

Asynchronous e-Learning: A Collaborative, Process-Based Solution for Design and Development Challenges

Dilini Lakma Thoradeniya, Malik Ranasinghe, Vishaka Nanayakkara, Buddhika Karunarathne, Eshana Ranasinghe, Gaindu Saranga Jayathilaka and Niranjana Gunawardena

University of Moratuwa, Sri Lanka

dilthora@gmail.com

malik@uom.lk

vishaka@cse.mrt.ac.lk

buddhika@cse.mrt.ac.lk

enranasinghe1@gmail.com

gaindusaranga@gmail.com

ndg@uom.lk

Abstract: This paper presents a case study of an asynchronous online learning program, 'Project Management Skills', benchmarked to the Exam Content Outline (ECO) that was released in October 2022 for the Certified Associate in Project Management (CAPM) qualification of the Project Management Institute (PMI), USA. It investigates how the design and development processes have incorporated contemporary research findings and practices in online course design and development. Key challenges of the program include supporting resource persons with traditional, face-to-face teaching experiences to effectively deliver content in online asynchronous mode, as well as producing content in the English language in a manner that can be easily digested by students who are not native English speakers. The study presents an analysis of data gathered from key informant interviews with Content Developers, as well as project documentation such as meeting minutes and reviewer comments. The findings indicate that the multiple review model employed in the design and development process complements best practices in asynchronous online education and enables a high level of collaboration which reduces the burden on the Content Developer to take on multiple roles. Additionally, it facilitates the input and support of a diverse group of team members with specialist knowledge.

Key Words: Online Course Development, Course Design, Asynchronous Learning, Instructional Design, Collaborative

1. Introduction

Extant literature on the design and development of online courses is numerous, of which a smaller component is on courses delivered in asynchronous mode. Findings of such studies usually focus on success factors, strategies and best practices, or on theories, frameworks and models (Volery and Lord, 2000; Niess and Gillow-Wiles, 2013; Picciano, 2021; Varkey et al., 2023). However, there are fewer studies on how such knowledge is practically incorporated within the design and development process of online asynchronous courses.

This paper aims to contribute towards narrowing this knowledge gap by investigating the design and development process of the asynchronous online "Project Management Skills" programme to be delivered on open.uom.lk, the open learning platform of the University of Moratuwa (UoM), Sri Lanka. In particular, the objectives of the study are (1) to understand how the steps in this process have incorporated contemporary research findings and practices in online course design and development, and (2) to identify challenges which emerged in course development and their potential solutions. The objectives are expected to help establish lessons learned that can be used to refine the process further. This is important as at least eight (8) other courses of the programme are still in development, and all courses are expected to undergo annual improvements for up to three (3) years. Additionally, the case study is expected to provide insights into overcoming specific contextual challenges, namely, supporting resource persons with traditional face-to-face teaching experiences to effectively deliver content in online asynchronous mode, as well as producing content in the English language in a manner that can be easily digested by students who are not native English speakers.

The scope of the study is limited to reviewing the design and development process, primarily from the perspectives of those who were involved in the process, i.e., the content development team including content developers, reviewers, and coordinators. Student perspectives of the course are not included, as at the time of initially writing this article, the courses were yet to be launched.

2. Literature Review

2.1 Success Factors and Best Practices

While there are many studies on critical success factors and best practices for online education, the research question requires a focus on asynchronous online education, instructor perspectives, as well as course design, development, and delivery.

Instructors of online courses must possess certain characteristics. First is pedagogical competence and its application to online education. This includes knowledge of instructional design, assessment strategies and the ability to create meaningful learning experiences (Rapanta et al., 2020). Instructors should possess effective written and verbal communication skills to effectively convey ideas to students (Foster, Colburn and Briggs, 2018). Digital literacy and online competence is another factor, as its absence can be an obstacle to effectively implementing quality online education (Al-Azawei, Parslow and Lundqvist, 2016).

In terms of course design and delivery, the course structure is notable (Peters, 1998; Kim and Kim, 2021). Another recurring factor is student interaction and its relation to learner engagement and motivation (Baxter and Hainey, 2023). Student interaction is of three types: (1) instructor-student interaction, which is limited in asynchronous learning, (2) student-student interaction, the importance of which is debated in asynchronous online education, and (3) student-content interactions which may be the most critical and easiest to implement in asynchronous learning (Moore, 1989; Kuo et al., 2013).

Varkey et al. (2023) has reviewed the best practices in asynchronous learning in the perspective of instructional and learning sciences. Sequence learning is one; it allows for spaced learning periods and retention intervals. This may be facilitated in an asynchronous environment via discussion forums, spaced question sets and formative assessments. Another key concept for asynchronous instruction is the use of Mayer's twelve principles in the creation of multimedia content (Mayer and Moreno, 1998). Additionally, clear and concise feedback to students is important to enable learning and change student behaviours.

2.2 Rubrics, Guidelines and Evaluation Instruments

Quality is a major concern in the design and development of online courses, and has given rise to various rubrics, guidelines and evaluation instruments.

Ko and Rossen (2010) reviewed several such systems, such as those developed by the Illinois Quality Online Course Initiative (IQOCI), North American Council for Online Learning (NACOL), California State University, Chico (CSUC), and Quality Matters™. Instructional Design and Student Evaluation and Assessment were the common elements across all four systems. Instructional Design in this case can include the course overview and introduction, clear course and learning objectives, content structure and sequence, active learning strategies and multiple learning paths. Other elements that were represented in at least three of the four systems are learner support & resources, and course evaluation and course management.

Several of these elements are repeated in a review of evaluation instruments by Baldwin, Ching and Hsu (2018) presenting 63 elements in four categories: (1) Course Design including goals, objectives, content presentation, learner engagement and technology, (2) Interaction and Collaboration, (3) Assessments, and (4) Learner support.

3. Methodology

The aim of the study requires a research design that enables an in-depth, descriptive investigation of the design and development process of the "Project Management Skills" programme. Hence, an exploratory case study was conducted (Yin, 2014; Tan, 2022). Case studies are well suited for instances where processes, problems and/or programs need to be studied to improve understanding which can in turn improve practice (Ponelis, 2015).

It purposively samples two of the twelve courses in the programme, as at the time of writing this paper, these modules had progressed the furthest in the design and development process, and therefore can provide more holistic insights.

The primary method for data collection was the review of documents such as meeting minutes, the project progress tracker, and content development drafts that include internal, external and language reviewer feedback. These are supplemented by key informant interviews conducted with four of the five Content Developers involved in the sampled two courses. These structured interviews were supplemented with a

questionnaire to categorize some of the responses. The structured interviews and supplementary questionnaire addressed four key areas of interest: (1) the Professional and Teaching Background of the Content Developer, as well as the Content Developer’s perspectives of (2) the development of content, (3) feedback from reviewers, and (4) other support provided to the Content Developer.

4. Case Study

4.1 Programme Overview

The intention behind the “Project Management Skills” programme is threefold, and is reflected in the three options that will be provided to students for undertaking the modules.

1. **Audit Course:** The objective is to provide a student with the required knowledge and skills of a subject. It includes a range of formative assessments to ensure the student has gained the knowledge and the skills. No summative assessments or examinations are included. On completion of the course an e-certificate of participation is issued. As a policy all Audit Courses on open.uom.lk platform is offered free-of-charge (FOC). This paper focuses on the design and development of these Audit Courses.
2. **Credit Courses:** The objective is to assess a student’s knowledge and skills at the end of a course and certify their competency at a given level. After a student has gained the required knowledge and skills as described in the Audit Course, the students must successfully complete the summative assessments and examination to earn the credit. On successful completion of the course a certificate with the credit value and the earned grade is issued. A nominal fee is charged for the summative assessments.
3. **Master’s Programme:** This is a stackable programme leading to a Conversion Master’s degree qualification at Level 6 of the Sri Lanka Qualifications Framework (SLQF) (Ministry of Higher Education, 2012). It is equivalent to the 4-year of the undergraduate honours degree. The objective is to provide students who have completed 3-years of undergraduate education in any field of study, such as the humanities, commerce, technology, or natural sciences an opportunity to top-up to an equivalent honours degree in Project Management.

Why will this course be offered online in asynchronous mode? First, it encourages self-directed learning which provides more flexibility to the student in terms of their commitment of time, and is predominantly dependent upon the student’s self-motivation (Davis, Gough and Taylor, 2019; Alzahrani et al., 2023). Perhaps the most important reason was to increase accessibility to the course regardless of the student’s geographical location, providing a more “inclusive and equitable learning experience” (Bower et al., 2015, p.2). As a result of the COVID-19 pandemic, the use of smart devices for learning (e.g., phones, tablets and laptops) became more prevalent among students in Sri Lanka. Despite this, the stability of internet connections in remote areas is a concern, and this can cause interruptions leading to a poor learning experience. This problem is resolved by offering the course in asynchronous mode. Additionally, the asynchronous mode can circumvent the problem of time zones and can encourage the enrolment of foreign students, which was seen as a potential revenue stream amidst Sri Lanka’s currency crisis.

Four courses of the programme were launched on the 23rd of June 2023. At the 8-week mark, the programme recorded more than 2300 student registrations and around 150 course completions.

4.2 Course Design

The Course Design process consists of four stages leading to the Content Development Process (Figure 1).

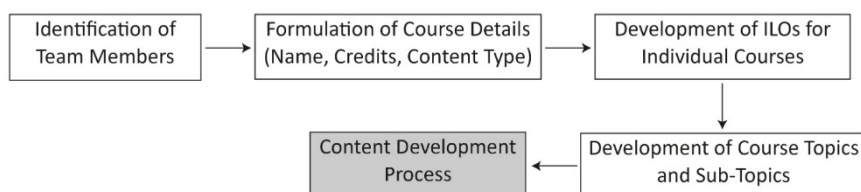


Figure 1: Course Design Process

The process began with the identification of team members. These include the Content Developers and Course Coordinators. Content Developers take on the role traditionally held by instructors in that they are responsible for developing and delivering the content of the module. They consist of a mix of industry professionals and academics. If more than one Content Developer is assigned to a module, a Content Lead is appointed to handle coordination between the Content Developers. Course Coordinators are academic staff from the University. Their primary responsibilities include formulating the scope and sequence of the module (i.e., course structure) in addition to some activities that may be usually undertaken by an Instructional Designer (Kenny et al., 2005). They are responsible for ensuring that the quality of the module meets the university’s standards.

The next step was the formulation of course details. After discussions, the twelve modules of the programme were developed by grouping appropriate Project Management Knowledge Areas and the additional inclusion of project management subjects specific to law and the IT industry. Each module should contain fourteen Topics, with each Topic having at least three Sub-Topics. Each Sub-Topic should contain a Lecture Video, the Script of the video, Lecture Notes, and Quiz Questions for Formative Assessments. Content Developers were requested to create at least 60-minutes of video per topic (i.e., 14 hours of lecture video per course), in order to meet the requirements for awarding the necessary credits for the Master’s programme.

In the third stage, the Intended Learning Outcomes (ILOs) for the courses were developed collaboratively by the Course Coordinator and Content Lead, supported by senior academics in the team. Considering that the target is to produce students eligible to sit for the CAPM exam, the program’s ILOs were mapped to the October 2022 Exam Content Outline (ECO) for the CAPM. Keeping in line with instructional design requirements, Bloom’s Taxonomy was used to formulate ILOs appropriate for the Master’s programme.

Thereafter, the course topics and sub-topics were developed based on the content of the Project Management Body of Knowledge (PMBOK) 6th and 7th Editions where possible. Additionally, the topics were benchmarked to the content of various project management courses worldwide, particularly those available in online asynchronous mode.

Information on the ILOs and course syllabus (i.e., topics) is made available to potential students prior to their enrolment in the course. The content types (i.e., lecture videos, scripts, notes and formative assessments) and a more detailed topic breakdown (i.e., sub-topics) are presented in a dedicated Course Overview section once the student is enrolled in the course.

4.3 Content Development Process

The Content Development process followed the Course Design Process (Figure 2).

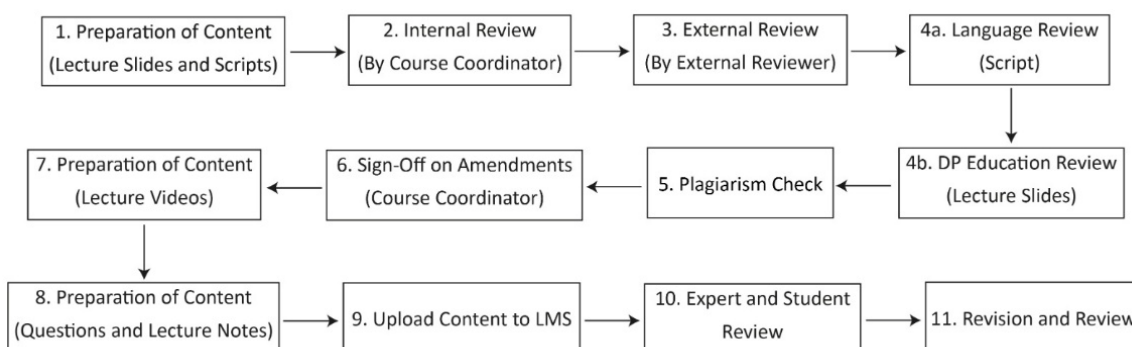


Figure 2: The Content Development Process

In addition to investigating the content development process in relation to contemporary practices, this section also presents the Content Developers’ perspectives on the process, particularly on developing the various content types: lecture slides, scripts, videos, notes, and formative assessment questions. The Content Developer’s perspectives help identify the challenges of the content development process. This is followed by complementary insights from the multiple “review” stages of the content development process.

4.3.1 Preparation of Lecture Slides and Scripts

The Content Developers were provided with a PowerPoint presentation template to ensure uniformity of content. The template includes colour coding instructions for text, to differentiate between important points, terminology and peripheral information in line with Mayer's Signalling Principle.

The script was prepared for two reasons. Asynchronous delivery required pre-recording of videos totalling 1-hour per topic. There is no flexibility to "spill-over" to next week's lecture when the content is too large, or to finish a lecture early if the content is too small. Another reason to include a script was to alleviate difficulties with language: while the medium of instruction is English, Content Developers and Students are not native English speakers. A script would allow the Content Developer to lecture with an uninterrupted flow and the correct use of the language, while students can follow the narration in the video or re-check any instances where terminology or enunciation is unclear.

The lecture script was the most challenging type of content to create, with one Content Developer finding it 'Very Challenging', and the remaining three found it 'Challenging'. The development of Lecture slides was found to be the third most challenging content type with three content developers finding it 'Challenging', while one was 'Neutral'.

A recurring theme on the development of the script was tied to experience in and a preference for traditional, face-to-face (F2F) or synchronous teaching. Adapting to asynchronous online course delivery was challenging for most Content Developers, but some stated that once adopted, the mechanism became easier. *"It was challenging to portray the necessary information while maintaining the appropriate speaking style"* and *"Speaking by looking at a script was very challenging because the usual practice is for [the narration] to naturally come out during the physical lectures"*, are statements made by content developers indicating a concern about sounding as if they are "reading" rather than "speaking" during the lecture.

The time requirement of 60-minutes of lecture video was challenging for contrasting reasons. One Content Developer found that *"it was very difficult to identify what should and should not be included within the time period"*. In contrast, at least two other Content Developers had trouble extending the videos to the required time due to their speed of speech or as stated: *"Sometimes there is no information to add."* The latter reason can be overcome by improvements to instructional design and strategy by the Course Coordinators, e.g., revision of the syllabus to include more topics and/or by including examples or case studies during the planned improvement cycles for the programme. Such strategies have the added advantage of increasing student interest in the content.

Other challenges encountered when writing the scripts include inexperience with asynchronous course development, the lack of project management knowledge of the target audience (thus requiring more detailed explanations), concerns about copyright, the use of *"correct information from reliable sources"* and difficulties in finding reference textbooks.

Per topic, lecture slides and scripts each took 6-12 hours for half the content developers while the other half took more than 24 hours to complete development. Interviews revealed that those who took less time were either more experienced in teaching or had not met the required total video length. Some felt that the financial payment for content development was not sufficient for the time put in and was de-motivating, indicating that content development activities took longer than initially anticipated.

4.3.2 Preparation of Lecture Videos

The lecture videos employ a didactic video style, specifically the "Talking Head", combining both the Voice and Image Principles of Mayer (Choe et al., 2019). In terms of pedagogy, the Content Developers were guided to create short videos no longer than 20 minutes in line with the Segmenting Principle allowing for the content to be digested easily.

Content Developers found Lecture Videos to be the second most challenging content type to prepare, both due to technological issues and being inexperienced with asynchronous education. They noted that not having interactions with students *"was very difficult to adapt to"*. One Content Developer found it 'Very Challenging' and took more than 4 hours per topic to complete recording. He opted to record the video by himself and experienced technical issues such as disruptions from surrounding noises and comparatively lower playback volume. He also experienced issues with video editing.

4.3.3 Preparation of Lecture Notes

The course includes Lecture Notes in line with the learning culture of Sri Lanka. It also serves to increase student-content interaction and provides an avenue to direct students to additional material on the internet.

Lecture Notes were the second easiest content type to produce. Three Content Developers felt 'Neutral' towards the process and took 2-4 hours of preparation per topic, while one felt the process was 'Easy' and completed preparation in 1-2 hours. The Content Developers noted that the reason for the relative ease of preparation is that the information required was already compiled when preparing the lecture slides and scripts.

4.3.4 Preparation of Quiz Questions

The Audit Courses require only formative assessments, which test the student's understanding of the work. Using H5P features on Moodle, some of these questions are made available at various points in the Interactive Lecture Video, in order to maintain student interest and increase student-content interaction. The remaining questions are made available as a quiz at the end of each topic, and the students must complete these to access subsequent topics. The Content Developers noted the formulation of questions as the easiest content to produce because of the variety of question formats available through Moodle, e.g., multiple-choice-questions, drag-and-drop etc. Summative assessments are still in development for the Credit Courses and Master's programme.

4.3.5 Reviews

The content development process includes multiple stages of review (Figure 2) both as a mechanism for providing support to the Content Developers, and to maintain quality. The feedback was categorized and rated in terms of their usefulness in the perspective of Content Developers.

Feedback on improvements to the content was the most highly rated with three Content Developers finding it 'Very Useful', remarking that the input from Course Coordinators with an academic background and those with experience in developing online content was very helpful. In contrast, one rated the feedback as 'Somewhat Useful', stating that the review process was detrimental at times due to the inclusion of new team members who proceeded to alter module outlines and/or were unfamiliar with the PMI process, as well as because the feedback provided at different stages would at times contradict one another.

Tips on Presenting was rated highly, with 2 Content Developers finding it 'Useful' and 2 more finding it 'Very Useful'. After watching sample videos prepared by the Content Developers, feedback on lighting, facial expressions, gestures, voice modulation and speed were provided.

The Language check was similarly rated, with one Content Developer commenting, "*Language is important [because the] content developer does not have 100% English fluency.*" Another noted that if unfamiliar with technical terms, the Language Reviewer could alter terminology and phrases that could change the meaning of the content. This is not a major issue, as all feedback is incorporated to the content at the Content Developer's discretion. Additionally, language reviews were conducted with the target non-native English speaker audience in mind and included suggestions for simplifying sentence structure and terms.

The perception of feedback on teaching strategies is mixed with two finding it 'Very Useful' and others finding it 'Somewhat Useful'. Pedagogical advice from academics were appreciated by some, while others felt that they did not receive enough feedback on the topic, perhaps indicating that more uniformity in providing feedback is necessary.

The final review stage, that is, the "Expert and Student Review" was conducted using a feedback form. Most responses were rated on a scale (either labelled or numbered). In general, the feedback was positive, and the consensus was that all the content of the courses are at least at an acceptable level. The reviewers suggested improvement to the content, which can be incorporated in future iterations of the development process. Closed Captions were recommended as an alternative or supplement to the script to facilitate better understanding of the English language for non-native speaker students. Suggestions regarding the user interface of the course (e.g., ability to scroll through the script while watching the video) were noted and will require modifications to the LMS itself. The reviewers noted that the ability to move freely within the content without restrictions could be improved. Currently, students cannot skip ahead when watching videos, and cannot access subsequent topics without completing a set number of tasks (i.e., watching the video and answering the formative assessment

questions). However, the removal of such restrictions may cause concerns as to whether students would genuinely review the course material before acquiring a certificate of completion.

5. Collaboration and Support

The Course Design and Development processes require collaboration of many parties as seen in Figure 3.

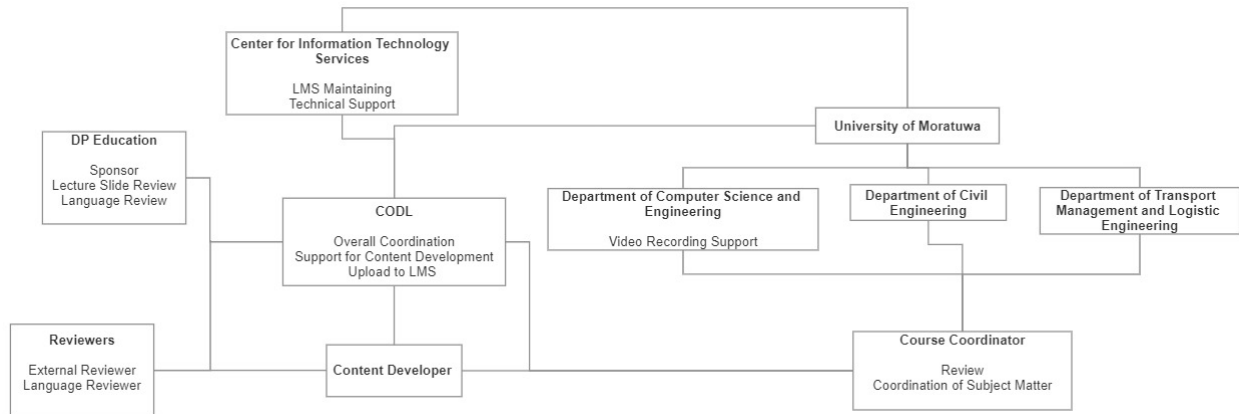


Figure 3: Network of Collaborative Parties

The Content Developer may be viewed as the central figure supported by Course Coordinators, External and Language Reviewers, as well as the Centre for Open and Distance Learning (CODL). Traditionally, an instructor would perform four roles: Pedagogical, Social, Managerial and Technical (Berge, 1995; Morris, Xu and Finnegan, 2005). In this case study, the content developers are either supported in these roles or are completely removed from some roles as others fully take on some of these responsibilities. For example, CODL as the overall coordinating body, takes on the Social and Managerial roles as well as the uploading and management of content on the Learning Management System (LMS). Other elements of the Technical role are undertaken by the University's Centre for Information Technology Services. It leaves the Content Developer primarily with the Pedagogical role, supported by the Course Coordinator. This is an important feature, as it reduced the burden on the Content Developers who work full-time on other jobs, and/or may not have the competencies required for all four roles.

It is also relevant that the primary selection criteria for Content Developers is their familiarity with the subject matter. Possessing a PMI certification was not essential, but an added advantage. Technological competency was not a criterion, as support was to be provided through the CODL. Consequently, CODL had to provide more technical guidance and support to Content Developers of the Project Management Skills programme, especially in comparison to the Content Developers involved in previous IT related programmes such as the Trainee Full Stack Developer Course. The selected Content Developers consisted of mostly industry professionals and a few academics, and had additional workloads and time constraints.

Collaboration was facilitated mainly through Meetings on the Zoom platform, while collaboration on content was facilitated by the use of shared folders and documents on Google Drive. It is interesting to note that the team had convened in person only on one occasion (to attend a workshop), but have otherwise worked remotely. Communication lines are open via phone, email and group chats on WhatsApp.

In terms of usefulness, Meetings received mostly positive feedback from Content Developers. Positive comments noted that the meetings allowed for input and discussions on how to improve content and was a useful medium to receive comments from persons experienced in the use of asynchronous online education. A recurring suggestion for improvement was adjustments to the frequency and length of meetings, moments of repetition and lack of structure leading to feelings of unproductivity. As an industry professional, a Content Developer noted "*financial loss*", or the opportunity cost of time spent at meetings. A strategy used by CODL to counter the number of weekly meetings was to form clusters (i.e., combining the teams from multiple courses).

Material support provided to the content developers included a detailed 'Guideline for Content Creation' which outlined requirements for and provided support on pedagogical (e.g., consistency of content) and technological issues, and additional support material relating to Project Management content (e.g., reference texts).

The Technical Assistance provided was appreciated by the Content Developers, who cited their lack of technical knowledge. Additional help in video editing was requested by one Content Developer. Technical assistance was initially provided with instructional videos on specific activities (e.g., the creation of lecture videos using three different types of software), and then individual requirements on request. While most Content Developers chose to record the videos using their own devices and in their own spaces, the university also provided recording equipment and access to the recording studio on request. Additionally, a workshop on video preparation was conducted on a face-to-face basis early in the content development process.

A perceived downside of collaboration was the inconsistency in subject matter and presentation due to the involvement of multiple Content Developers for the same course. A suggested solution was greater involvement in subject matter coordination by the Course Coordinator.

6. Conclusion

The case study explores the content design and development process of two courses of the open.uom.lk's online asynchronous "Project Management Skills" programme and notes that in general, the process complements contemporary theories and practices, especially in the pedagogical and technical arenas. For example, Mayer's Principles were incorporated in multiple aspects of creating content for the courses to deliver an effective asynchronous learning experience to the students.

A key finding of the study is the role of collaboration that emerges from the process. Collaboration through the multiple review content development process (Figure 2) was found to resolve many issues, including the case-specific contextual challenges stemming from the Content Developer's inexperience with teaching in online asynchronous mode, and addressing the issues of English language competencies of both Content Developers and potential students. Additionally, the delegation of the traditional instructor's roles in pedagogical, social, managerial and technical arenas to other team members helped reduce the Content Developers' workload and played a significant role in maintaining the quality of the content. Significantly, the programme was able to engage many industry professionals as lecturers, as they were supported in the pedagogical, technical and managerial roles by members of the collaborative team. However, the study notes that collaboration requires both good communication and coordination strategies. Particularly, tools such as meetings must be streamlined to maintain productivity and team motivation.

The findings of the study will be very useful for other courses currently in development under the "Project Management Skills" programme, as well as for the development of other asynchronous learning courses within similar contexts. The study is limited by the small number of key informants. The inclusion of more courses in the analysis may provide insights of statistical significance. This could be the basis for further work once more courses are complete. A larger sample size for questionnaires could allow analysis for statistical correlations, for example, between the Content Developer's competencies in asynchronous online education and their experience developing content for this programme.

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