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Using Generative AI to Augment & Adapt A Flagship In-person Course into Asynchronous formats- A Case Study

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Background

The Master of Engineering Technical Management (METM) Program was founded in 2019 as an online graduate program for working professionals in the technical fields [1]. It has welcomed five cohorts of graduates since its inception. The program is currently delivered asynchronously online with the exception of two in-person Residency Week; students take the rest of the courses remotely, at their own pace, while balancing a full-time career and their family life.

Challenges in Front of Us

As the METM program matures and establishes its core curriculum and major partnering organizations (i.e. those who have employees graduated from the program), there is an increasing demand for flexibility in customizing the learning paths without committing to a full graduate degree, i.e. certificates consisting of different combinations of existing courses, especially when the financial and time investments required of getting a certificate are more manageable; additionally, students have the option to taking multiple stacks of certificate towards a full degree.

Due to the nature of the certificates and unique learner characteristics, it is best to offer them as online, asynchronous courses. Thus, the current in-person Residency Week courses must be converted into the same delivery format as the rest of the curriculum. Traditionally, instructors will redesign the course in terms of content, activities, assessments, etc. to adapt to the new

delivery format and duration of the course, while keeping the same learning objectives and workload as if the course is offered in-person [2] [3]. This method could take a significant amount of time- on top of redesigning, instructors need to record their lectures for students to watch on-demand.

Solution

After brainstorming, the instructors for one of the Residency Week courses, TCMT630. Organizational Leadership for Senior Technical Leaders, decided to explore the feasibility of utilizing the power of Generative Artificial Intelligence (Gen AI) to facilitate converting their course to an online course: this course is currently a five-day, in-person class, to be converted to an eight-weeks online course. The objective is to complete the conversion within a shorter lead time, and achieve a more comprehensive adaptation using a compilation of previously accumulated course materials (classroom recordings, lecture slides, etc.) when compared to the traditional conversion method.

Implications

This work-in-progress paper will discuss details of course structure, pedagogical adaptation, student engagement strategies, technological implementation, benefits and challenges of using Gen AI in this process, and future plan for implementation and evaluation of learning outcomes. The scope of this paper is to discuss the utilization of AI-powered tools in course conversion process, while taking into consideration the difference between online asynchronous learning and in-person synchronous learning; the focus will be on the process, instead of on the discussion of instructional design theories and frameworks- which will be incorporated through prompting AI with the current format, content, objectives of the course, and critical aspects to

consider while designing an online course - to create the same but “distilled” version of the course that is going to be offered in a different format.

Once the process is tested, this AI-assisted conversion has the potential to become the “blueprint” to convert other in-person courses to online formats for the METM program. Findings in this study could also shine light for other educational programs or instructors who face similar challenges during their course development/transition, or those who want to try an alternative way of problem solving, e.g. taking a ride on the AI wave.

Keywords: ***Generative AI, Working Professionals, e-Learning Development, Engineering Education.***

Course Structure

This course was first offered in 2020, and has been offered eight times as of January 2026. The current course delivery format is in-person, synchronous course. Students attend classes in person from eight am to five pm for five days in a row. Table 1 illustrates the five-day schedule and various leadership topics for the course. Besides lectures, students participate in live discussions with their peers, role-play simulations, as well as completing the following assessments to evaluate their takeaways from the lectures, readings, and discussions (Table 2).

Day	**Organizational Leadership Topics for Senior Technical Leader**		
Day 1	Module 0. Course Intro Module 1. Organization Structure & Leadership Roles	Module 2. Defining Your Personal Brand and Adapting It Over Time	Module 3. Defining Goals and Desired Outcomes
Day 2	Module 4. Team Building, Acquiring Talent, Motivation, Retention, and Healthy turnover	Module 5. Networking & Leading without Authority	
Day 3	Module 6. Decision Making with Full/Incomplete/No Data, Ambiguity	Module 7. Innovation	

Day 4	Module 8. Conflict Management & Negotiation	Module 9. Leading Changes in Your Organization: Managing the Resistance	
Day 5	No class, students attend guest speaking events.		

Table 1. Current course schedule.

Assignments:	**Maximum No. of Pages***	**Points**
Daily Quizzes * 4 (complete in-class)	-	50 points
Paper 1 (due 11:59pm on Monday)	4 pages	100 points
Paper 2 (due 11:59pm on Tuesday)	4 pages	100 points
Online Discussions (multiple due dates)	-	100 points
Final Paper (due 11:59pm the following Sunday)	6 pages	150 points
Total	*Including cover page	500 points

Table 2. Current course assessments.

Pedagogical Adaptation

For the majority of the time, the instructors, who are the primary agents, are giving direct instructions (ID) and taking the lead on the pace of the class, which is a teacher-centered pedagogy [4]. Students, as the passive recipient of information, do not get as many opportunities to practice reinforced learning as they would in an online, asynchronous class. Although students have a printout of all the lecture slides, so they can focus on the dialogues that go beyond the bullet points in the slides, they must focus their attention listening to the lectures and taking notes, while interacting with the professors and among themselves. According to the neuroscience of learning [5] [6], they rely mainly on their working memory, which puts constraints on their cognitive resources. Their perceived social presence is determined by their willingness to participate and mental engagement, which will impact their perceived sense of isolation [7].

This redesign is grounded in Cognitive Load Theory (CLT), first pioneered by Australian Educational Psychologist John Sweller in the late 1980s, is an instructional design theory that is widely recognized in many disciplines, including STEM education (science, technology,

engineering, mathematics). One of the arguments it advocates is that learning is optimized when information is presented in a way that takes into account the limited capacity of working memory [8][9]. Based on this theory AI (Notebook LM) was instructed to convert 40 hours of in-person learning effort into a manageable asynchronous structure to prevent learner burnout and optimize learning outcomes. Considering the different environment students would be in when taking an online asynchronous course, many aspects of the course must be redesigned in order to achieve the best learning experience and outcomes for the students. As a two-credit hour graduate level course that operates from eight am to five pm for five days, the 40 hours of learner efforts will need to be redistributed into eight academic weeks to meet the time requirement of an online asynchronous certificate course. And while there is no structured time allocated to participate in learning, students learn at their own pace, but must be self-accountable to start and finish under a time constraint (eight academic weeks). Keeping learners engaged is easier to do for in-person classes while instructors can read the signals by looking at students' reactions and asking questions to gauge their comprehension- for an online course, immediate feedback/communication is difficult, there must be strategic learning activities and assessments with structured due dates as checkpoints to guide and keep students engaged from start to finish. For example, the in-person discussions will become discussion board activities [10], role-plays simulations will become a recorded video assignment, as well as live office hours, to promote student-student, student-teacher interactions and reduce the perception of online learning isolation [7].

Table 3 lists the major difference in characteristics of the two course modes, challenges and opportunities of each kind, as well as the redesign strategy for a successful transition from Point A (synchronous learning) to Point B (asynchronous learning).

Characteristics	Synchronous Learning (point A)	Asynchronous Learning (Point B)	Redesign strategy
Pacing	Instructor-led	Learner self-paced	Course schedule
-Flexibility	Low	High	Course schedule
-Learner Accountability	Structured environment that builds accountability	Rely on self-discipline	Have consistent, manageable due dates
Interaction	Real-time, simultaneous	Time-delayed, on-demand	Recurring office hours, activities to foster interaction
-Feeling of Isolation	Less likely to feel isolated	More likely to feel isolated	Foster peer-to-peer dialogues and collaborations
-Learner Engagement & feedback	Easier to spot and intervene early on	Difficult to spot and delayed intervention	Add regular checkpoints
Primary Pedagogy	Mainly Direct Instruction (DI)	Opportunity for Active Learning (AL) and Reinforcement Learning (RL)	Adjust pedagogy, design appropriate activities & assessments
-Learner Cognitive Load	Lower. More relying on Working Memory (WM)	Higher. More relying on Active Learning (AL)	Breakdown lectures into smaller chunks

Table 3. Comparison of characteristics of two course modes and redesign strategy.

Technological Implementation

The diagram below (Figure 1) illustrates the overall process this paper is proposing to convert an in-person course to an online asynchronous course with the help from Gen AI. The starting point is the accumulated classroom recording **transcripts,** and the finish line is the fully developed online course. Steps are described in detail in this section.

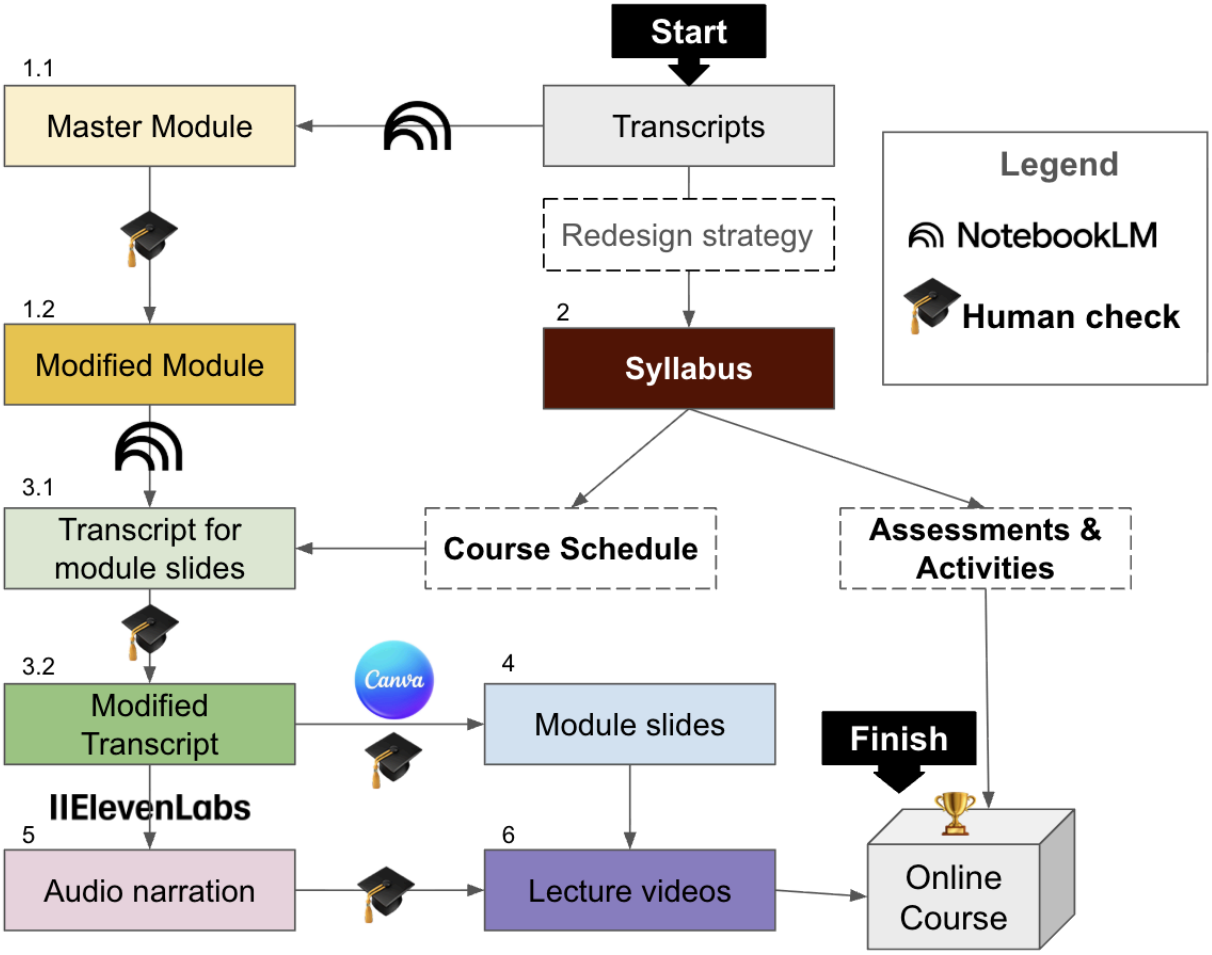

Figure 1. Workflow explained, from transcripts to an online course.

Step 1.1. Consolidate transcripts to create "Master Modules". All transcripts from previous years (2020-2026) of classroom recording were gathered, labelled accordingly, and converted into accepted text documents. The goal is to consolidate the lecture materials over the years because each semester has good content with variations due to incremental improvements over time. Thus, all of the transcripts were used, none were discarded, as providing more data points to AI would have a better result than less data points. Notebook LM was used to consolidate module content, including main points, key takeaways, stories/cases used, questions

asked by students, in-class activities (discussions, role-play, simulations, etc.). Nine “Master Modules” were created to get ready for Step 1.2.

Step 1.2. Faculty review of Master Modules and edit into “Modified Modules”. This is a very critical step- instructors must review and identify AI-induced errors, hallucinations, etc. as well as hand pick the content that they would like to present. For example, while the Master Modules were designed to retain a bank of examples, cases, stories mentioned over the years, what were used in early semesters (2020, 2021, etc.) might have been tried and discarded based on their evaluation of students’ feedback and fitness for the topics.These evaluated and edited modules were then labelled as “Modified Modules”.

Step 2. Create a course syllabus adapting the asynchronous delivery mode. Using the redesign strategy mentioned in Table 3 and the **Modified Modules** were used as source files to create a course syllabus for an online, 2-credit hour course that requires 40-45 hours total learner efforts over eight academic weeks. Instructors then review and modify the syllabus to ensure its accuracy and alignment with learning objectives. Table 4 was taken as part of the syllabus to demonstrate learner activities and learner efforts (measured in minutes and hours) by week. This will become the guidelines for the module building step next.

Learning Activities per Module		
	Activity	**Approx. Learning Effort**
	Video lectures	70–90 minutes
	Readings / curated resources	45–60 minutes
	Applied learning activity	75–90 minutes
	Assessment (graded)	45–60 minutes
	Total per module	**5–5.5 hours**
Week-by-Week Time Breakdown		
Week	**Modules**	**Approx. Learning Effort**

1	Module 0 - 1+ Orientation	4.5–5 hrs
2	Module 2	5–5.5 hrs
3	Module 3	5–5.5 hrs
4	Module 4	5–5.5 hrs
5	Module 5	5–5.5 hrs
6	Module 6	5–5.5 hrs
7	Module 7	5–5.5 hrs
8	Modules 8–9 + Capstone	6–7 hrs

Table 4. Learning activities and weekly schedule, copied from course syllabus.

Step 3.1. Module building-Transcript. Using the learning activities and weekly schedule (Table 4), it is time to build the actual module content using these guidelines. Sections from the Master Module documents will be incorporated into corresponding course elements (Table 5), such as slides' bullet points, learning activities (e.g. reading, discussions, group assignments, quizzes, projects, etc.).

Master Module Sections	What to do with it
1.0 Unified Structural Outline	Incorporate into lecture slides
2.0 Core Key Concepts & Takeaways	Use as module learning objectives, and learning activities
3.0 The "Story & Case Bank"	Incorporate into lecture slides
4.0 Engagement & Activities	Turn into learning activities
5.0 The Q&A Archive	Turn into learning activities
6.0 Variable Content	Incorporate into lecture slides

Table 5. Learning activities and weekly schedule, copied from course syllabus.

For example, the following section shows what Week 2 looks like for students in the created syllabus.

Week 2: Cultivating Your Professional Influence

This week focuses on the critical task of building a professional reputation that precedes you, moving from a passive commodity to a sought-after asset.

Module Topic: Module 2: Defining Your Personal Brand

Key Questions:

- *If you don't define your professional brand, who does?*
- *How can digital tools be leveraged to build a reputation that precedes you?*

Learning Activities:

- Video Lectures: The Brand Concept; Strategic Importance; Actionable Brand-Building Strategies.
- Readings: "*Case Study of Marcus Rashford: The People's Champion, a 'National Treasure,' and an Inspirational Personal Brand"*.
- Applied Learning Activity:
    - Pick a real life person that was successful in building a strong personal brand, study their personal brand, branding strategy, and success factors.
    - *Personal brand statement*. Students will craft their unique personal brand statement and share it in the discussion forum for peer feedback.
    - *Elevator Pitch Development & Peer Review.* Students will craft a 60-second elevator pitch and practice as a simulation with either a classmate, or a work colleague, record a video and share it for instructor and peer feedback.
- Assessment: Week 2 Comprehension Quiz.

The **Modified Module** document for Module 2 was added to Notebook LM as source file with very specific prompts of how to utilize each section (Table 5) to create **transcripts** for audio narrations of the slide decks. Guardrails were enforced in the prompt, e.g., transcripts must align with module learning objectives, and use "1.0 Unified Structural Outline" section as the outline for the transcript; and the length of the audio narration of all the slides for one module must be within 60-90 minutes using the average speed of nature speech.

Step 3.2. Faculty review transcripts and edit into "Modified Transcripts". This is another vital step to ensure alignment and accuracy, as well as an opportunity to add or remove content based on the estimated length of the transcript.

Step 4. Create Slide Decks based on Modified Transcripts. A few approaches can achieve this goal: either manually build the slides, or having AI create draft versions for further edits. One of many popular AI slides creation tools is Canva, its AI slides feature was released around October 2025. By uploading the **Modified Transcript** and providing style preferences through natural language, Canva generated fully editable draft slide decks (see a **draft slide deck** for Module 2). The draft slide decks then get further edited to the instructors' liking.

Step 5. Audio recording for Slide Decks. There are many options for how to create audio clips for the transcripts generated from **Step 3**: the instructors could either record themselves in a studio-like environment, or, they could utilize various AI-powered tools to voice-clone themselves, and generate audio narrations. The tool chosen in this case was ElevenLabs (free and paid tiers available). By uploading a short clip of audio recording, ElevenLabs then learns and trains its model to produce audio files based on any scripts the instructors want it to narrate in their voices.

Step 6. Module Building continued. Now it is time to assemble the module elements together. Combine slide decks with their corresponding audio narrations, and convert it into lecture videos. The rest of the module elements, such as readings, applied activities, assessment, will be posted onto the selected Learning Management System.

Discussion & Conclusion

Benefits and Challenges of using Gen AI in this process

Time-saving has the biggest consideration of using Gen AI tools for this project. Beginning Step 1. Transcript consolidation, if done manually, consolidating transcripts from 2020-2026 (eight semesters offered) will take a significantly longer time, and likely requires a professional Curriculum Archivist to perform this task. Table 6 demonstrates a breakdown of the time consumption comparing AI (Google Notebook LM, in this case) versus human. Assuming 8 hours of recording for four days each semester, minus lunch hours and breaks in between (2 hours total per day), that would be roughly 192 hours of transcripts. Note that both scenarios are approximations for idea implementation, but the contrast is undeniably significant: **one hour** versus **one year** of full-time commitment, just at the very first step.

Task	NotebookLM (AI)	Curriculum Archivist (Human)
Initial Processing / Indexing	~15–30 minutes (upload and background grounding).	~1,500+ hours (Initial reading/listening alone takes weeks).
Thematic Identification	< 2 minutes per query.	300–400 hours (Using qualitative coding software like NVivo).
Reducing Overlap	Instant (via cross-source analysis).	100–200 hours (Cross-referencing notes/spreadsheets).
Preserving Examples	High Precision (with direct citations).	Variable (Human memory/note-taking is prone to omissions).
Total Estimated Time	~1 Hour (Including prompt refinement).	~9–12 Months (Full-time dedicated effort).

Table 6. Time effort comparison of human Curriculum Archivist versus AI in consolidating lecture transcripts (Step 1).

However, with “super power", there comes more responsibilities- AI gets confused with the instructions if the prompts are not well-written (unclear, unstructured, etc.), and makes mistakes even when prompts are well-written. Human supervision and intervention was needed in every step of the process to ensure both inputs (source documents) and outputs (AI generated content) were evaluated for alignment (goal-achieving) and accuracy (factual). Reiterations, i.e. trying and modifying prompts as well as running the same prompts multiple times were also necessary at times.

At the time of submitting this paper, we have not fully completed the course conversion, thus, the total time spent on AI tools, faculty review/modification cannot be calculated as of now. We hope to report this piece of information in later phases of this project.

Cost-wise, faculty and the instructional designer do not get extra compensation to work on this course re-design project; the cost of technology will be the cost of accessing Google Notebook LM, Canva, ElevenLabs. While ElevenLabs charges a monthly subscription fee ($99/month for Pro level, 500 minutes of audio generation), the other tools are free to access for the faculty and the instructional designer- although they might not be free for other users and institutions, something to plan strategically beforehand..

Future Plans

Currently, this project is at **Step 4. Create Slide Decks based on Modified Transcripts**, thus, no audio clips have been generated, and the full course is yet to be put together. The instructors need to finalize the Audio Transcripts as well as the Slide Decks before going into audio production. At least, the path forward is laid out with clarity, and with AI models evolving exponentially and fast, we are certain that the final product would be better than expected.

The plan has three phases: Phase one is to completely convert this course, TCMT630. Phase two is to evaluate the workflow based on students and instructor feedback, i.e. evaluation of quality and effectiveness of AI-generation and AI-human collaboration flow using a faculty interview, as well as students' feedback after the in-person course is offered (student survey will mirror the in-person course feedback survey, with additional questions gauging the naturalness of the cloned voice and remote learning effectiveness). Phase three is to use the improved workflow with gained insights from previous phases to convert other in-person courses in the program.

The findings and proposed strategy could also shed light for other educational programs, who are likely facing similar challenges converting traditional face-to-face courses into online asynchronous format.

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