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Managing the online classroom and academic activities through PLM platform in crisis context

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Abstract: Online classes have become inevitable during the pandemic situation in the last couple of years. Educational institutes are struggling to adopt the new practices related to online class delivery. In the course of the online delivery process, the quality of the teaching is questionable. Many institutes have adapted themselves to this changing situation of the online classroom delivery process through different platforms. But a classroom delivery process is not just about delivering the content or syllabus through online mode. Before and after online class delivery, there are various pre and post activities for an educational institute. A new approach has been tried in the academic year 2020-21 to use the ENOVIA Product Lifecycle Management (PLM) platform for the online delivery process. It helped the faculty engage the class and collaborate with their colleagues, coordinator, School head, students, and others for different pre-classroom activities. The activities like syllabus preparations, lesson plan preparations etc., and post classroom activities like conducting quizzes, exams, interactions with students, ISO documentation, class committee meetings etc. Also utmost important use of the platform to store and keep the data secured both before and after class delivery.

Keywords: Online classes, Pandemic situation, ENOVIA PLM, ISO documentation, Collaboration, Crisis context

1. Introduction

In the ongoing crisis context, it has become mandatory for all educators to use online platforms for their classroom delivery process. Online classroom delivery is not a new concept. Although many institutes and organizations used online media for various meetings and other interaction purposes, it was rarely used for delivering regular classroom courses. Many educational institutes faced multiple problems, right from selecting an online platform and utilizing the same for class delivery. Institutes of National importance and other top institutes across the globe and within the country have faced many issues in organizing online classes through different platforms. Some institutes planned for both synchronous and asynchronous courses to deliver the course content. Recorded videos by the concerned faculties were considered asynchronous classes, and live discussions with students were considered synchronous classes. Few institutes tried to deliver lab content using an online platform and measured the impact of remote sessions. Some students expressed that learning computer science in remote sessions was significantly more than in regular classroom and laboratory sessions [1]. Undergraduate programs do not just try online distance learning pedagogy. Still, few postgraduate programs have also implemented and tried to study the impact of the online learning environment a decade ago [2]. Although the online tools were not as effective today, educators have attempted to implement online education and distance learning through available platforms. The knowledge transfer and exchange of information related to the laboratory course was carried out via chat box, e-mails, webcams, discussion forums etc. [3]. In the recent pandemic time, many engineering and professional degree offering colleges and Universities have tried to use MS Teams, Google Meet, Zoom, Hangout, Skype and other similar online platforms [4-5]. Each forum has its advantages and disadvantages. Some platforms are user friendly, and few platforms are complex to manage more students. Managing students and class delivery is one aspect. On the other end, have we ever thought to manage the entire process of the classroom management system, including the preceding and proceeding activities related to the classroom delivery? Due to the pandemic situation, it has become essential to manage preceding activities like syllabus setting, board of studies discussions, lesson plan preparations, and other related activities using online mode. Also, every classroom delivery has some proceeding works like class documentation, feedback, assessment and other related jobs, which are now required to be carried out online. The gap in the current work lies here. Many institutes are trying to deliver the best possible online class for their

respective courses and laboratories. Still, they are not bothered about the various pre-operational and documentation activities before and after the classroom session. If they are concerned, then they are using different platforms to do their work. For example, if online classes are managed through the MS Teams platform, exams are carried out using Google forms or similar platforms.

The coordination activities before and after classroom activities are carried out using either e-mail exchanges or some localized and customized software. If each task is performed using separate software or a platform, it's difficult for any institute or organization to consolidate the data and analyze it. Therefore, there is an immediate need to understand the application of a platform, which can perform preliminary and post activities and classroom management activities. In University, PG specialization on Advanced Manufacturing Systems is offered, where Product Lifecycle Management (PLM) is one of the significant verticals consisting of both theory and laboratory courses. PLM tool has various modules to manage the entire lifecycle of the product, right from its inception phase till the disposition phase. At University, the Dassault Systems ENOVIA PLM platform is used for teaching PLM laboratory courses. This PLM platform is configured so that it can be used to handle both online classroom delivery and department activities. The major role of the ENOVIA PLM platform is consolidated in Fig.1. ENOVIA PLM has various modules, out of which the essential modules such as collaboration and approvals, IP classifications, Change management and project management modules have been used to the fullest in the proposed online classroom management system. The proposed model and the paper explain the PLM platform's use for successful online classroom delivery, assessment, documentation, and other collaborative activities. The advantages of using the ENOVIA PLM platform for the teaching-learning process and their implications are addressed towards the end of this paper. This approach is the first of its kind to use any PLM platform and 3D Experience functionalities for the overall classroom management system. The procedure of using the PLM platform for the purpose mentioned above is explained in the methodology section.

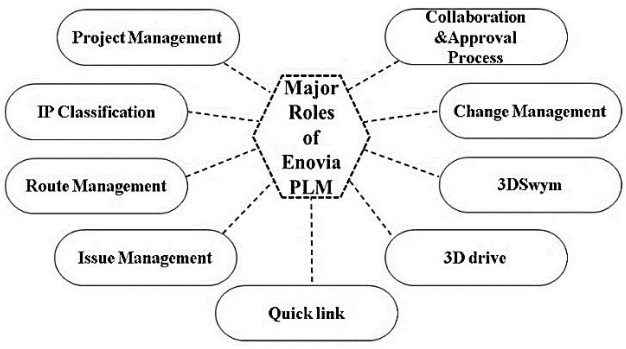

Figure 1. Major roles of Enovia PLM

2. Framework

Fig.2 shows the framework for the proposed classroom management system. The classroom management system has been split into three stages. Stage 1 indicates the different works categorized under preliminary works. Before engaging courses through an online platform, the staff member must collaborate with industry personnel and other related members to design the curriculum structure and syllabus for the planned programme and courses [6]. Further, the designed curriculum structure and syllabus has to get approved through the Board of Studies (BoS) meeting. Once the syllabus is approved, the following work is to prepare the lesson plan and lab plan by concerned staff members. All these preparations are categorized under the preliminary work stage. Stage 2 is the heart of the classroom management system, which concerns class delivery, notes, and other information circulation to the students and the assessment process. During this stage, all the notes and related information has to be saved in the apt repository. Once the regular classroom delivery has been completed, the faculty has to undergo post classroom work, categorized under Stage 3. Activities such as class committee meetings and ISO documentation are to be carried out in Stage 3.

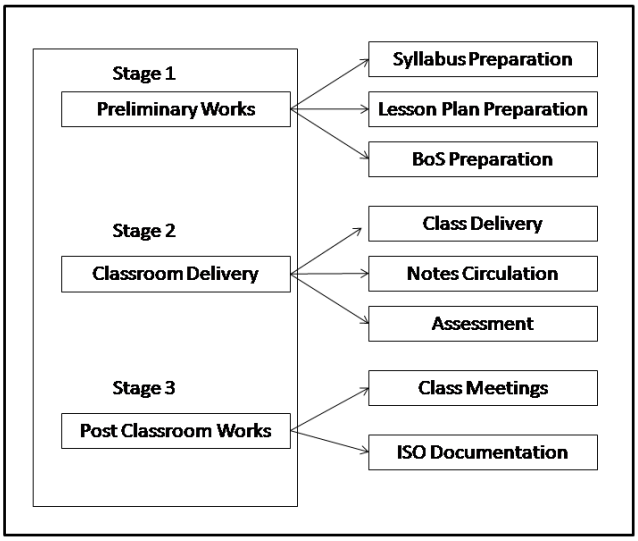

Figure 2. Classroom Management System

3. Case Study and Implementation

The framework described in Fig. 2 is further explained as a case study and implementation process.

3.1 Case study

The implementation of the classroom management system is done using the ENOVIA PLM platform. Two different theory courses and one laboratory course have been selected as the same faculty member handles all these three courses. The entire case is implemented in the Advanced Manufacturing Systems (AMS) Post Graduate (PG) programme at the University. Before taking the allotted

online classes, a faculty member must first be involved in curriculum and syllabus design. The faculty has to interact with other department faculties, school heads, and industry personnel to design the curriculum structure and syllabus.

Further, the designed curriculum and the syllabus have to be approved through the BoS meeting. Once the syllabus is approved, the faculty must prepare a lesson and lab plan for the allotted subject. After preparing the lesson plan, it has to be checked and reviewed by the reviewer, which has to be finally checked and approved by the school head. Sometimes, the reviewer may suggest changes to the original lesson plan owner, or the school head may reject the lesson plan due to poor quality. This particular sequencing has to be considered. Once the lesson plan is approved, the concerned faculty starts preparation for the online class delivery process. The faculty delivers the class as per the schedule and circulates the notes whenever required to the students. Also, the faculty has to conduct in semester assessments for the students during the online class delivery process. After the end of the assessment process, faculty has to interact with students for doubt clearance and feedback process. Students submit assignments to the faculty, and faculty can propose changes if the assignment is not up to the mark. The documents shared during the classroom process and the students' answer sheets must be saved in the apt repository. Finally, the faculty has to document all the processes through the ISO documentation process. ISO documentation process involves preparing LDPR (lesson delivery progress report), LPR (lab progress report), Attendance report, feedback analysis, internal exam analysis etc. The platform to be selected for the classroom management process should perform all the activities mentioned in the case.

3.2 ENOVIA PLM platform implementation

ENOVIA platform implementation requires setting the dashboard for three activities. Dashboards related to curriculum structure, online classes and ISO documentation are needed to be set up. Once the mind mapping is done systematically, each dashboard has to be planned so that every information related to particular work has to be available. For example: In the curriculum structure dashboard, information such as the members of curriculum activities, faculty in charge, reviewer, approver, original documents, edited and corrected documents, rejected documents etc., should all be available in the dashboard. In the task of curriculum structure, as the curriculum needs to be framed, the syllabus needs to be framed and checked by the experts. The following activities are performed in the implementation phase.

1. Create a route for curriculum structure.
2. Add the people for the route and give them proper access. Decide the appropriate hierarchy.
3. The main author of the curriculum/syllabus needs to add the content, send it for correction and approval via created route.
4. See that the assigned members in the route get the proper notification regarding the latest updates.
5. The reviewer checks out the document, suggest improvement to the main author via route.
6. Once the author creates the revised version, the reviewer accepts it, and the route continues to the next stage.
7. In the final stage, the HoD or school head can accept or reject the curriculum and syllabus based on the quality. If he accepts, the route gets completed.

Fig. 3 shows the route created for approving the curriculum structure.

Figure 3. Route system for curriculum design

The submission of assignments can adopt a similar route system by the students to the concerned faculty members. The faculty can accept, reject or suggest changes to the students via created route system. The route system can be extended for the process of ISO documentation purposes also. Respective faculties can prepare ISO documents such as assessment reports, send them for correction to the PG coordinator, and get them approved by the school head. Therefore, the routeing system in collaboration and approvals app of the ENOVIA system helps in three different ways during the online classroom management system. Other uses of collaboration and approval apps for this implementation are as follows [7].

1. The various meetings can be organized in the dedicated workspace, and the discussions can be systematically recorded in the platform.
2. The people in the route or the workspace can subscribe to the document and get regular updates.
3. The files can be checked in and checked out, and this function avoids duplicating the work.
4. All the discussions, documents and files are stored in the dedicated workspace, and only the authorized people can have access.
5. Proper folders can be created in the workspace, and these folders help to store the data securely.
6. If there are any issues during and after the meeting or during the work, there is an option to raise the issue. These raised issues can be managed successfully in the platform.
7. The whole online classroom management can be successful by using the collaboration and approvals application of the PLM ENOVIA platform.

3.3 IP (Intellectual property) Classification

IP Classification helps create the library for document storage purposes and further divides it into three parts: part

library, general library, and document library. The document library provides a secure place to store files. The PG coordinator, Professors, and students can browse and find the files very easily. Sometimes they can work on it simultaneously and access it from any device at any time. Any document created by the faculty and the students is valuable and can be considered the institute's intellectual property (IP). Therefore, protecting and safeguarding the IP is one of the major concerns of any educational institute. The IP classification app of ENOVIA can store and protect or systematically safeguard the data. Fig. 4 shows the classification of IP via the PLM platform.

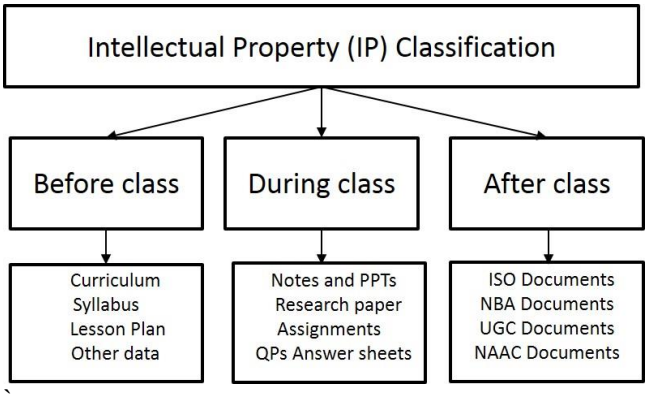

Figure 4. IP Classification structure

One of the advantages of incorporating IP classification during the implementation process is that the IP classification methodology helps store data organized, share data with authorized persons, and control the files and documents appropriately.

3.4 Change management process

It is the responsibility of the PG coordinator and staff member to ensure the smooth and efficient conduct of the PG course for the specified semester. There are many situations where the PG coordinator suggests changes to the faculty. For example: While preparation of syllabus or lesson plan. Similarly, concerning course faculties can suggest various changes to the students during assignment submission or project submission. Till today, these changes have been communicated either orally or through mobiles or e-mail conversations. There should be a proper track of these changes made. The tracking system is not efficient in mails, phones or other traditional approaches. ENOVIA PLM platform has a feature called change management. Any changes made before the conduct of the class, during the class, and after the class hours can be monitored and followed up properly via the thread system. The changes can be requested by raising the issues. Once the issues are raised, it is the responsibility of the in-charge person to look at them, do the changes, submit the changes, and close the issue. The change action can be created using the following steps.

1. Create change action required
2. Add members who need to make the changes
3. Members carry out the changes and realize
4. Get the change approved and close the issue

Overall, the change management process can help improve the quality of the overall PG programme in a systematic and structured manner.

3.5 Project management process

The entire classroom management system can be considered a whole project, and the project management application in the ENOVIA PLM platform can be used to manage this particular project [8]. Each semester in the PG programme comprises five theory classes, two laboratory classes, and project work. It becomes tedious for a PG coordinator to concentrate on all these sections. Hence, the ENOVIA project management application can be used to manage these sections effectively. The PG coordinator can consider the PG course as a program.

Further, this program can be split into various projects based on classrooms and laboratory sessions. Each project can be assigned an owner and can be made in charge of that particular project. For example, a course called PLM Advanced can be one separate project assigned to faculty 'X', and PLM Technical lab can be called another project assigned to faculty 'Y'. Similarly, other theory and laboratory courses can be assigned as a project to different staff members. Now, the PG coordinator can create a dashboard and include all these assigned projects to track, monitor, and give proper feedback and suggestions via the same dashboard. The main advantage of the dashboard is that all the projects under the program head can be seen simultaneously, and it becomes extremely easy for the PG coordinator to follow up on the progress of the entire PG programme. Fig. 5 shows the split-up of the projects of the whole program.

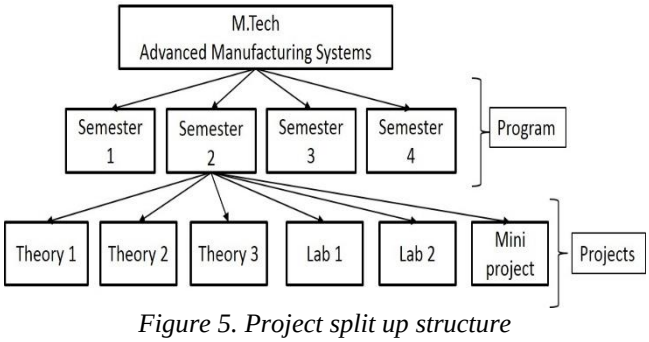

Figure 5. Project split up structure

The other advantages of project management applications for classroom management systems are as follows

1. Each project can be further split up into experiments. For example, let's consider PLM technical laboratory as a project. This project can be further split into four experiments: demonstration, exercise, structured inquiry, and open-ended experiments [9].

2. These experiments further can have a proper work breakdown structure.
3. A Gantt chart can be created to check the progress of the project and can be further linked to the dashboard of the PG Coordinator.
4. Each project can be assessed, and particular risks can be calculated using RPN (Risk probability number).
5. Tracking monitoring is made easy from the dashboard created during the start.

3.6 Use of 3D Swym application

3DSwym is one of the useful apps. It reveals the power of communities to share and innovate throughout internal or external ecosystems by providing intuitive content creation tools and social interaction. The online classes can be engaged using this app, similar to another social and collaborative app. Fig. 6 shows the screenshot captured during the special guest lecture class arranged for students in PLM domain. The app is designed to be user friendly. Professor uploads students' attendance in link format in the quick link widget. The users may add URLs and keep/attach additional web links (attendance, feedback, test, and other project-related connections) to verify their attendance report readily. The entire test and assessment can be carried out in this platform. One of the most significant advantages of the 3D swym application is that students can collaborate with industry people and external people to solve an engineering problem. There are various communities related to PLM, Design, Automation etc., where students can post their doubts and get them cleared by the experts in the respective community.

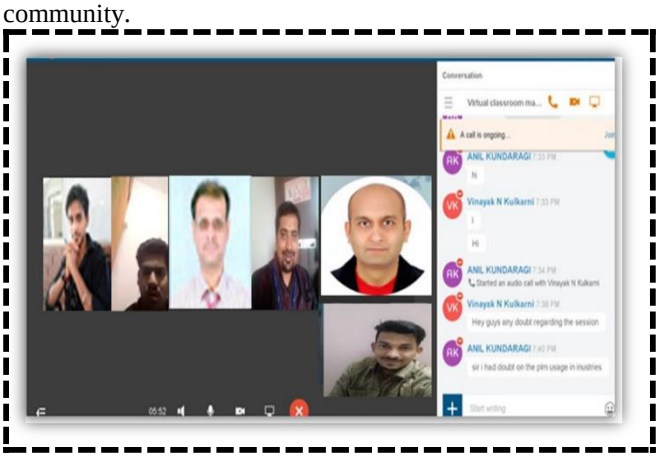

Figure 6. Screenshot of online class using 3DSwym

4. Advantages of classroom management system via PLM platform

The following are a few of the advantages to be considered:

1. Students and staff members can collaborate and work together in a closed environment.
2. Meetings can be recorded, and decisions taken during the meetings can be listed permanently.
3. Educators can set up a community for each class and invite a group of students. This group of students can further share their ideas and collaborate to work on a particular engineering task.
4. The approvals from the PG coordinator and school head is made easy through the routeing process.
5. The projects can be monitored under a common dashboard. Real-time data can be extracted.
6. The quality of the syllabus, lesson plans can be improved through the route process system.
7. The data such as class notes, ppt, research papers can be saved in an organized manner through the IP classification process.
8. The change management system helps the concerned faculty member to know the exact changes required. Similarly, the students can understand the needed modifications easily and rework expectations via a change management system.
9. The platform is helpful not just to conduct classes and evaluate the students but also to collaborate with staff members and school heads to carry out documentation and other departmental activities.

5. Limitations of classroom management system via PLM platform

The following are a few of the limitations of the work carried out.

1. One drawback of the ENOVIA PLM system is that the entire PLM set-up may initially cost the institute. Initial investment is found to be high because ENOVIA PLM is not a freeware software. It requires licencing and proper installation based on whether the licence is on-premise or on-cloud.
2. The whole process needs proper training to understand the working of various modules of the PLM system, which may again cost the particular institute.
3. In our particular study as the PLM platform was already in use for PG students as a part of academic syllabus, it was easy for both faculty and students to use the software, otherwise students and staff needs to be educated on configuration of the system.
4. As a sample for present study, only few ISO documentation were used during the implementation, whereas, the whole ISO documentation can be carried out in the platform in the further studies.
5. The entire work was carried out using on-cloud platform licencing because of pandemic situation, whereas, one can even use on-premise licencing for classroom management.

6. Conclusions

The entire work focuses on using the ENOVIA PLM platform to manage the virtual classroom in the crisis context. Although many platforms exist for class delivery purposes, ENOVIA has many more advantages in functions and features. ENOVIA platform is not designed for a classroom management system. Still, as the platform to handle PLM theory and laboratory courses in the University, it is experimented with and used for classroom management purposes. This platform shows some promising features that are very much secured. The applications of ENOVIA platforms such as collaborations, IP classifications, change management and project management are used in this case study mentioned in the paper, and the implementation was found to be satisfactory. Some configurations are made to the system to suit the present case. In the future, some customization may be required to make full fledge utilization of the PLM system to the classroom management system. The overall experimentation of the PLM system for classroom management was satisfactory in the first attempt. It can be further improved based on the experience and lessons learnt during the process of implementation.

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