELATED LITERATURE

Virtual conferencing has become more popular, especially during COVID-19. With restrictions on in-person gatherings, people and organizations use online platforms to connect, collaborate, and share information. Virtual conferencing works well for business meetings, academic conferences, and social events, allowing people to meet remotely. The COVID-19 situation has pushed us to find new ways to communicate, and virtual conferencing has proven to be a flexible and accessible solution. While it became essential during the pandemic, people realized its benefits, such as saving costs, being environment-friendly, and making meetings more accessible. As technology improves, virtual conferencing will continue to be a valuable tool for connecting and collaborating even after the pandemic (Veldhuizen et al., 2020).

Three crucial success factors of an e-conference involve attracting a good set of speakers, attracting an interested audience, and reaching your objectives and desired impact. For a successful online conference, having diverse speakers, relying on well-known experts, and including younger professionals for varied insights are essential. Emphasis is placed on diversity across age groups, genders, and regions, with a particular focus on sourcing speakers who represent these demographics in specific areas. Attracting the right audience, understanding their needs, and reaching them are therefore vital. While online formats can attract a global audience, engaging hard-to-reach groups like farmers is challenging, requiring targeted outreach to extension workers and NGOs. Finally, the impact of the e-conference is crucial, and defining desired outcomes early helps measure success through qualitative or quantitative methods (Veldhuizen et al., 2020).

Moodle, employed by millions of students and instructors globally, is a free and open-source Learning Management System (LMS) for creating and administering online courses (Mustafa and Ali, 2023). This flexible platform finds application in diverse contexts, such as distance learning, blended learning, and corporate training (Al-Ajlan and Zedan, 2008). Its notable features encompass:

- **Course Management:** Moodle allows instructors to create and manage courses, including adding content and assignments.
- **Communication:** Moodle provides a variety of ways for students and instructors to communicate, including forums, chat, and email.
- **Assessment:** Moodle provides various tools for assessing student learning, including quizzes and surveys.
- **Reporting:** Moodle provides reports on student progress and activity.

Furthermore, in a Moodle instance, activating additional features beyond the default settings is possible. These enhancements (termed plugins) broaden, extend, and tailor the functionality of Moodle (Kumar, 2013). Developed by third-party contributors, these plugins can be readily obtained from the Moodle website at no cost. Here are some other noteworthy features:

- **Accessibility Block:** A valuable tool for users with visual impairments.
- **Contact Form:** A helpful way for users to contact the site's administrators to submit requests for technical support or assistance.

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- **User Tour:** Utilized to introduce users to the different features of the platform and how to use them.

At the time of writing, the authors encountered a scarcity of literature regarding using Moodle as a platform for academic conferences. Consequently, this study allowed Moodle users to delve into and maximize the potential of the LMS by expanding its functionalities in the context of academic conferences.

METHODOLOGY

Development Requirements

Development Team

The successful development of the OUTriP hinges on three key players: the Project Manager orchestrating strategy, the Server Administrator upholding stability, and the Platform Architects tailoring the digital landscape.

- **Project Manager (1 person):** Responsible for overseeing the comprehensive planning, seamless coordination, and successful execution of the virtual conference platform. This involves strategic decision-making, timeline management (Figure 1), and ensuring the platform aligns with the conference's objectives.
- **Server Administrator (1 person):** Plays a critical role in maintaining and optimizing the server hosting the virtual conference platform. This includes ensuring uninterrupted uptime, monitoring server performance, and promptly addressing technical issues. He is responsible for the platform's stability, reliability, and security.
- **Platform Architects (2 persons):** Dependently on design and implementation. They fine-tune the Moodle instance to cater to the unique requirements of the conference. They also provide plugins that extend Moodle's functionality to align with the conference. Moreover, they enhance the user interface to ensure a user-friendly experience for all participants.

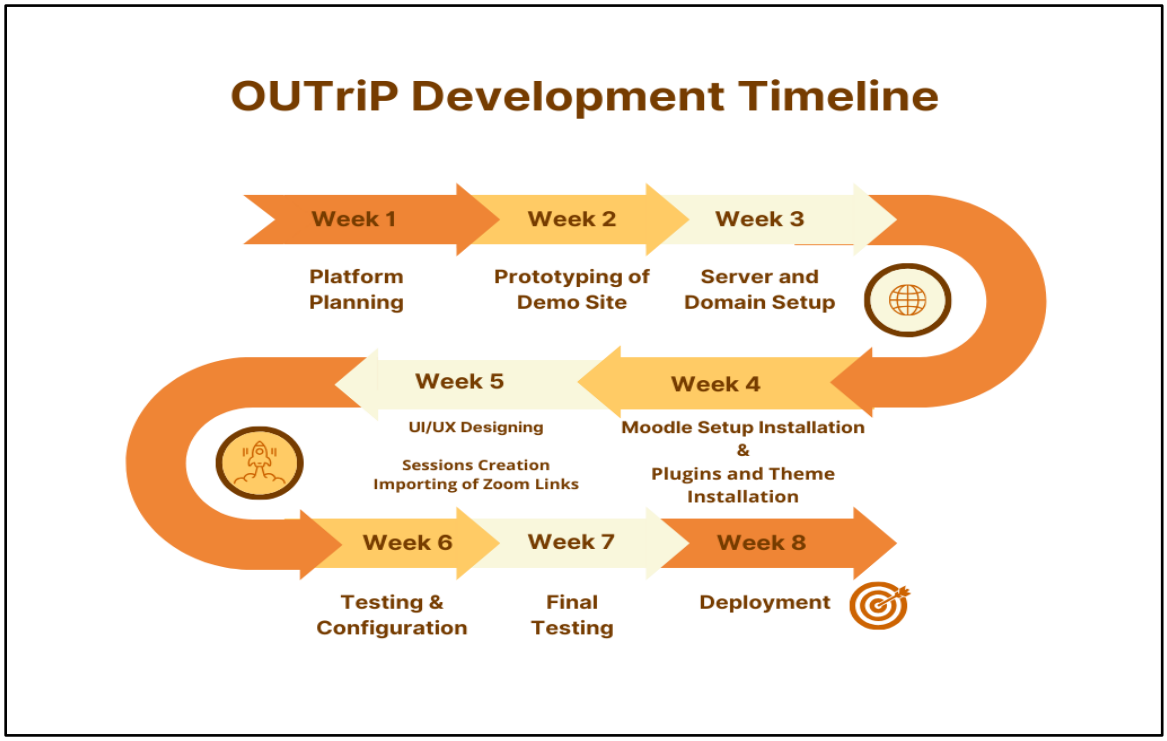

Figure 1. OUTriP Timeline of Development

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Technical Specification

The procedures outlined in this section are primarily one-time steps aimed at ensuring the readiness of the OUTriP to accommodate any future conference it may host. Figure 2 shows the web architecture used to develop the conference platform.

- **Cloud Server Subscription:** We purchased a scalable cloud server subscription from *Linode (https://linode.com)*, a popular choice for deploying web applications. Expecting about 300 participants, we obtained a Linode server with 4 GB of RAM and 80 GB of storage.
- **Server Environment Preparation:** We installed the popular web server, *Apache*, a free and open-source tool that delivers web content online. Likewise, we employed *MySQL* for the database, which provides a robust and scalable backend. For security purposes, we also configured the server to utilize *Let's Encrypt*, which offers free SSL certificates.
- **Moodle Installation:** We used version 4.0 of Moodle, the latest, most advanced, most secure Moodle version at the time of the OUTriP's implementation in 2022.
- **Theme Selection:** We tested different themes for the OUTriP to ensure a visually appealing and user-friendly experience. The *Educard* theme was chosen because of its clean design and easy-to-navigate user interface, enhancing the experience for attendees accessing the platform.

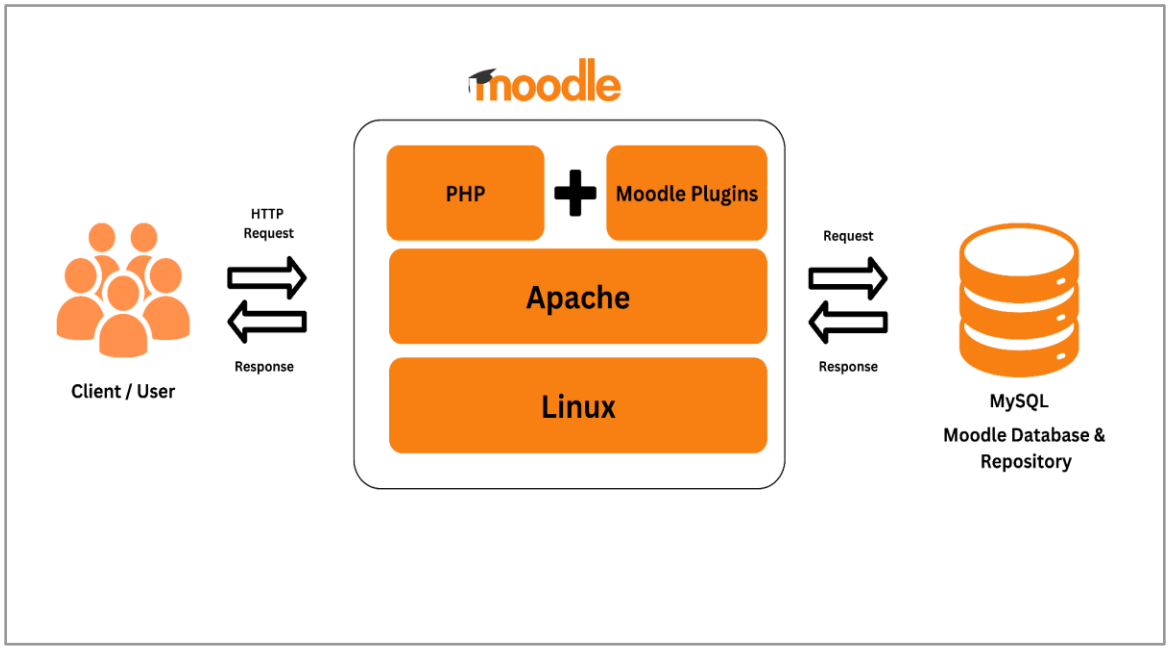

Figure 2. Web Architecture of the Development of Moodle-Based Conference Platform

Platform Concept: Features and Functionalities

Table 1
The functionalities of the UPOU Virtual Conference Platform

Look and Feel	Support	Conference Participation
Home Page	Contact Support Form	Conference Sessions
User Tour	Frequently Asked Questions	Badges
Accessibility Block		Post-Event Survey and Certificates

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Before the initiation of the conference, the platform architects are tasked with various crucial responsibilities. Initially, they must guarantee that only registered participants can enter the platform by providing their designated login credentials.

Furthermore, the user interface must be tailored to meet the specific needs of the conference, and the organization of conference sessions should follow the structure of Moodle courses and categories. Simultaneously, the server administrator is responsible for ensuring the stability of the server hosting the platform.

During the conference, the participants gain access to various features and functionalities of the OUTriP. As shown in Table 1, they can be categorized into these three: *Look and Feel, Support, and Conference Participation.*

Look and Feel Features

Look and Feel features refer to the visual and interactive aspects of the platform that collectively contribute to the user's overall experience and impression.

- **Home Page.** As the central hub or landing page, it provides essential conference information (such as the Tri-conference highlights, announcements, and navigation to the other features of the OUTriP, as seen in Figures 3 and 4.
- **User Tour.** Offering a step-by-step guide, this feature helps attendees explore the platform's various functionalities.
- **Accessibility Block.** As illustrated in Figure 5, this block enables users to customize the platform according to their visual needs. In light of this, changing text sizes and color schemes are supported.

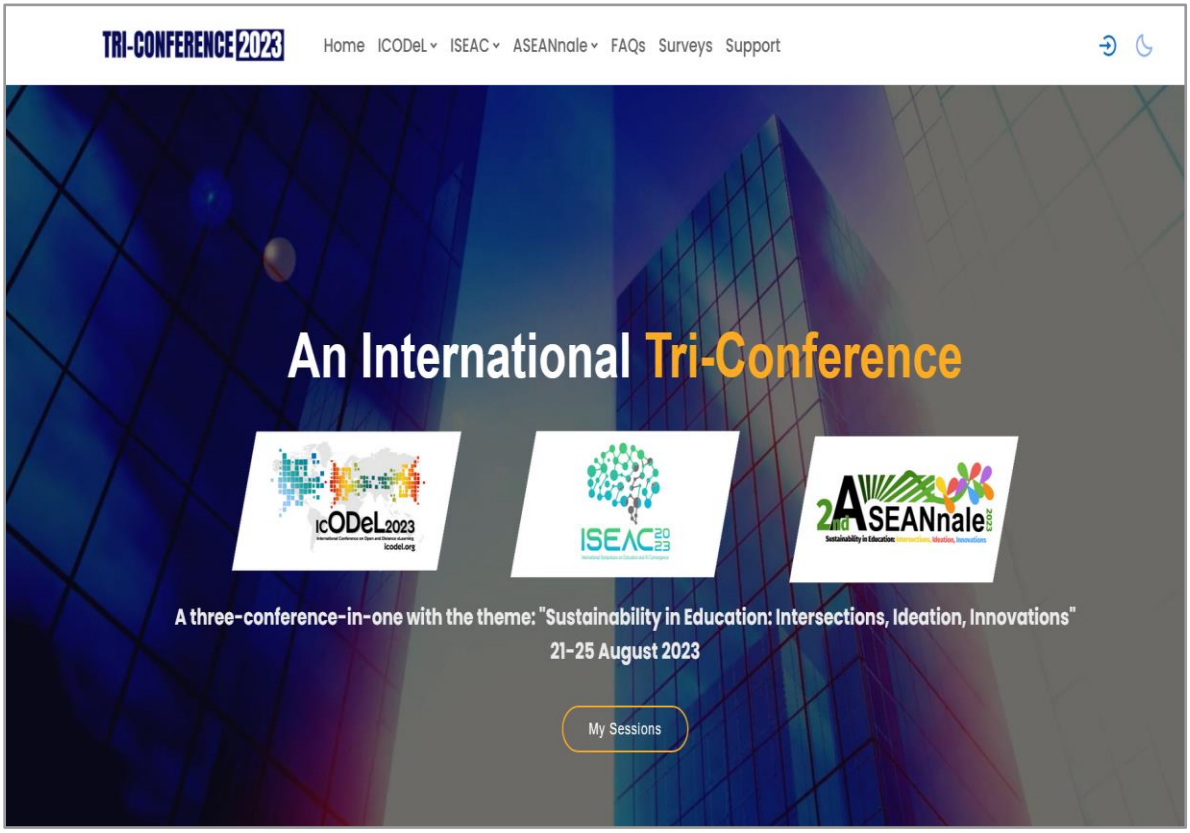

Figure 3. The header section of the home page.

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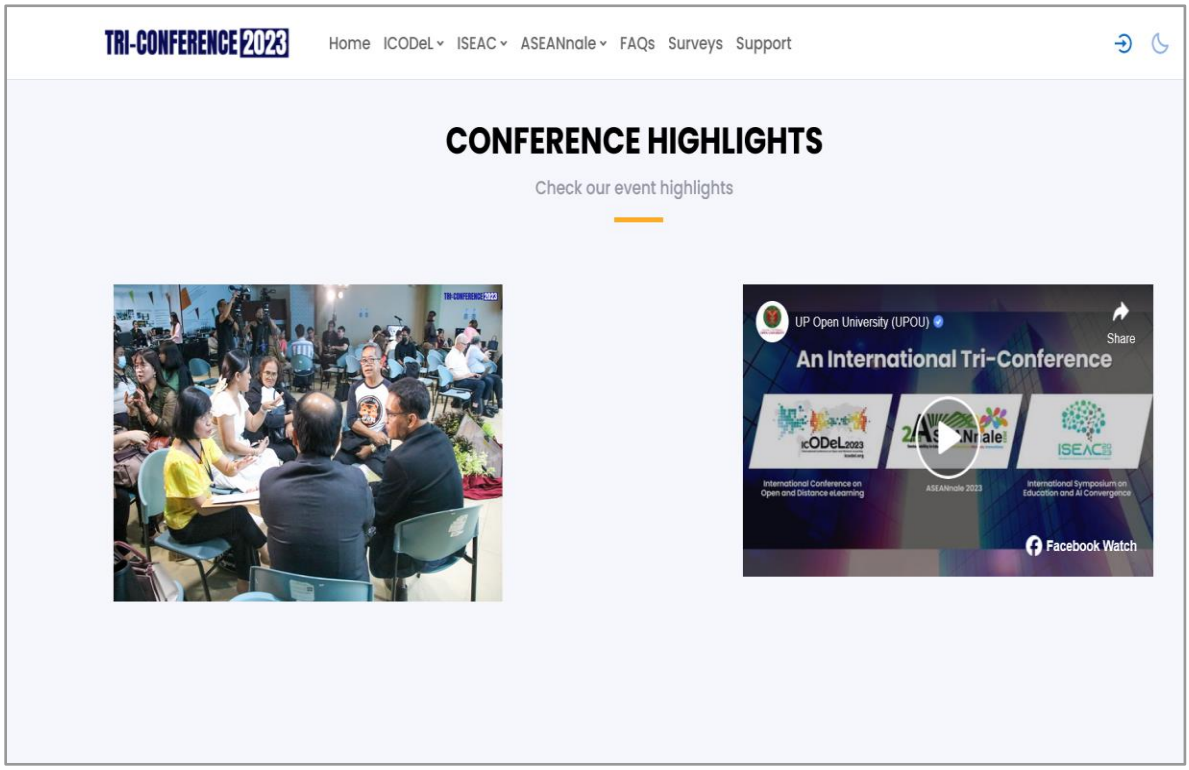

Figure 4. Conference highlights section of the home page.

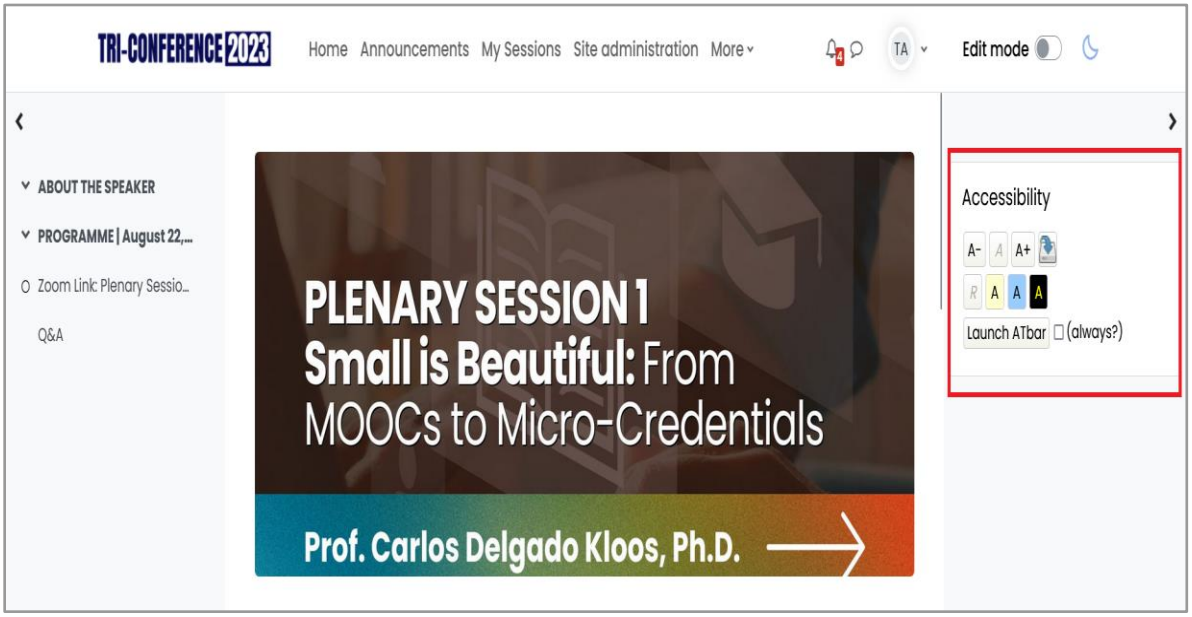

Figure 5. The Accessibility Block is on the right side of the platform.

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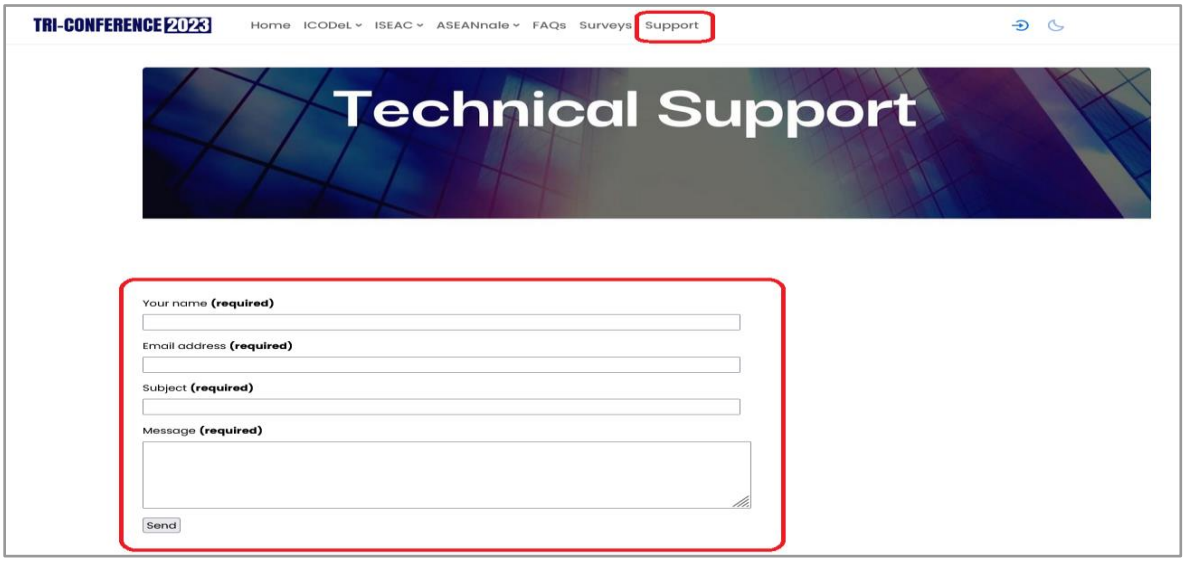

Figure 6. Illustration of the Contact Support Form.

Support Features

Support features pertain to the assistance and problem-solving resources provided to participants to ensure their smooth and satisfactory experience. This primarily entails technical support for resolving platform issues.

- **Contact Support Form.** The Contact Support Form (in Figure 6) is a Moodle plugin configured to receive requests from conference participants. These requests are automatically sent to our email address or ticketing system so our support team can address them quickly and efficiently. This is a convenient way for users to send their concerns, as they do not have to remember any email addresses or navigate away from the platform.
- **Frequently Asked Questions.** These questions, implemented as H5P content (in Figure 7), provide participants quick access to answers to commonly raised questions.

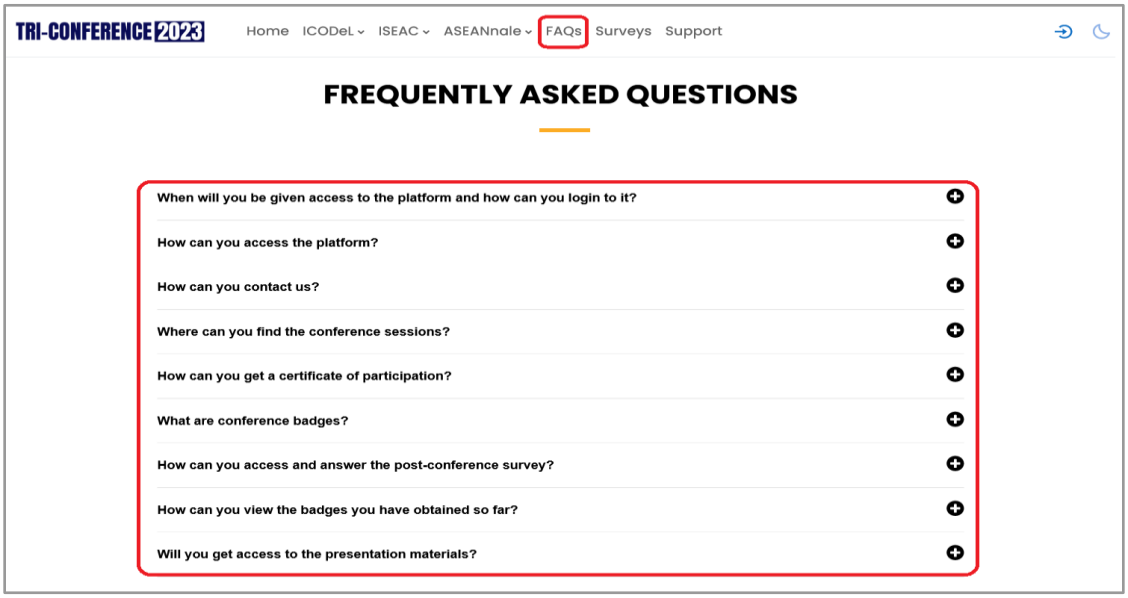

Figure 7. Some of the FAQs for the Tri-conference.

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Conference Participation Features

Conference participation features encompass all aspects related to the participants' engagement. It includes registration, session attendance, and overall involvement in the conference activities.

- **Conference Sessions.** Sessions are organized and categorized into respective conferences and distinct daysFurthermore, Figure 8 demonstrates how a conference session appears in the OUTriP, containing details about the program, speakers, and video streaming links to watch the conference. Moreover, the Program Page (in Figure 9) can be considered a repository for both plenary and parallel sessions for each conference.
- **Badges.** Participants can earn badges by attending conference sessions. For the Tri-con, these are the different types of badges available:
  - **Session Badge.** It is awarded for attending a single conference session.
  - **Morning Badge.** It is awarded for attending at least one session in the morning. In other words, the participant earned one Session Badge in the morning.
  - **Afternoon Badge.** It is awarded for attending at least one session in the afternoon. In other words, the participant earned one Session Badge in the afternoon.
  - **'Conference Completed' Badge.** It is awarded for completing each conference (ICODeL, ISEAC & ASIANnale). Participants with any of these badges have access to the survey.
  - **'Survey Completed' Badge.** It is awarded for completing any of the conference (post-event) surveys. This badge allows the participant to get their certificate.

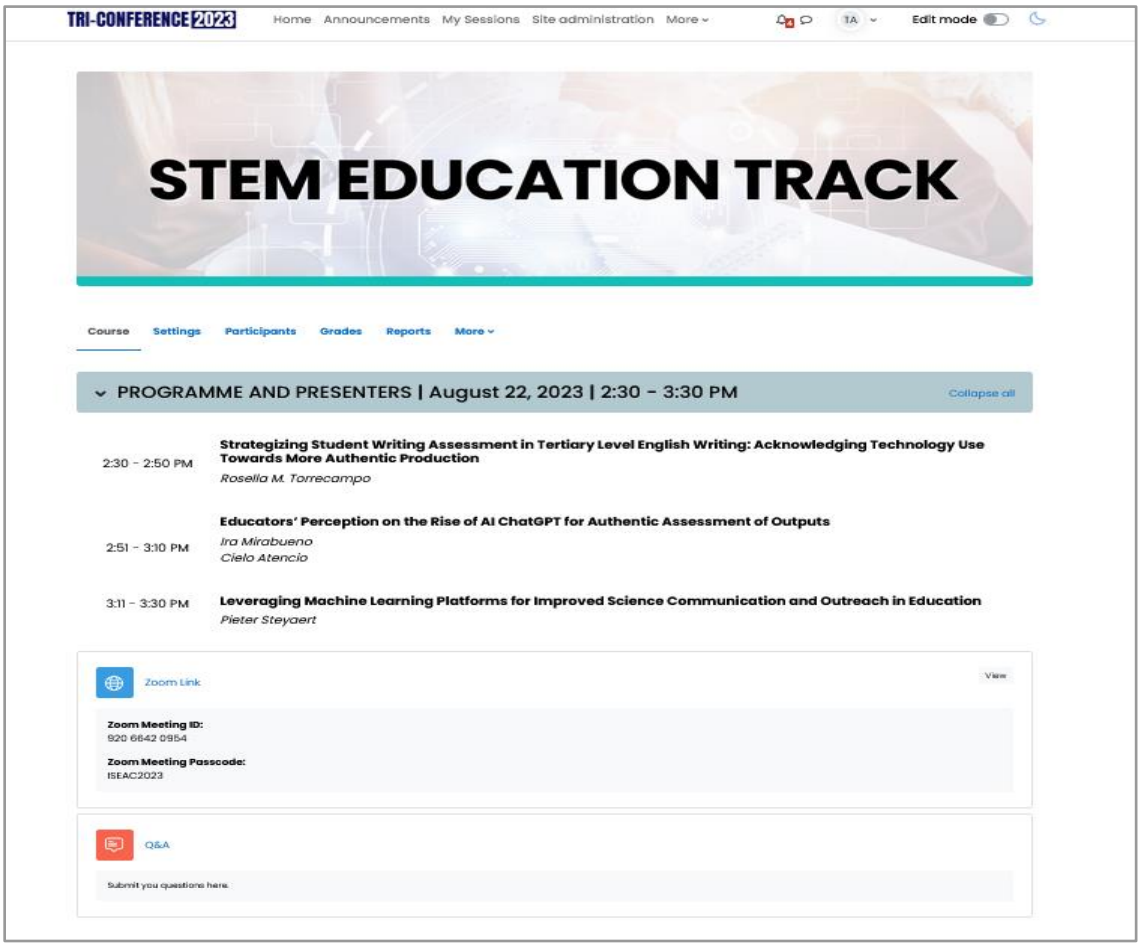

Figure 8. Sample conference session in the OUTriP.

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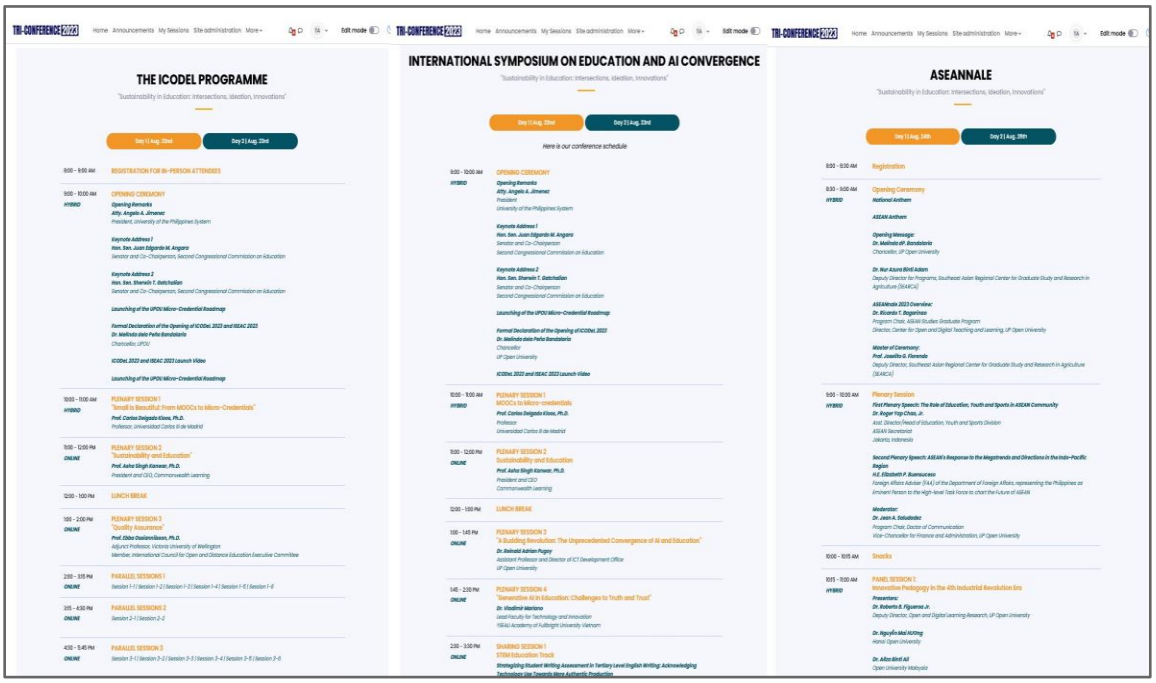

Figure 9. Program Page

The badge system outlined earlier, facilitated by the badge enrollment feature in Moodle, aims to promote active involvement in the conference. Attendees who participate in a more significant number of sessions will accumulate more badges, and those who accrue a sufficient number of badges become eligible to obtain a certificate. This setup acknowledges and rewards participants for their active engagement.

- **Post-Event Survey and Certificates.** Participants are asked to complete a survey after the event to provide feedback on the conference. The survey asks about the session quality, content value, and overall experience. Those who finish the survey can download their certificates directly from the conference platform (see Figure 10). We improved a Moodle plugin to create these certificates, and you can see a sample certificate in Figure 11.

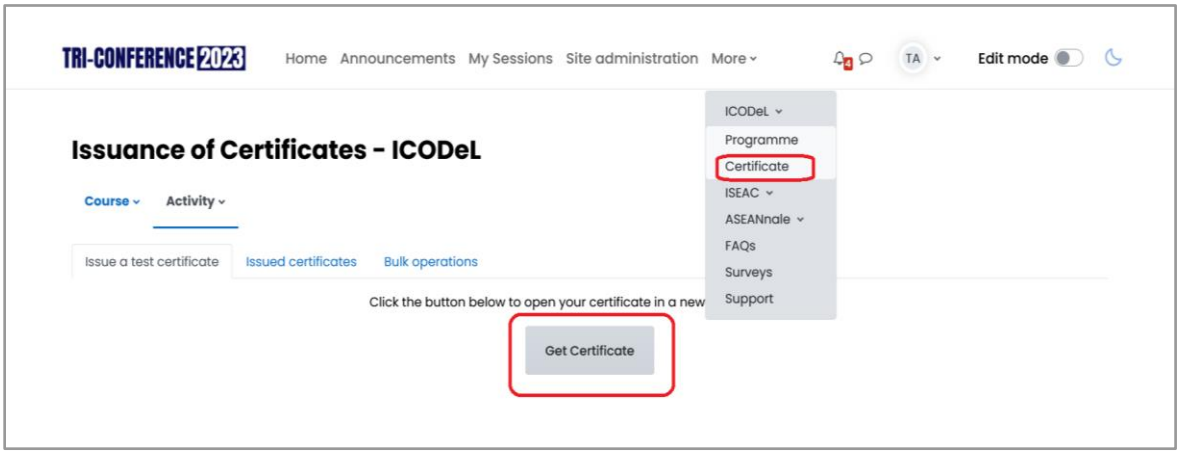

Figure 10. The page where participants can get their certificates.

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Figure 11. Sample certificate

Platform Usability Evaluation

System Usability Scale

To assess the acceptability of the OUTriP among end-users, a survey based on the *System Usability Scale (SUS)* was given to 258 participants. The SUS is a widely recognized industry standard serving as a convenient and reliable tool for measuring usability (Brooke, 2013). Created by Brooke (Brooke, 1996), the SUS consists of ten items, which the respondents can rate on a five-point Likert scale, ranging from strongly disagree (1 point) to strongly agree (5 points). The list below shows the survey items:

1. *I think that I would like to use the platform frequently.*
2. *I found the platform unnecessarily complex.*
3. *I thought the platform was easy to use.*
4. *I think that I would need the support of a technical person to be able to use the platform.*
5. *I found the various functions in the platform were well-integrated.*
6. *I thought there was too much inconsistency in the platform.*
7. *I imagine most people would learn to use the platform very quickly.*
8. *I found the platform very cumbersome to use.*
9. *I felt very confident using the platform.*
10. *I needed to learn many things before I could get going with the platform.*

The usability score from each respondent is derived by applying the following steps:

1. For odd-numbered items, subtract one from the response;
2. For even-numbered items, subtract the response from 5 and
3. Get the sum of the converted responses and multiply that total by 2.5.

The overall usability score is then computed from the average of the respondents' given usability scores. If the usability score exceeds the global mean score of 68, the assessed solution is relatively usable (Pugoy et al., 2016). As described in Table 2, the SUS Adjective Scale can also be used to interpret SUS scores (Bangor, 2009).

Open-Ended Questions

Aside from the SUS survey, the following open-ended questions were also given to the participants:

1. *What are your comments on the conference platform?*
2. *What can you say about how easy it is to use the conference platform?*
3. *What are the challenges you have encountered in using the conference platform?*
4. *How can we improve the conference platform?*

Table 2
The SUS Adjective Scale

Usability Score	Adjective
0-25	Worst Imaginable
25-39	Poor
39-52	OK
52-73	Good
73-85	Excellent
85-100	Best Imaginable

RESULTS AND DISCUSSION

SUS Survey Results

Table 3 shows the results of the SUS analysis. With a mean SUS score of 70.86, the average perception of usability leans towards the positive end of the scale, indicating that participants generally find the platform usable. However, the median SUS score of 67.5 suggests some variability in user perceptions, with many scores clustering around this midpoint. This variability is further emphasized by the standard deviation 16.22, indicating that the scores are dispersed around the mean. This means that while the average perception is positive, there are significant variations in individual opinions, with some users rating the usability higher and others lower. The mode score of 50, the most frequently occurring score, indicates a notable presence of lower usability ratings in the dataset, potentially highlighting areas where improvements could be made. The range of SUS scores, from 47.5 to 100, underscores the diversity of opinions, with some participants rating the usability relatively low while others rating it very high. This range suggests that OUTriP has a broad spectrum of perceived usability, with room for improvement in some areas.

Table 3
SUS score analysis

	SUS Score
SUS score mean	*70.86*
SUS score median	*67.5*
SUS score mode	*50*
SUS score variance	*16.22*
SUS score range	*52.5*

While the mean indicates a generally positive perception of usability, the median, mode, and range suggest varying degrees of usability satisfaction among participants, pointing to the need for a nuanced approach to address specific usability issues. This variability could be significant for ICTDO to consider when designing or improving the next version of OUTrip to ensure that it meets the needs and expectations of a diverse user base.

Furthermore, we analyzed the different items of the SUS survey, as depicted in Table 4. The findings suggest that the OUTriP is a well-designed and usable platform that meets the needs of its users. The high percentage of participants who agreed with the statements indicates that they found the platform easy to use, efficient, and effective. This is supported by 83.34% of participants agreeing with the statement. *I found the various functions in this system were well integrated*, indicating that the platform is easy to navigate and that users can find the information and tools they need quickly and easily. Additionally, 77.77% of participants agreed with the statement *I think that I would like to use this system frequently*, suggesting that the platform is a valuable resource.

Overall, these results indicate that our platform effectively supports the conduct of a virtual conference.

Answers to Open-Ended Questions

Based on participants' feedback, it was found that a significant portion, precisely 25.78%, reported seeing the conference platform as easy to navigate and use. This positive response suggests that a notable segment of attendees experienced a smooth and user-friendly interaction with the platform. It indicates a level of satisfaction among users regarding the platform's intuitiveness and accessibility, contributing positively to the overall user experience during the conference.

Although most participants navigated the virtual conference seamlessly, 10.16% claimed to have experienced connectivity issues. However, these challenges were beyond the control of OUTriP and the conference organizers, stemming from variables like internet service provider discrepancies, user locations, and overall internet traffic fluctuations.

Some great ideas have been suggested to enhance the virtual conference experience. One is to add a sidebar that shows all the day's sessions, making it easier for users to access and understand the schedule. Quick tutorials for participants could be beneficial, offering a handy resource for navigating the platform. Introducing more interactive activities aligns with the desire for a more engaging conference experience. To improve accessibility, there is a suggestion to include audio captions for lengthy descriptions, catering to those needing auditory assistance. Recognizing the diverse participants, especially newcomers, a tutorial on platform access and registration in user-friendly formats like flowcharts or videos has been proposed. Lastly, creating a dedicated platform section for participant communication, fostering community, and collaboration is suggested. These ideas contribute to ongoing efforts to make the virtual conference platform user-friendly, accessible, and conducive to active participation and meaningful connections.

All the valuable feedback received, including insights on ease of use and identified challenges, has been duly noted. These inputs will play a pivotal role in informing and guiding future developments of the virtual conference platform to ensure an even more seamless and satisfying user experience.

Table 4
Top 5 Strongest Usability Aspects of the OUTriP

Usability Aspect	Findings
I found the various functions in the platform were well-integrated.	*83.34% agreeing*
I think that I would like to use the platform frequently.	*77.77% agreeing*
I thought the platform was easy to use.	*76.39% agreeing*
I felt very confident using the platform.	*76.39% agreeing*
I imagine most people would learn to use the platform very quickly.	*70.83% agreeing*

CONCLUSION

We have successfully developed a novel and cost-effective virtual conference platform, OUTriP, leveraging the versatile capabilities of Moodle—an open-source Learning Management System (LMS) renowned for its accessibility and cost-effectiveness. We have seamlessly integrated eight distinctive features into the platform through the collaboration of a proficient development team and adherence to rigorous technical specifications. These enhancements elevate the overall user experience and actively foster participant engagement in conference activities.

The positive reception of OUTriP among participants is underscored by consistently high usability scores and commendable feedback. This overwhelming support is a testament to the platform's efficacy in providing a user-friendly and enriching virtual conference experience. Recognizing the importance of continuous improvement, we are dedicated to addressing minor issues and incorporating valuable participant suggestions. This includes ensuring the Zoom conference session link is accessible to the participants. An additional section on the home page for ongoing presentations can be included in the following platform version. Our commitment is directed towards refining the platform, ensuring its accessibility and user-friendliness are maximized to meet the evolving needs of our diverse user base.

Looking ahead, OUTriP stands poised as a transformative tool for individuals seeking an immersive conference experience and educational institutions striving to host virtual conferences within budget constraints. Its

adaptability, combined with its commitment to ongoing enhancements, positions OUTriP as a valuable asset in the landscape of virtual conferencing, paving the way for inclusive and cost-effective educational events.

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