UNIVERSITY OF GOTHENBURG

DEPARTMENT OF EDUCATION, COMMUNICATION & LEARNING

ONBOARDING XMOOC PROJECT TEAMS

Designing learning for professional development

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Thesis:	30 higher education credits
Program and/or course:	International Master's Programme in IT & Learning
Level:	Second Cycle
Semester/year:	Spring term 2020
Supervisor:	Dr. Christian Stöhr
Examiner:	Dr. Annika Lantz-Andersson
Report no:	VT20-2920-005-PDA699

Abstract

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Keywords:	MOOC, instructor, onboard, 70-20-10, ADDIE, constructive alignment, TPACK

Purpose: The goal was to design and test a best-practice Onboarding approach, informed by literature and an instructor survey, to address challenges in executing MOOC projects, and to improve the Onboarding experience for MOOC instructors and project teams.

Theory: The author compiled challenges and best practices into the ADDIE framework as inspiration for selecting critical learning objectives for an Onboarding curriculum, employing the 70-20-10 model (McCall, Lombardo, Lombardo, & Morrison, 1988). Iterative design techniques were informed by thoughtful interaction design (Stolterman & Löwgren, 2004). Evaluation of a beta prototype was conducted using the framework proposed by (McKenney & Reeves, 2012)

Method: The project team previewed the alpha prototypes of a MetaMOOC learning design. The beta prototype was developed with indicative content and formally evaluated with five experts using qualitative interviews. Coding of the feedback included categories to inform future iterations.

Results: Evaluations of the beta prototype learning (formative) objectives and content provided showed these to be largely appropriate with suggested improvements. The design (summative) objectives were proven to be unrealistic. The author recommends a more comprehensive curriculum as well as project management toolkit, spanning the entire project lifecycle.

Foreword

The International Master in Information Techology and Learning has been simply a fantastic experience. At last I obtained theoretical background to complete the somewhat disjointed “learning by doing” work experience of the last 20 years. Having the luxury to contemplate, reflect, and discuss with classmates has been welcome at this stage in my life. Thank you to my course leaders Dr. Thomas Hillman and Dr. Markus Nivala of Göteborgsuniversitet, and to my classmates.

Similarly, whilst the thesis is an important “rite of passage,” in a student’s life, for me the effort primarily represented a chance to learn more about a field I have a passion for. Furthermore, I wanted to get a suitable experience to move my career in a different direction. Although I have managed many professional projects in my life, this was the first large academic project I have ever worked on, replete with cultural differences from my normal corporate working life. When one completes such a project it’s important to thank people who gave their valuable time and attention to help. One could not have hoped for a better advisor in Dr. Christian Stöhr of Chalmers University. Dr. Stöhr was instrumental to setting up dialogue and creating the momentum for a thesis-worthy project. His experience in supervising student theses was a critical factor in helping me complete the effort in a structured and disciplined fashion. I learned even more about the domain through his guidance in key concepts such as TPACK. He always expected professional work and took the time to provide constructive feedback.

There would have been no project without the Chalmers Blended Learning team: Hugo Landgren, Anders Bark, Sofia Toivonen, who welcomed me into their cozy office immediately. It was a dream of mine to work with MOOCs and was a rare chance to work with the only team in Göteborg doing so. They were always available to help with questions and resources, and I can only hope at some point that this project helps make their work easier. The external experts who evaluated the prototype each gave up at least two hours of their valuable time to help, not least out of the respect they have for Dr. Stohr and the Blended Learning team.

My mother, Dr. Lee Wilberschied, brought all of her years of academic expertise to bear on my behalf (!) in reading one of the final drafts of this paper, furnishing any number of helpful corrections, constructive criticism, and motherly encouragement.

Finally, to my husband Arash and son Max, thank you for being patient when I didn’t always have time for you in the last couple of years. As Max says, “mommy now you can have fun again!”

My sincere gratitude to you all.

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1 Introduction

In 2008, Downes' and Siemens' open online course, "Connectivism and Connected Knowledge" attracted 2,000 students (Hollands & Tirthali, 2014) and energised the learning community, prompting considerations of the potential of Massively Open Online Courses (MOOCs) at the university level. The MOOC vision was to afford students from around the world more open access to higher education using web-based technologies. The year 2012 proved to be a point of departure for MOOCs, initiated with three free-of-charge courses from Stanford University: Introduction to Artificial Intelligence, Machine Learning and Introduction to Databases. Each course attracted over 100.000 students, causing somewhat of a sensation as the concept emerged in the TED Talk forum (Pappano, 2012; Shah, 2013; TED Global, 2012). The instructors from these courses went on to found Udacity and Coursera as for-profit digital education technology providers. Within months, in a swift reaction to what appeared to be a growing commercialisation of higher education, MIT launched MITx, recruiting "partner" institutions to offer courses on its learning technology platform (McGill University, n.d.). That same year, MIT announced a (critically, non-profit) collaboration with Harvard University and MITx was renamed EdX. EdX was initially envisioned to first, enhance Harvard and MIT's on-campus students' experience and second, to make learning from prestigious institutions more accessible globally (Chandler, 2012). Today, many MOOCs routinely attract tens of thousands of students from all over the world, all learning at once.

After more than a decade of existence, MOOCs as a concept have evolved into a few archetypes (Haavind & Sistek-Chandler, 2015):

cMOOC: in the spirit of Connectivism, the instructor monitors and steers online interactions to build connections between participants. The instructor has a significant role as a moderator and the reward to the learner is intrinsic learning and networked knowledge. This is the approach preferred by Downes and Siemens (Hollands & Tirthali, 2014).

xMOOC: thousands of participants engage either for no credit or a paid certificate, with a learning experience mainly designed around a Behaviourist model. Emphasis is on keeping learners engaged enough to continue through the course, rather than covering the same heavy content load as would be typical for an on-campus course. To effectively manage the sheer scale of student numbers, the learner experience relies on individual performance and automated feedback features.

pMOOC: smaller groups of learners collaborate online to complete a given project, in the spirit of a Constructivist or even Situative learning approach, depending on the type of project. An early example of this was the Stanford initiative Venture Lab (Shah, 2013).

hMOOC: a blended learning approach with learners participating also offline, potentially more similar to traditional university distance-learning courses.

Since the original ideal of expanding accessibility of learning to the globe, the larger xMOOC providers, including the self-proclaimed not-for-profit ones, have become more focused on revenues than altruism. Accordingly, their predominant strategy is now on the "professional lifelong learner" (Shah, 2018). Simultaneously, the xMOOC concept has exploded in popularity, with Coursera and EdX boasting 37 and 18 million registered users respectively in 2018. That year also saw a cumulative 900 universities having launched a total of over 11.000 MOOCs on various platforms (Shah, 2019). It is clear from the numbers alone that there is real market demand for MOOCs, and universities have an interest in mastering their delivery earlier than their competitors.

Chalmers University in Göteborg, Sweden, started developing MOOCs in 2014. Although Chalmers was successful in publishing them, the process of developing MOOCs compared to traditional campus courses proved to be challenging for all involved. Those universities who wish to embark on the

xMOOC journey need to temper their enthusiasm for the new medium with several realities. The digitisation of classroom-based content in conjunction with a multidisciplinary team, the experience of being both temporally and physically removed from students whilst instructing, and administering thousands of students in one course, are usually new professional skills for the instructor who has to deliver a MOOC learning experience. The challenges and best practices of MOOC projects are documented in academic literature and reports, yet not presented in a any useable methodology or framework for new project teams. Such structured sets of lessons learned and benchmarks, organised according to a standard learning project methodology such as ADDIE (Analyse, Design, Develop, Implement, Evaluate), can be useful for instructor and MOOC project team Onboarding and as guidance as a project progresses.

To place this assertion into context, this study considers a project with an xMOOC production team with experience in delivering over 20 MOOCs and MicroMasters® programmes on the EdX platform.[1] The Blended Learning team of Chalmers reflected on their experiences and decided that, although they had managed to get the MOOCs "live," the journey from concept to go-live could be improved in future projects. Their historical "light-touch," supportive approach sprung from a desire to be respectful of the instructors, acknowledging the importance for the sense of ownership of the MOOC be kept with the instructors. Yet, it resulted in project deliveries being compressed too close to the planned go-live date, as well as frequent go-live date postponements. The Blended Learning team's proposed solution to these challenges was a "MetaMOOC primer" digital course targeted at new ChalmersX xMOOC instructors, delivered via the EdX platform. The course was intended to provide several benefits, not least among them to begin socialising new instructors to what was expected of them whilst working with an xMOOC project team. In order to deduce what content should be included, the team conducted a survey of experienced ChalmersX instructors in early 2019 (Chalmers Blended Learning Services, 2019).

1.1 Purpose of the study

The design problem (which can be interpreted as the "research question") to be addressed was to design a best-practice Onboarding approach for new ChalmersX instructors, incorporating the ChalmersX experience with available research. The approach should address the concerns of the Blended Learning team, ultimately contributing to improvements in project delivery and quality. This study presents the design, evaluation, and findings of an Onboarding learning approach for new xMOOC instructors, culminating in the evaluation of a beta prototype course delivered over the EdX learning management system. The design focused on mitigating reported challenges, and selecting key best practices available in the survey of Chalmers instructors, domain literature, and EdX learning materials.

1.2 Summary

As a first step, the author was asked to consult the literature and survey and report findings to refine the project scope. The MetaMOOC Primer course existed in a draft status but with minimal content. The author was given freedom initially to design an approach which would include, but not be limited to, this draft course in its form at that time. The project scope changed during the design process, which this thesis describes in detail.

The thesis is structured as follows: The *Literature Review* section presents the most-frequently mentioned challenges and best practices from the literature and EdX learning materials within the

[1] EdX MicroMasters® programmes are short curricula of several graduate-level courses in a focused domain designed for career advancement or as a potential way to start a full master's degree at the partner institution at a lower cost (EdX, n.d.-b).

ADDIE (Analyse, Design, Develop, Implement, Evaluate) framework. These are then compared to the ChalmersX instructor survey results, synthesising similarities and trends across all sources.

The next section, *Recommended Design Approach*, presents the design problem in more detail, as well as the designs that were refined over three design iterations. The rationale behind using the collated literature from the ADDIE model to define key learning objectives for each project phase is explained. The initial concept, a comprehensive professional blended learning approach informed by the 70-20-10 model (McCall et al., 1988) is elaborated upon, as well as the dynamics influencing the project scope over the next two design iterations.

In the *Development Project Evaluation* section, the method and rationale for designing a formal evaluation of the third design iteration, or a "beta" prototype, are explained. Additionally, the method for selecting participants and how data were collected led naturally to the results and analysis of the evaluation. The course's fitness to deliver defined formative (learning objectives) and summative (design) goals are examined in detail and recommendations for improvement in the next iteration are summarised.

The *Discussion* section critically examines the project starting with the assumptions made at the very beginning of the engagement between the author and the Blended Learning team. It considers the evaluated product as one formal learning aspect of a comprehensive, 70-20-10 professional Onboarding experience for the new xMOOC instructor or project team member. The results of the project are explored in light of the implications for learning designers, practitioners in the xMOOC project field, and researchers. The study *concludes* with reflections about the future of xMOOCs and good project team practices at a time when it is expected that distance education at the university level will become not just the latest fad, but a necessity.

For the remainder of this paper, the abbreviation MOOC will imply the xMOOC archetype.

2 Literature Review

2.1 Literature Review Organisation

The author initially approached this project with conventional consulting methods: first reviewing existing documentation about the project to understand the proposed business problem in its "as-is" status, then shaping the focus for literature searching, then reviewing the literature for further ideas to inform any recommendations or learning designs, and finally comparing all sources for a synthesised set of conclusions.

The existing documentation included a survey of experienced MOOC instructors from the "client" organisation, ChalmersX (Chalmers Blended Learning Services, 2019). The *Literature Review* section weaves these various sources together to explain the background for design decisions taken in the project. The ChalmersX perspective for challenges and best practices is presented first, then the literature's perspective, then the two sources are compared. To orient the reader, the *Literature Review* section is organised as described here in Figure 1:

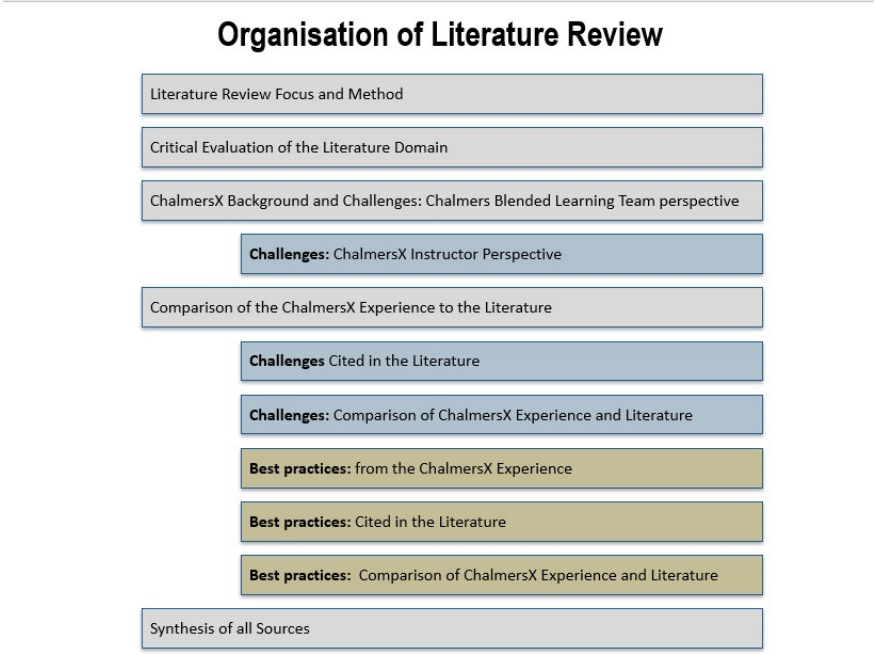

Figure 1: Organisation of Literature Review

2.2 Literature Review Focus and Method

With the expectation that the literature would guide the future design, the author focused the review of existing literature on first, the typical *challenges* of redesigning classroom instruction to a digital experience with a primary focus on MOOC instruction, and second, what documented *best practices* of onboarding MOOC instructors are available.

The author decided on inclusion criteria as follows:

- Books published by qualified researchers,
- Peer-reviewed journals,
- Peer-reviewed conference proceedings,

- Preliminary results at conferences if cited in peer-reviewed papers (The researcher decided on this after the Manual Search because the literature and field is still relatively new.),
- Reputable studies from industry e.g. consulting or research firms or government authorities,
- Prioritise use of results from the last five years over older publications.

Initial searches including all possible fields produced many results with few relevant articles, so the search criteria were tightened to include relevant keywords in the Title and Subject fields only, later opening to include selected keywords in any field. Using search engines nevertheless produced only fourteen relevant papers. The researcher then mined these papers to find systematic literature reviews (Hew & Cheung, 2014; Veletsianos & Shepherdson, 2016; Zhu, Sari, & Lee, 2018). Mining all bibliographies of the found papers and systematic literature reviews led to a further 20 relevant papers. Additionally, the researcher searched manually for all publications related to Chalmers' experiences creating MOOCs and selected one as relevant (Janssen, Claesson, & Stöhr, 2016). Finally, the author compared this found literature to the results of a survey of selected MOOC instructor "veterans," relevant to the design team and project at hand (Chalmers Blended Learning Services, 2019), readings for a course in Professional Digital Learning (Aycock, Garnham, & Kaleta, 2002; Beetham & Sharpe, 2013; Biggs & Tang, 2011; Boyle, Bradley, Chalk, Jones, & Pickard, 2003; Oliver, 2013; Sharpe, Benfield, & Francis, 2006), and material available from EdX for prospective MOOC project teams (EdX, 2013, 2014, 2020).

2.3 MOOCs and instructor experiences: a nascent domain

The first MOOC was offered in 2008, and subsequent larger-scale MOOCs began attracting "massive" student cohorts only in 2012. Therefore, the research domain in 2020 is quite new compared to others such as distance or technology-enabled learning as a whole. During searches and subsequent detailed reading, it became obvious that there is a relative shortage of research looking at MOOC course design from the instructor perspective. Sari, Bonk, and Zhu (2019) cited the Bonk et al. (2018) structured review of articles published between 2014 and 2016 mentioning this study revealed that "instructor-focused research is the least-studied area (3.4%) after student-focused, design-focused, and context and impact-focused research." (Sari et al., 2019, p. 2). Papers in this discipline are most often based on interviews with, or surveys sent to, MOOC veteran instructors, frequently with Likert-scale ratings to self-report recall after having delivered at least one MOOC. The respondents are often selected within a focused domain such as Science, Technology, Engineering, Mathematics (STEM), pharmacology, or statistics (Douglas, Zielinski, Merzdorf, Diefes-Dux, & Bermel, 2019; Kolowich, 2013; Kumar & Al-Samarraie, 2018; Lee & Rofe, 2016; Maxwell et al., 2018; Najafi, Rolheiser, Harrison, & Håklev, 2015; Sari et al., 2019; Zelinski et al., 2017; Zheng, Wisniewski, Rosson, & Carroll, 2016). The other type of papers are anecdotal case studies focusing on the instructors' experiences of developing one particular MOOC (Baudewyns et al., 2018; Janssen et al., 2016; Kellogg, 2013; Lee & Rofe, 2016; Ross, Sinclair, Knox, Bayne, & Macleod, 2014).

In terms of analysing instructor experience in preparing for MOOC instruction, the domain is still highly-reliant on self-reporting. However, the author found one interesting exception of note. Licheng et al. (2017) examined instructors in eight deliveries of the same Epidemiology MOOC course and used the Technological Pedagogical Content Knowledge, or TPACK framework (Mishra & Koehler, 2006) as the "best practice" framework for online instruction. The premise of the paper was that an even distribution of time spent within each type of TPACK activity would indicate a mature online instructor. They timed instructional activities to gauge how diverse a mix the various instructors were offering in their instruction time, and concluded that instructors need professional development on how to strengthen technology-based teaching. Specifically, a disproportionate amount of time in lecturing mode with slides indicates professional development needs in Technical Pedagogical Knowledge and Technical Content Knowledge.

This example is interesting in that it attempts to clearly define at least one success criterion for a MOOC, in contrast to traditional university measurements of student "persistence" through a degree programme or course completion. MOOC completion rates have remained notoriously low at approximately 3% overall and hovering around 50% for learners who have paid for the course, as Reich and Ruipérez-Valiente (2019) documented for EdX courses between 2012 and 2108. As Reich and Ruipérez-Valiente (2019) and Douglas et al. (2019) point out, MOOC learners have varying motivations for enrolling in the first place, which may or may not include earning a certificate or course completion. For these reasons it seems that course completion, although relatively easy to measure, is not a valuable measure of a successful MOOC, and more imaginative thinking is required. For example, it would be interesting to see future studies that define MOOC success in terms of learners indicating in a survey whether they had gained what they originally wanted to from the course, clear evidence of TPACK incorporated into the learning design, or a combination of these and some other criteria as defining "successful" MOOCs. The next step could then involve comparing what MOOCs with these characteristics have in common, in terms of the project team and instructor approach to development. Such work would be useful to define frameworks for first, how to gauge whether a delivered MOOC was successful, and second, to define best practices to develop a successful MOOC even before the team begins. To summarise, because there is no clear definition of what a successful MOOC is, it is challenging to design an Onboarding programme containing steps to create one. The practitioner who takes the time to consult the literature is then obliged to evaluate the collected insights into frustrations and lessons learned as he or she decides whether to engage in a MOOC project.

Given that no standard set of theoretical frameworks are being used to organise the largely self-reported MOOC instructor perspectives, the author settled upon the ADDIE (Analyse, Design, Develop, Implement, Evaluate) model as a useful taxonomy to organise ideas. Albeit widely used in Instructional Design circles, the origins of the *term* ADDIE are somewhat obscure. (Molenda, 2003) determined the concept evolved out of a collaboration in the 1970s between the Center for Educational Technology at Florida State University and the U.S. Army. The product of this collaboration evolved into the Interservice Procedures for Instructional Systems Development (IPISD), which was intended for use by all branches of U.S. military service. Molenda concludes that the term grew out of a sort of oral tradition, yet it has been widely accepted and promoted by professional bodies like the American Society for Training and Development as "the Instructional Systems Design (ISD) model" since the 1980s. Although as Molenda mentions, ADDIE is a "systematic approach to instructional development, virtually synonymous with instructional systems development (ISD) (Molenda, 2003, p. 40), one can also consider it as a robust project-management model for nearly any learning technology project (Bates, 2019). As one designs the learning experience and standard project plan for a MOOC, the ADDIE framework becomes useful to highlight and plan for typical challenges and best practices for each project phase.

The literature review was expected to add an academic yet complementary perspective to the ChalmersX instructor survey. All sources contributed to recommendations for the design project at hand: how to enhance the instructor Onboarding experience for the first-time ChalmersX instructor. The Society for Human Resources (SHRM) website defines employee Onboarding as, "the process of integrating a new employee with a company and its culture, as well as getting a new hire the tools and information needed to become a productive member of the team" (Maurer, n.d.). Although the prospective MOOC instructor is not new to working at Chalmers, he or she is likely new to working in a digital learning project team. With this concept of Onboarding in mind, an orientation to tools and information required to become a productive member of the team was what the author was asked to design.

The author considered The Australian Government (2014) recommended version of the ADDIE methodology, which includes a Preparation phase. This phase encompasses activities like setting up governance, preparing the team or creating a business case. The author viewed Preparation and

Onboard as interchangeable terms and the suggested activities a sensible construct for any digital learning project. For the purposes of this project, the author added the Onboard phase to the ADDIE model as a precursor and assigned challenges and best practices found in the literature accordingly. The following section describes the design problem, then the relevant literature is presented, compared with the ChalmersX veteran survey results, and finally synthesised with the context in mind.

2.4 ChalmersX: a real-world case study

2.4.1 Background and Challenges: The Chalmers Blended Learning Team perspective

At Chalmers, and more specifically within the Department for Communication and Learning in Science (CLS), the Blended Learning team offers comprehensive services on digital instructional design and production for Chalmers faculty, including MOOCs. In cooperation with pioneering instructors, the team has successfully published over 20 courses and MicroMasters® programmes programmes on the EdX platform covering topics as diverse as everyday sustainable living, graphene technology, and supply chain management (ChalmersX Course Library, n.d.). Over 200,000 students have enrolled in these courses, which accordingly have contributed to Chalmers' brand image as a leader in learning technology.

Success and accolades notwithstanding, the Blended Learning team reported anecdotally that course production and the projects in general were unnecessarily hectic with professors not fully appreciating that they needed to get started immediately with planning and creating course content. As a result, production activities were compressed to very long workdays in the few weeks before course "go-live," meaning there was insufficient time for reflection, incremental improvement and quality control. The Blended Learning team reported they generally took a "respectful" approach, guided first by a short initiation workshop with the instructor in person, then scheduling project meetings on a running basis to coach instructors on how to design the course and product content. In addition to the hectic last-minute work near go-live, some instructors would arrive at reserved video production sessions with their scripts unprepared, not realising that paid-for resources were sitting unutilised whilst they prepared and rehearsed their materials. The team sensed that they could adapt their approach to better address the practical need for instructors to understand how best to work in a project-based context, which would improve Blended Learning team resource utilisation and improve course content quality. To gather requirements, the team reached out to experienced ChalmersX instructors, or "veterans," to request they complete a survey about what they found most challenging and rewarding, and what they would do differently if they could.

2.4.2 Challenges: ChalmersX Experienced Instructor Perspective

Fifteen ChalmersX veterans responded to the survey (Chalmers Blended Learning Services, 2019), which posed six mainly open-ended questions about instructor experiences, asking about their challenges, lessons learned, and with what specifically the Blended Learning team was most helpful, The author analysed these mostly textual responses in an attempt to quantify trends in terms of challenges and best practices. The method employed was a form of grounded theory (Glaser & Strauss, 1967), and because this was not a large dataset, it was possible to do so manually. Specifically, the method was: breaking up the textual responses into parts, noting each time the respondent mentioned a concept, then inductively creating a taxonomy of concepts and coding the number of "mentions" across all respondents. The final step was to review the taxonomies and account for any duplications, thus reorganising them.

To illustrate this process, one answer to Question 6 about additional support needs was as follows:

(translated from Swedish) A MOOC about doing a MOOC is a good idea. If one can get a few tips on ***how one can create video lectures*** *and* ***how one should or should not create a manuscript*** *already before creating one's first manuscript, this could probably help quite a bit.*

More project management. *Demand that planning is already complete before the decision is taken that the MOOC shall be produced. Provide a standard plan which shows estimated time for each activity, which one can use for his/her own planning. There should be a list with all of the activities one needs to do, this will help the instructors to plan better.*

Ask a few annoying questions to those who shall create a MOOC:

Gladly ask the question about ***how much time one will be able to devote****. As it was, I essentially didn't think about how much time I had, and of course I should have. Ask even specific questions about* ***how the campus-based course material looks and how it needs to be adapted to MOOCs***. (Chalmers Blended Learning Services, 2019)

The interpretation of this answer is presented in Table 1 as a detailed example of how responses were analysed:

Quote fragment	Interpretation	Category (see below)
If one can get a few tips on how one can create video lectures	Information on how to prepare a video	Video production and preparation, including Manuscripts
and how one should or should not create a manuscript	Information on how to prepare a manuscript	Video production and preparation, including Manuscripts
More project management.	More project management and planning	Project management and support
how much time one will be able to devote	Be honest about the time commitment	Time-Consuming
how the campus-based course material looks and how it needs to be adapted to MOOCs.	Information on translating on-campus content to MOOC	Content production (general)

Table 1: Example of Survey Response Analysis

This response was particularly long; most covered only one or two concepts. As one looks at the survey questions, some related directly to challenges and lessons learned, and one related to positive feedback about what went well. The latter will be summarised in the section *2.5.3 Best Practices: ChalmersX Experienced Instructor Perspective*, and the former (challenges) is relevant for this section's discussion. Four questions centred around challenges and frustrations:

Q1: What did you experience as the most difficult to grasp, especially when getting started with MOOC production?

Q3-4: Which aspects of MOOC production did you find most challenging? Choose up to three answers and feel free to expand your answer in the comment field.

Q6: What additional support would you appreciate from the Blended Learning team?

There were no limits on response length to these open-ended questions, so the relative frequency of mention seems to be an appropriate way to gauge how significant a specific type of challenge was to the instructor veterans. Question 3 was the only question to provide a structured list from which the respondents could choose up to three options, but the respondents usually only chose two and left an open-ended comment. Each selection on the structured list counted as a mention, as well as any mention in the comments, using the same method as for the other questions. Analysed in this way, video preparation and production, (which includes the preparation of manuscripts) as well as content production in general were clear areas of difficulty in the instructors' experience. In the second tier of prevalence, understanding the bigger picture, creating pedagogical illustrations and visuals, exercises, and assembling a good course structure were mentioned most often. Figure 2 illustrates this clearly:

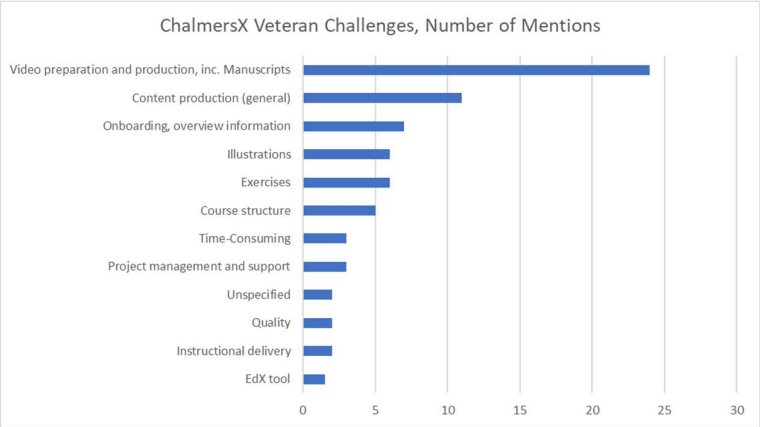

Figure 2: Number of Mentions per Challenge in ChalmersX Experienced Instructor Survey

Question 2 seemed to generate responses reflecting more of a "lessons learned" aspect rather than directly eliciting challenges. It read: *If you would get an assignment today to produce another MOOC, which of your experiences from your earlier MOOC production do you feel would most help you?* Similar to the results of other questions, the results in Table 2 below show that video preparation and production seemed a to be significant hurdles, as well as creating exercises. These topics are extremely important to cover in any Onboarding approach, to lessen the effort required to learn the new skills.

Category, Responses to Survey Question 2	Frequency of mentions
Video preparation and production	8
Various, including suggestions	4
Exercises	4
Time requirements	3
Course design	2
Course content production	1
Project planning	1

Table 2: Frequency of Mentions of Most Useful, Re-useable Experience, ChalmersX Instructor survey

Question 5 addressed best practices and can be found in the *2.5.3 Best Practices: ChalmersX Experienced Instructor Perspective* section. The approach to quantify this unstructured data is subject to the bias of only one researcher coding qualitative responses to a given taxonomy. Nevertheless, it adds an interesting aspect to understanding trends within the surveys, which can subsequently be compared to the literature.

2.5 Comparison of the ChalmersX Experience to the Literature

2.5.1 Challenges Cited in the Literature

A typical university lecturer finds that producing a compelling digitised learning experience, attractive to the paying professional, can be a significant challenge. The author organised the challenges found in the literature according to the ADDIE model in order to gauge which concepts most needed highlighting in the project's learning design. To aid comparison and contrast, challenges within each ADDIE phase will be summarised by these dimensions as applicable:

- People and Organisational Dynamics
- Process
- Technology
- Content
- Governance and Administration

The most frequently mentioned challenges during each ADDIE phase include these depicted in Figure 3 below:

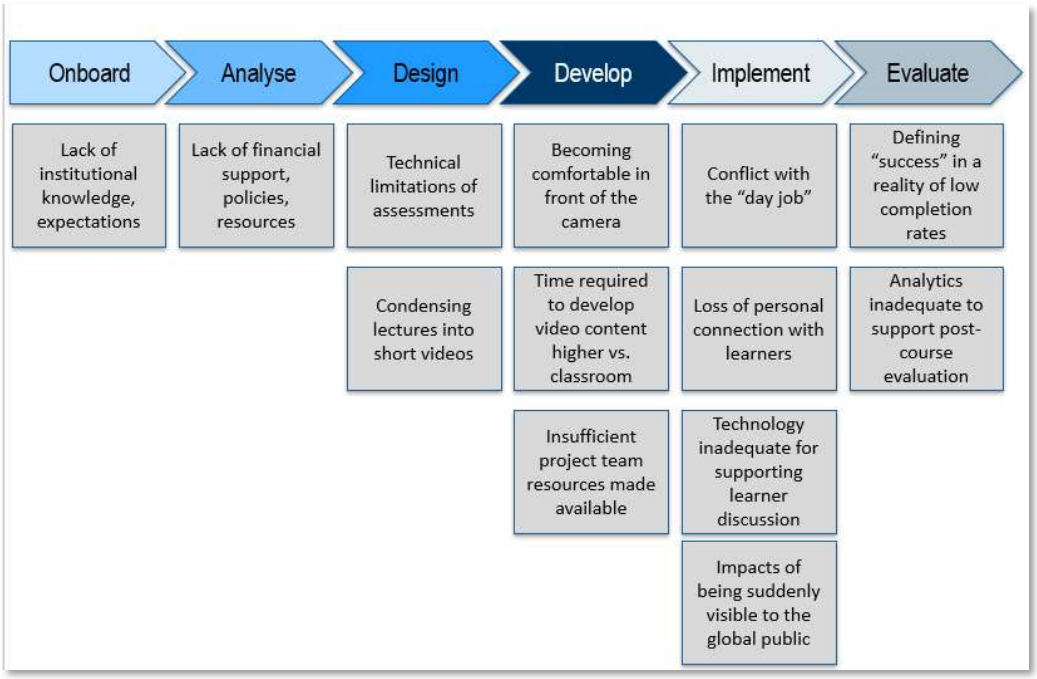

Figure 3: Summary of Challenges Most Often Mentioned in the Literature

Onboard and Analyse phases: Prospective MOOC instructors encounter challenges right from the point when the MOOC is just an ambition. They report that, although their institutions may be strongly encouraging them to create MOOCs, very little institutional guidance is available in terms of the process, policies, understanding the technology, or appropriate instructional design (Kumar & Al-Samarraie, 2018; Sari et al., 2019). MOOC veterans express a strong desire or their institution to have some sort of policy manual or "get started guide" to help them grasp the project scope and requirements (Zheng et al., 2016).

Design phase: During the Design phase, a MOOC team should develop a technologically-feasible learning experience design. Working on what may be an unusually large project team introduces difficulties in finding good times to meet regularly to collaborate (Sari et al., 2019). Otherwise, two topics emerge as the biggest challenges in the Design phase: technology and content. In terms of **technology**, the assessments seem to raise significant concerns about their limitations. MOOC platforms support massive numbers of learners, but as a consequence the assessments must be automated. Yao and Suen (2018) point out that automation works well only with highly-structured questions, which can imply the learner is only engaged at lower cognitive levels. The technology is not mature enough to support machine-graded essays, for example (Richter & Krishnamurthi, 2014), which mean formative assessments and assignments are either at a lower cognitive level, or labour-intensive to evaluate. Yao and Suen (2018) make a case for using the peer-grading functionality available in MOOCs as the only viable way to engage learners in very large cohorts at higher cognitive levels.

Although not unique to MOOCs, and indeed maybe relevant for any distance learning platform, instructors share concerns about cheating on assignments and exams. MOOC providers use a combination of honour codes, verified identification, and typing patterns to ensure learners say they are indeed who they say they are, and that they are the ones submitting the assignment (Yao & Suen, 2018). This is not something the instructor can necessarily control, but it may be important to inform him or her regarding ways that the platform can mitigate this concern.

Regarding **content**, new MOOC instructors report the arduousness of designing short video lectures of less than 15 minutes to explain complex concepts that might normally require several lectures to cover in the classroom (Sari et al., 2019; Zheng et al., 2016). Additionally, it requires time, creativity and insight to design online activities of the same quality and richness one might offer to on-campus students (Maxwell et al., 2018).

Development phase: During the Development phase, the project team creates the content and learning experience designed in the previous phase. Veteran instructors report that working with a multidisciplinary team raises unexpected obstacles, such as working for the first time with instructional designers or being dependent on teaching assistants who suddenly leave (Zheng et al., 2016).

Time is a further limitation often mentioned. Instructors sometimes take on the MOOC challenge with no promise of additional budget or formally apportioned time granted from their employers, which negatively impacts the instructors' official duties (Kolowich, 2013; Sari et al., 2019). At the same time, instructors at the University of Toronto reported that designing and delivering a MOOC is significantly more time-consuming than what is required for classroom-only delivery (Najafi et al., 2015) and that the time required was in the words of one veteran teacher, so "traumatising" that he or she would only consider doing it again if the "time to do it right" were definitely available (Zelinski et al., 2017, p. 5). Professors report that the course development time came at significant professional and personal cost (Evans & Myrick, 2015). Indeed, EdX recommends that new MOOC instructors estimate 300-400 hours of time to develop their course (Graham, 2015). This corresponds well with reported numbers from a course on prescription drug abuse developed at The Ohio State University, with an additional estimated 500 hours devoted by the multimedia staff. Reports of similar numbers appear in (Maxwell et al., 2018) regarding a course on consumer pharmaceutical knowledge

developed at University of Texas Austin, which reported similar numbers for the teacher and 600-700 hours required of the support staff.

Unfortunately, it seems that, at several institutions there is insufficient **governance** or support for content development. Instructors report that their university failed to supply a project manager, technical support, or budget for teaching assistants (Zheng et al., 2016). Furthermore, many universities neglect to provide recognition for MOOC teaching at the same level as, for example, published papers, even though the MOOC burnishes the school's reputation (Evans & Myrick, 2015).

Working with a new teaching medium, specifically video, is often mentioned as presenting a steep learning curve (Zheng et al., 2016) with instructors needing multiple, sometimes frustrating and embarrassing "takes" in the beginning. US-based teachers report having to be reminded that their audiences are global, so colloquialisms, jokes and local slang must be removed from their manuscripts as they moderate their rate of speech for non-native English speakers (Maxwell et al., 2018).

Implement phase: With the hard work of the content development complete and ideally beta-tested, the course is released to the world. The challenges in this phase centre around the **people and organisational dynamics, governance and administration**, **process, and technology** of the MOOC, which all seem to all be related from a human resources perspective.

The experience of suddenly having one's face thrust onto a global stage in front of thousands can be disconcerting for the new instructor. The sheer scale of the "massive" aspect of MOOC student numbers without having piloted the course on a smaller cohort can be overwhelming, as well as rude, unfair, personally-directed, irrelevant feedback coming from students. Typical university professors are unaccustomed to public criticism. It requires emotional processing, even if one does not plan to take action on it. Fearful that these sort of comments would be professionally damaging, some professors who were aspiring to for tenure status decided to stop teaching MOOCs (Evans & Myrick, 2015). When the barrier to admission is simply creating an account and signing up for a course, an unfortunate reality is that some students can be inappropriately resourceful and demanding. Instructors found their e-mail inboxes suddenly inundated with MOOC learner queries, even if they had not published their addresses. One teacher even reported being "stalked" by a student living in the same city (Haavind & Sistek-Chandler, 2015). First-time MOOC instructors with misaligned expectations of retention and engagement rates for MOOC students versus on-campus found the MOOC dropout rates demoralising. Other discouraging aspects included the inability to engage meaningfully and personally with each individual student as they were accustomed to (Evans & Myrick, 2015) and evaluate all assignments personally, with the same care (Haavind & Sistek-Chandler, 2015).

The **process** of moderating the MOOC can require time for acclimation. Teachers in several studies reported that moderating discussion forums seemed like they were working in a vacuum without the student interaction they typically enjoy with on-campus groups (Evans & Myrick, 2015; Haavind & Sistek-Chandler, 2015; Hew & Cheung, 2014). MOOC students in many cases do not interact with one another on the MOOC platforms, and need significant instructor presence to do so (Hew & Cheung, 2014; Richter & Krishnamurthi, 2014).

In terms of the **technology**, instructors report the Discussion functionality to be too limited to administer and facilitate effectively, resulting in threaded discussions with only a few learners participating. It has become common practice to exploit commercial social media solutions such as Facebook, Twitter or Google Hangouts, or even Meetup for learners to meet in person, instead (Baudewyns et al., 2018; Bonk et al., 2018; Evans & Myrick, 2015; Zheng et al., 2016). Some instructors were insecure about best practices for releasing content to students in multiple time zones (Zheng et al., 2016) and weren't sure where to get guidance.

As mentioned in the discussion of other project phases, insufficient **governance** from the sponsoring institutions presents challenges during the implement phase. Several studies mention the demands on

time needed to supervise the MOOC once it is running, even if time is less than required in the Design and Develop phases. The time required to supervise so many learners is more than for one on-campus course (Najafi et al., 2015), yet MOOCs frequently are not formally considered part of the normal workload. Subsequently the delivery becomes a distraction from an instructor's regular duties. Teachers monitor discussions and learner activities after-hours, creating a negative effect on their personal lives (Kumar & Al-Samarraie, 2018). In short, the entire investment of time and effort only seems beneficial for teachers who are already tenured (Kolowich, 2013; Sari et al., 2019; Zheng et al., 2016).

All of these factors, if not addressed properly, take a toll on the MOOC instructor. A human resources manager would do well to remember these instructors, are highly-qualified professionals. One reflection from a MOOC veteran shows how, unremedied, this situation could have an unfortunate impact on the domain as a whole: *"after teaching MOOC twice, I really feel exhausted. So I quit. Although I really enjoy interacting with so many students, I felt I put too much into my MOOC, my heart, my energy, my time, and even my emotions. I feel like I could not afford it. I really feel exhausted. I might teach again when I can get enough support and help from my university and Coursera. Teaching may become easier."* (Evans & Myrick, 2015, pp. 216-217).

Evaluate phase: Evaluation ideally should occur continuously, even during course delivery if needed (Bates, 2019). Instructors who reflected after delivering their MOOCs wrestled with topics such as redefining the teacher's identity in a MOOC. Are they distant "academic celebrities" or a set of automated processes put in place, or are they something in between, perhaps a participant in aiding knowledge construction? Ross et al. (2014) posed these questions as well as reflecting on what degree of instructor presence is realistic and the limits of what learners are prepared to accept. In their delivery of the Coursera MOOC E-Learning and Digital Cultures, the instructors were absent until the second week. They noticed from student discussions that this caused significant discomfort, and the learners were clearly relieved when the instructors became discernable in their first live video cast.

Ross et al. (2014) also question what defines "success" for a MOOC delivery when completion rates are typically so much lower than for on-campus courses and the value of learner enjoyment may not be sizable. They noticed, as well as Reich and Ruipérez-Valiente (2019) have more recently, that the students tend to be postgraduates from developed economies. In that case, they ask, does measuring quality of student outputs reflect learning, or simply validate the starting point of the learner?

The **technological** limitations of the MOOC platforms present themselves in the context of evaluation as well. Baudewyns et al. (2018) reflected dissatisfaction with the analytics, which were insufficient to help them understand how course design may or may not have contributed to learner engagement and success. Respondents in Zheng et al. (2016) cite insufficient tools for collecting and analysing student feedback that would aid them in improving the next course delivery.

Despite these impediments, many instructors who go through the process report that it positively influences their classroom-based practice and instructional design skills going forward (Haavind & Sistek-Chandler, 2015; Kolowich, 2013; Najafi et al., 2015). Instructors report being more satisfied with the experience correspondingly with the number of MOOCs they have delivered (Evans & Myrick, 2015). These "survival" reflections imply that creating a MOOC can be an opportunity to extend one's professional development as an educator in multiple settings. With this diverse set of reported experiences, it is interesting to revisit the ChalmersX survey results to gauge to what degree they correspond.

2.5.2 Challenges: Comparison of ChalmersX experience with the literature

When re-examining the feedback from the ChalmersX veterans and comparing it to the literature domain, there are some significant parallels and several areas which indicated little need to emphasise

in the Onboarding learning design. In the survey results discussed in the *2.4.2 Challenges: ChalmersX Experienced Instructor Perspective* section, video preparation and production and content production in general were mentioned most often as hindrances. Second in importance were understanding the bigger picture, creating pedagogical illustrations and visuals, exercises, and assembling a good course structure. In third place came suggestions for offering better Onboarding and clearly communicating the amount of time and commitment that creating a MOOC requires.

Table 3 contrasts the ChalmersX survey results to the most frequent challenges cited in the literature by ADDIE phase.

Phase	Example Challenge in Literature	Degree of alignment	ChalmersX Survey results
Onboard and Analyse	Lack of institutional knowledge	◐	Third tier of "mentions" in the survey. There is plenty available now with the BL team and several "veterans," requested this be shared in a more structured way. The Onboarding approach will address this.
	Lack of financial support and resources	○	Not a particular concern as Chalmers teachers have the BL team and will always seek budget and time before committing.
Design	Technical limitations of assessments	◐	Second tier of importance. Mentioned it was challenging to be creative and craft a sufficient number of good-quality exercises.
	Condensing lectures into short videos	●	Most-frequently mentioned challenge
Develop	Becoming comfortable in front of the camera	●	Most-frequently mentioned challenge
	Time required to develop higher than vs. classroom	◐	When mentioned, requests to make it very clear about the time commitment
	Insufficient project team resources made available	○	Chalmers teachers would not commit to a project without this.
Implement	Conflict with the "day job"	○	Not mentioned
	Loss of personal connection with learners	○	Not mentioned

	Technology inadequate for supporting learner discussion	○	Not mentioned
	Impacts of being suddenly visible to a global public	○	Not mentioned
Evaluate	Defining "success" in a world of low completion rates	○	Not mentioned
	Analytics inadequate to support post-course evaluation	○	Not mentioned

Table 3: Comparison of ChalmersX Survey Results to Challenges Most Frequently Mentioned in Literature

This visual representation makes it easier to see that the ChalmersX veterans found the earlier project phases to pose more challenges, and this finding was precisely what the Blended Learning team was hoping to address. The ChalmersX Onboarding programme should therefore emphasise setting a good foundation for these activities in order to get the project team working well together early. Challenges are of course vital to consider, as well as good-news stories of best practices, both at ChalmersX and as revealed in the literature.

2.5.3 Best Practices: ChalmersX Experienced Instructor Perspective

As mentioned in the *2.4.2 Challenges: ChalmersX Experienced Instructor Perspective* section, the Blended Learning team's survey (Chalmers Blended Learning Services, 2019) collected veteran instructors' perspectives on challenges, lessons learned and perceived best practices. Question 5 focused on understanding best practices: *What forms of Blended Learning team support did you find most helpful during MOOC production?* As depicted in Table 4, the Blended Learning team was rated highly for support with producing course content, which indeed is their core competence.

Category	Frequency of Mentions in Survey Question 5
Course content	11
Unspecified, the team was helpful with everything, no criticism	3
Introducing high-level MOOC concepts	3
EdX platform	2
Project management support	2

Table 4: ChalmersX Blended Learning Team's Perceived Best Practices Reflected in Instructor Survey

These results resonate well with the literature as discussed in the next section, which underscore how fortunate ChalmersX instructors are to have such a resource in the Blended Learning team. A dedicated on-campus instruction design and content production team is cited as a key success factor.

2.5.4 Best Practices Cited in the Literature

Best practices or lessons learned are plentiful in the literature. Just as with the challenges, the author organised them in light of the ADDIE model to decide which learning objectives would address them. Some pivotal selected best practices are from sources outlining good learning digitisation practices generally, as well as some devoted to developing MOOCs. Figure 4 summarises the most frequently-mentioned best practices from the literature.

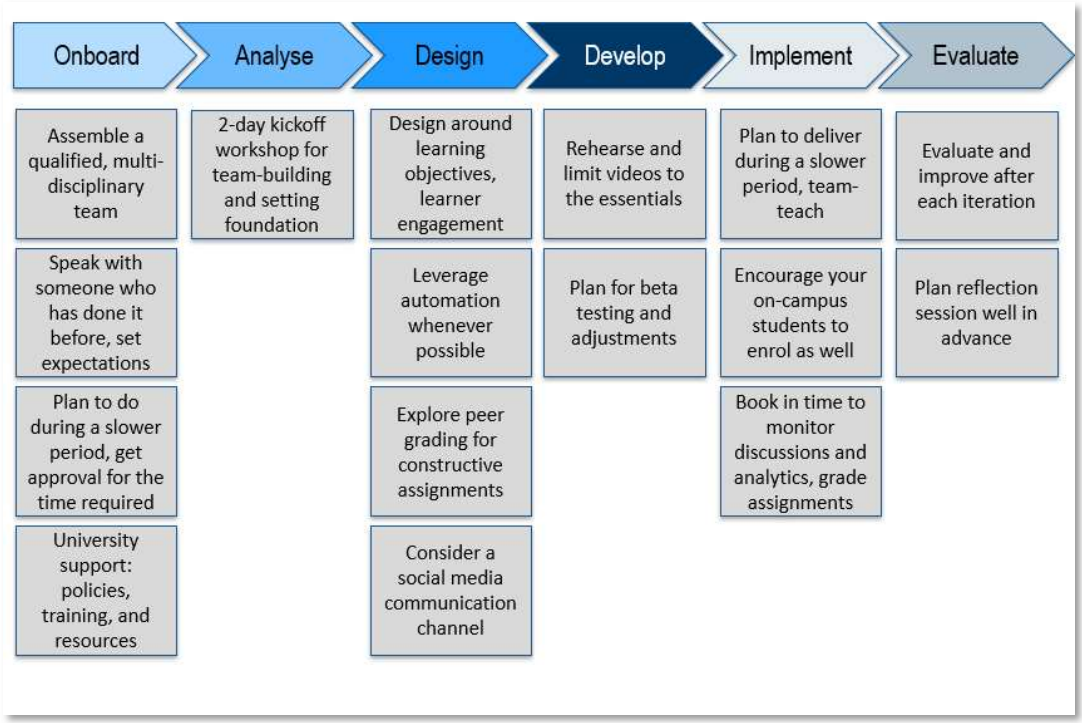

Figure 4: Summary of Best Practices Most Often Mentioned in the Literature

Understanding these best practices by the ADDIE framework allows them to be included at relevant stages of an instructional design and standard project plan. The Australian Government (2014) promotes benchmarking the Analyse, Design, and Develop phases to consume 10%, 36%, and 35% of budget respectively, with Implement and Evaluate taking only 4% and 7%. This implies the Prepare, or Onboard phase should expend about 8% of resources.

Onboard phase: During the Onboard phase, the project team should be preparing themselves and the required infrastructure needed to begin the Analysis and Design phases (The Australian Government, 2014)[2]. In contrast to a typical university lecture-based course, it requires an entire team

[2] The Australian Government's infographic uses the term Preparation phase, but the author has chosen to use the term Onboard to represent the same type of project activities.

of **people and organisational dynamics** to design, develop, and implement digital learning. Several sources suggest potential members for a MOOC team: discussion moderators, beta testers, software/media experts (Baudewyns et al., 2018; EdX, 2013; Kellogg, 2013), teaching assistants, authors and technical support (Haavind & Sistek-Chandler, 2015), a "data czar" in the team to administer and monitor analytics and click-stream data (EdX, 2014), and a project manager (Richter & Krishnamurthi, 2014). A dedicated team to support the project and facilitate good communication was cited as a key success factor in several case studies (Baudewyns et al., 2018; Maxwell et al., 2018)

Before MOOCs existed, there were plenty of practitioners creating digital university-level courses. Experienced digital instructors recommend speaking with veterans who have gone through the experience as a confidence-boosting and helpful step (Aycock et al., 2002; Sari et al., 2019; Sharpe et al., 2006). Malaysian instructors say that it is imperative for the institution to provide clear guidance on goals, policies, instructional design frameworks, and use of the technology (Kumar & Al-Samarraie, 2018).

As mentioned previously in the *2.5.1 Challenges Cited in the Literature section*, it is crucial for a prospective instructor to understand how much time is required to develop, design and deliver a MOOC, so that the team can request adequate budget or time be allocated from the institution. Aycock et al. (2002) reported this as a challenge in 2002 before the age of MOOCs. They recommend planning this work over the summer period and requesting hours accordingly. An important part of this preparation work is being trained on the technical platform, understanding its possibilities/limitations, and developing insight into how one should ideally moderate discussions amongst a large number of learners (Aycock et al., 2002).

Finally, good **governance and administration** during the Onboard phase will positively contribute to a learning technology project's success. Experienced instructors recommend demanding adequate, contractual time for developing the course content and training on the technology, just as they would for a new on-campus one. It can be advantageous to work on the MOOC during the summer period, when the typical demands of classroom teaching, meetings, and supervising PhD students are diminished (Aycock et al., 2002; Zelinski et al., 2017).

Analyse phase: During the Analyse phase, the team should be defining the learning needs and scope of their future course, including the desired audience, first high-level course outline, and learning objectives (Bates, 2019). One intriguing best practice suggested is to conduct a two-day initial Design Workshop. In their study of implementing e-learning programmes in a university, Sharpe et al. (2006) found this to be an efficient way to build the project team culture, focusing attention on several key deliverables requiring team alignment. The workshop concludes with a presentation of the outputs to a friendly reviewer, perhaps in this context, even a veteran MOOC instructor. University of Toronto instructors mention that it is crucial in this phase to take the time to craft high-quality learning objectives to aid in later phases (Najafi et al., 2015).

Design phase: The Design phase is a weighty one, including definition of design principles, the final set of learning objectives, and learner activities; identification of which technology and content will be used; and storyboarding with the team (Bates, 2019). It is imperative at the start of this phase to have the set of more or less inviolable "design principles" prepared, in order to help the team establish some reasonable boundaries around their ideas (Stubbs, Martin, & Endlar, 2006). These could be ideas like: learners must demonstrate comprehension of the learning objective, learners must engage with the course at least once every *n* days, or rules about how course communication will happen.

Course veterans offer some further best practices around the design **process**. First is to think carefully about how to personalise the experience, or make it culturally sensitive for international learners in less developed geographies, even as thousands of students are taking the course asynchronously. In fact, a majority of surveyed experienced MOOC instructors plan to improve their efforts after their

first course (Bonk et al., 2018). It is important to define concretely how the team will moderate group discussions, offer self-pacing options, afford possibilities for students to choose their own project topics or "break-out" groups, provide media options for lower-bandwidth locations, or even allow non-native English speakers to help each other with translation (Bonk et al., 2018; Haavind & Sistek-Chandler, 2015). In order to enhance learner engagement in their political science MOOC, the team of Baudewyns et al. (2018) consulted the literature and leveraged strategies promoted in the Hew (2016) study of highly-rated MOOCs.

A crucial part of the Design phase is composing for optimum use of the MOOC **technology** available. Experienced MOOC instructors recommend planning for as much automation as possible, especially regarding learner feedback (Haavind & Sistek-Chandler, 2015). University of Toronto instructors strongly recommend using collaborative tools such as discussion fora to manage questions, feedback requests for help, etc. rather than e-mail (Najafi et al., 2015). Finally, MOOC platforms offer peer review (which is viewed positively by learners as long as there is a good grading rubric), and some artificial intelligence (which is not yet robust but worth exploring) as ways to automate feedback whilst somewhat personalising the experience (Najafi et al., 2015; Richter & Krishnamurthi, 2014). To counter the challenges with the MOOC Discussion functionality and plan for learner engagement even before the go-live date, it is recommended to design a social media approach e.g. on Facebook or Twitter (Maxwell et al., 2018; Ross et al., 2014).

In its Design Workshop guide (EdX, n.d.-a), EdX recommends using the Constructive Alignment curriculum design technique in a specific way, although the reasons behind the recommendation is unclear. The author assumes this is due to the technique working well with the technology, as well as a good practice promulgated at MIT and Harvard. Constructive alignment (Biggs & Tang, 2011) is highly applicable to university teaching both in the classroom and with digitised learning delivery. It is intended to "systematically align the teaching/ learning activities, and the assessment tasks, to the intended learning outcomes, according to the learning activities required in the outcomes" (Biggs & Tang, 2011, p. 7) and furthermore to engage the learner at higher levels of cognition compared to traditional lecturing pedagogy. An additional advantage is that it focuses the instructor on what concrete action the learner is expected to perform with the information presented *first*, before including potentially extraneous learning activities, content or materials to the lesson plan. This makes curriculum planning more focused and efficient. The EdX Design Workshop guide (n.d.-a) recommends that, once the team defines the course subjects and topics, they should next brainstorm what learner activations or "defining problems and exercises" are appropriate. Then they should work backward to define which learning activities support the defining problems and exercises, and only *then* define the learning objectives.

Once the course outline, activities and objectives are designed, it is time for the detailed work of designing the course **content**. Experienced practitioners remind one to remember who the learner is: normally a professional who has limited time and wants to use the learnings in real life and work immediately, if possible. Addressing such an audience means shifting focus from covering a lot of content, rather to piquing and maintaining interest and engagement (Graham, 2015; Kellogg, 2013; Najafi et al., 2015; Richter & Krishnamurthi, 2014). It is common to design the first week to include orientation to the technology platform, "rules of engagement" and learners introducing themselves to one another so that they will be more likely to interact with one another going forward (Aycock et al., 2002). Accessibility of the content occurs in two contexts: first, making content affordable and comprehensible to all by using Open Educational Resources whenever possible, rather than paid-for or scholarly articles (Haavind & Sistek-Chandler, 2015; Kellogg, 2013). Second, accessibility also has a connotation with learner ability, and dictates accordingly to use standard Universal Design techniques whenever possible (Richter & Krishnamurthi, 2014). In order to save time and control cost for content development, delivering presentations showing the slides and annotations on a screen (or "screencasts") can be an occasional substitute for the fully-produced video (Maxwell et al., 2018).

To counter the criticism that most MOOC platforms seem to be designed for automated grading and potentially engaging learners at lower cognitive levels, Lee and Rofe (2016) consciously incorporated peer-led assessments into their Research Methods MOOC. Learners were placed into groups, and they submitted drafts of their assignments into the Discussion feature for peer review and comment. They could do this as many times as they wished before submitting the final assignment for structured peer review and a pass/fail grade. Yao and Suen (2018) make a case for peer review as the only feasible and scalable way to engage learners at higher cognitive levels with the MOOC technology as it exists today. For some subjects a more constructivist approach may be more appropriate than for others, and incorporating it into the course design implies the need for instructors to fully understand the peer review functionality of the MOOC platform.

Develop phase: The Develop phase is another substantial phase with a suggested resource consumption of 35% (The Australian Government, 2014). Best practices mentioned for this phase are not as numerous as for the Design phase; however, one team discussed the **process** that worked well for them. In their development of a political science MOOC, the team scheduled regular collaborative discussions and structured peer review of each other's content (Baudewyns et al., 2018). Their view was that these components are critical to ensuring quality and scholarly excellence.

Most best practices shared for the Develop phase centre around **content production and testing**. EdX's own materials compare the experience of transitioning from classroom learning to MOOC learning with actors transitioning from stage to film. The Overview of Creating an Online MOOC Course article (EdX, 2013) recommends a video duration of between five to seven minutes, and, to maintain user engagement, definitely no longer than 15 minutes. EdX also recommends certain video formats best-suited for high learner engagement: screen or tablet capture, whiteboard capture with instructor speaking to it, overhead camera capture of writing on paper, or live capture of a lecture using multiple cameras (EdX, 2013, 2014). Understandably, such sophisticated production can take some time to master. Experienced MOOC instructors recommend writing manuscripts and rehearsing them repeatedly to, first, keep within the time limits, and, second, allow themselves to come across as warm and approachable (Haavind & Sistek-Chandler, 2015; Kellogg, 2013). Once the course is almost ready to launch, it is advisable to plan for beta testing and to include time in the project plan to be quickly adaptable if any adjustments are needed (Janssen et al., 2016).

Implement phase: Once the course's content and marketing materials are developed, it is time to launch the MOOC to the world. Underlining the challenges cited earlier about the time and effort required to deliver a MOOC, it can be helpful to plan delivery during less-busy periods such as summer and between conference deadlines, further minimising risk with a team-teaching approach (Zheng et al., 2016). Experienced instructors recommend encouraging or requiring on-campus students of the same course to enrol in the MOOC to achieve several benefits: exposing students to their "classmates" from around the world with their diverse experiences and perspectives, providing an alternative method for introverted students to express themselves in online discussions, and finally enabling a "flipped classroom" for the on-campus learners, which allows the instructor to leverage class time for higher-order activities (Graham, 2015; Popp, 2013).

Recalling instructors who were initially overwhelmed with how to manage so much virtual student interaction (see the *2.5.1 Challenges Cited in the Literature* section), seasoned instructors recommend that the instructors and teaching assistants reserve time to monitor online discussions, grade assignments, check the analytics, or complete any non-automated feedback (Najafi et al., 2015). If enrolment numbers are exceptionally high and it was not possible to fully automate feedback and grading mechanisms, EdX mentions the possibility of appointing learners who are very active in discussions to become "community teaching assistants" (EdX, 2014). Several instructors mention that they simply had to accept that they would not be able to form the same connection with each individual student as they normally are able to do with their on-campus groups (Graham, 2015; Haavind & Sistek-Chandler, 2015). Some instructors prefer managing learner discussions,

synchronous or asynchronous, within commercially-available social media platforms versus the MOOC discussion functionality (Kulkarni, Cambre, Kotturi, Bernstein, & Klemmer, 2015; Lee & Rofe, 2016). The appropriate solution may depend on preferences and what is available at the time of course design. Finally, EdX recommends exploiting the analytics and dashboards available in the solution to regularly monitor engagement and feedback data to determine whether adjustments are needed (EdX, 2014).

Evaluate phase: Placing the E at the end of ADDIE should not imply that the project team only takes time to reflect and adjust at the end of the project. Each phase should include some element of this, not least during the Deliver phase as mentioned above. The Evaluate phase should be scheduled with key stakeholders well in advance and follow a structured agenda (Oliver, 2013). As a sensible practice for any digital learning programme, the team should continuously evaluate and refine the delivery over several iterations (Boyle et al., 2003). This is a key consideration for institutions such as Chalmers, which focus on constantly-changing disciplines in engineering and technology.

Two institutions (The Ohio State University and University of Texas Austin) who developed some of the first U.S.-based MOOCs on pharmacology cited their ability to repurpose content for re-use on other delivery platforms such as Apple iTunesU, as well as for on-campus student electives. This capacity helps university leadership view MOOC development as a major success and a good investment. UT Austin decided, as a result, to define their project method to include a content repurposing strategy in the earlier project phases as standard procedure (Maxwell et al., 2018).

The literature reveals a mature set of best practice recommendations for a MOOC team to consider at each project phase. In the specific case of the ChalmersX design project, it is also important to compare the literature with the ChalmersX instructor survey results.

2.5.5 Best Practices: Comparison of ChalmersX Experience with the Literature

As mentioned in the *2.5.3 Best Practices: ChalmersX Experienced Instructor Perspective* section, the Blended Learning team received the highest marks for their assistance in producing course content in the Develop project phase. It is safe to say the team has an outstanding level of competence in this area. Other factors such as introduction to the high-level concepts of MOOCs, support with the EdX technical platform, and project management were mentioned, but not to the same degree. The comparisons with the literature in terms of best practices are clear, although the answers to the single, open-ended survey question did not cover such a wide range of best practices.

Whilst the Blended Learning team clearly excels at the Develop project phase, they expressed their desire to enhance support for MOOC instructors at earlier project phases. Specifically, they wish to impress on the prospective instructor to: appreciate the implications of working in a project culture and get started with their course activities earlier. Additionally, the Blended Learning team would like to provide more structure during the project.

The comparison of the literature with the ChalmersX experience has examined typical challenges and best practices and evaluated their significance for each project phase. One can conclude that the focus of any Onboarding learning design for future ChalmersX instructors should focus on the earlier project phases, and on setting a firm foundation for the project team to collaborate well together.

2.5.6 Synthesis of All Sources

A review of the Blended Learning team's experience, the ChalmersX veterans' feedback, and the literature compels one to state explicitly that this practice of digitising university lecture-based content into a MOOC format represents a significant new professional competency for the instructor. Skilled though they may be in working as individuals in a presence-teaching setting, working in a project team to deliver digital content to meet a fixed go-live date is a vastly different proposition. Indeed, one of the most frequently-mentioned instructor challenges in the literature was knowing where to go in the university to understand how to get started with a MOOC. To improve the transition from concept to course production, the Chalmers Blended Learning team saw a need to devise a structured method of competence development for the instructor.

To address this requirement, in late 2018 the Blended Learning team commenced a project called the ChalmersX "MetaMOOC primer" course in the MOOC format, delivered on the EdX platform. The team acknowledged that their presence-based, "respectful" coaching approach was not as effective as it could be in setting expectations or exposing the instructor to the realities of working in a project-based culture. A shell of the course already existed in late 2019, which was organised loosely according to the ADDIE model. It contained some the thoughts of what content could be included, but the author was free to make recommendations.

The business objective as shared with the author was to create a learning experience that makes it ultimately more likely that project activities will be initiated immediately, at the best level of quality possible, with the resources available. The Blended Learning team had not collected "as-is" benchmark data, but remarked anecdotally that a disproportionate amount of project resources had been inefficiently consumed during the Develop phase. To empirically evaluate whether a learning programme would contribute to improving this situation, it would be necessary to track resource utilisation against a structured project plan and compare this over time to some accepted guidelines. As mentioned in *the 2.5.4 Best Practices Cited in the Literature* section, the Australian Government (2014) recommends that the Analysis, Design, and Development phases should consume 10%, 36%, and 35% of budget respectively, with Implementation and Evaluation taking only 4% and 7%. The design process required the synthesis of all sources. The previous twelve years of research provided the bases to be applied to enhance the use of time, funding, and skills. The following section details the design process of the approach which, in the longer term, might help the Blended Learning team move toward a more optimal use of project resources.

3 Recommended Design Approach

3.1 The Design Problems and Objectives

3.1.1 Original Concept—the "MetaMOOC Primer" course

In initial meetings about the project in December 2019, the Blended Learning team described their challenges of delivering projects on time and at a reasonable pace of work. The team ascribed the root cause of these difficulties to a lack of proper information and understanding on the part of the potential MOOC instructors for what was expected of them. Additionally, the team described the cultural challenge of asking university professors to perform in the context of a technology project team. The author challenged whether the problem was actually a learning need on the part of the instructors, or whether there were potentially other factors in operation. In this meeting the team confirmed their conviction that, indeed, the knowledge gap was a result of instructors' inadequate understanding of "working in a project culture" and that the eventual objective was spreading out production effort more evenly and smoothly during the project, rather than the typical chaos immediately before the go-live date. The Blended Learning team said they had tried various methods to enforce adherence to deadlines, but in their opinion the issue seemed to be a cultural one specific to a university working environment. The team was inspired by open-source learning materials created by Stanford Online Lagunita (n.d.). The hope was that such a learning intervention would communicate the importance of starting on project deliverables as early as possible. The Blended Learning team professionals were there to support the instructor; yet, they were also dependent on the instructor to stick to deadlines. The author asked whether an acceptable outcome of the course would be for a professor to decide that the MOOC would be too much of a commitment and decide against it, and the answer was that this would certainly be desirable if it made sense for that person.

The author was curious whether there had been any further exploration of the root causes between the gap in performance and the defined summative objective, and requested further background information. It seems that that had not been the case, according to the meeting notes for when the project was first defined in November 2018 (Chalmers Blended Learning Services, 2018). The only solution considered to address the situation was a custom "MetaMOOC Primer" course, ideally delivered over the EdX Edge learning platform. The team defined the project objective as primarily to, (translated from Swedish) *make it clear how we produce a MOOC in order to reduce the amount of unpleasant surprises for the instructors during production, and to increase production to a more appropriate tempo earlier in the project.* Other expected benefits included (translated from Swedish):

- marketing,
- increased visibility and transparency,
- helpful to assign to new Blended Learning team members,
- make it clear that there is a team to support [the instructors],
- create understanding around the Blended Learning team's recruiting,
- qualify appropriate "teacher candidates," increase the "we-feeling," or team-building feeling during production,
- the instructors become familiar with the EdX environment, see possibilities and limitations
- show the importance of being able to see one's MOOC in advance, at the same time being able to keep an eye on details and the bigger picture

Over the next few months after this November 2018 meeting, the team conducted further sessions to define the imagined structure of such a course and what content it might contain. These thoughts were

reflected in a "shell" course within EdX Studio, shown to the author in November 2019, a year after the initial meeting. This prototype contained mainly notes and a few videos which the team said they already had available and planned to re-purpose. In the first meeting the author formed the impression, correctly or not, that this shell was still open for reconsideration as there was very little mature content.

Whether the problem was fully explored and best solution provided are questions that the author examines critically in the *Discussion* section of this paper. Because there was no record of these topics being explicitly discussed by the Blended Learning team, one can only speculate about why no other solutions were considered, as well as about the expected advantages of presenting the information in a MOOC format rather than a personalised presentation and expectations-setting meeting as Blended Learning team had done in the past. Some benefits must then be imagined such as:

- First, the MOOC is an efficient, consistent, and scalable way to communicate the information to the prospective instructor.
- Second, employing a wide variety of learner interactions within such a course will also provide a type of situated learning with legitimate peripheral participation approach for the MOOC instructor "apprentice," consistent with seminal theory popularised in *Situated Learning: legitimate peripheral participation* (Lave & Wenger, 1991). Indeed, as one surveyed ChalmersX veteran stated, *"It is ... very difficult to imagine a suitable course structure without previous experience with making a MOOC course,"* and another said *"[I] believe it would help to go through two to three MOOCs elsewhere first"* (Chalmers Blended Learning Services, 2019).

There may have been other approaches to address the challenges. If one assumed that insufficient instructor knowledge was indeed the pivotal root cause, one could choose to be efficient, conserve resources and use the complete curriculum of courses already existing for EdX partners: *EdX 101: Overview of Creating an EdX Course*, *DemoX*, and *StudioX: Creating a Course with EdX Studio*. The team could have decided to assign new instructors some of these courses instead of creating a new, custom one.

If analysis concluded that a root cause for challenges was a project team that needed more structure, another approach to improving project team performance could have been to create a project toolkit and method, which could be combined with the existing approach of presence meetings. The team did not seem to seriously consider any options other than the MetaMOOC primer course, and, in later design discussions with the author, the team elaborated that they had always wanted to provide a "this is what it's like to work with ChalmersX," bespoke learning experience. Presumably this approach would address the stated objective, to market the Blended Learning team and what it has to offer specifically to serve the potential ChalmersX instructor. This limitation to content created in-house became an important scope delimiter after the first design iteration, see the *3.2.1 First design Iteration: defining an unconstrained vision* section.

3.2 The design method: principles, vision, operative images, and evaluation

A sensible practice for any design project (for learning or otherwise) is promoted by Stubbs et al. (2006): establish a set of course design principles that are more or less inviolable. This helps the designers and evaluators keep good discipline for any project scope. In a design review meeting in December 2019, the author proposed these design principles. The design shall:

- Support a 70-20-10 approach for the learner.
- Employ the constructive alignment design approach (Biggs & Tang, 2011) consistent with EdX's recommendation (EdX, n.d.-a).

- Be primarily designed to drive project deliverables forward, (in the context of learning activities and exercises), not necessarily to purely demonstrate comprehension.
- Support the learner at each stage of the project just-in-time, with an appropriate balance of immediately relevant content, followed by an activity, i.e. consistent with the constructive alignment learning design approach (Stubbs et al., 2006).
- Be informed by literature, the experience of ChalmersX veterans, and EdX best practices.
- Include decision gateways, when the instructor is explicitly asked for commitment to continue to the next stage of the project.

The discussion of the design principles was unfortunately inadequately socialised due to inadequate meeting time and key team members being absent due to illness. During the first meeting in December 2019, the attendees mentioned that they did not see any conflict with using existing EdX materials within the design. However, after the first design iteration (see below), the Blended Learning team rejected the recommended design principle, "prioritise use of existing materials from EdX, either in original form or repurposed," with respect to any required content in the course. Although high-quality content from EdX already exists (as mentioned in the *3.1.1 Original concept—the "MetaMOOC Primer"* course section), the Blended Learning team made it clear only after the second design iteration that they wanted to provide more of a customised "this is what it's like to work with ChalmersX" experience. It was deemed acceptable to link to EdX resources as recommended additional materials, but not to drive the learners to them as the primary content. During the course design and development iterations, the author strove to incorporate the remaining design principles into deliverables.

The discussions of recommended approach and design principles followed the "thoughtful interaction design" method recommended by Stolterman and Löwgren (2004), the "vision." Stolterman and Löwgren's approach is iterative in nature, working three levels of abstraction: a **vision** , then an **operative image** which is a "bridge between the abstract and the concrete" (Stolterman & Löwgren, 2004, p. 10), an externalised product available to be manipulated by the senses and subject to iterative evaluation, and, finally, a **design specification**. By December 2019, there had been several discussions defining the objectives and vision of the Onboarding programme, and there was already an operative image available, at least in the Blended Learning team's opinion. The author was challenged to further confirm, refine, and clarify the vision by use of operative images throughout the design process.

3.2.1 First Design Iteration: defining an unconstrained vision

After reviewing the literature and all ChalmersX resources available, the author concluded that the design challenges were the following: an uninformed set of key stakeholders in the new MOOC project team, as well as a shortage of tools, templates, standard project plans, and documented preferred ways of working. Instructors in particular did not normally have the requisite knowledge of MOOCs, digital learning, or working in a project team to make a well-informed decision about whether they could commit to delivering a MOOC project.

The author's first design recommendation was a comprehensive Onboarding curriculum adhering to the 70-20-10 blended learning framework (McCall et al., 1988). A 70-20-10 *blended* learning experience includes:

- 70% (experiential learning) e.g. the instructor preparing and producing project deliverables independently,
- 20% (social learning) e.g. coaching and supervision from Blended Learning team (presence meetings)

- 10% (formal, in this case, *digital* learning) with both assigned MOOCs and ones of the instructor's choice, such as "competitor" MOOCs in his or her field, or ones of purely personal interest

The author recommended such a blended approach with the insight that it is an appropriate learning method for professional learners who are up- or cross-skilling. In this case, it addresses the university instructors' obtaining a new skill: transforming their traditional classroom lectures and assignments into a digitised learning design and delivery mechanism aimed at a large, diverse group of learners taking the course more or less asynchronously. Assigning selected MOOCs as the *formal* learning provides a structured introduction to basic concepts, as well as the experience of being a MOOC learner. However, as Johnson, Blackman, and Buick (2018) rightly conclude, high-quality, impactful experiential learning (the 70%) needs structured support with feedback, reflection, and practice. They assert that in order to achieve learning transfer, participants need opportunities to practice what they have been exposed to in formal learning with structured coaching and social learning (the 20%) from peers, mentors or subject matter experts. Furthermore, high-quality professional 70-20-10 learning programmes must be designed so that each type of learning supports the others.

To incorporate all of these considerations, the author recommended crafting learning activities that were actually "pre-worked" project deliverables. The learner would then bring these outputs to scheduled project meetings as a basis for a richer discussion to move the project forward. The project meetings would then be dual-purpose—first, coaching the instructor (the 20% social learning aspect) and second, project meetings with a sharper focus and set of outcomes. The synergy among the three types of learning seemed to the author to be a comprehensive and practical approach for onboarding new MOOC instructors. As discussions about the project scope and vision continued, the author endeavoured to introduce more shape and design tension into the discussion, starting with design principles.

Although a "MetaMOOC" course outline already existed in EdX Studio, the author wanted to create a vision and operative image unencumbered by the existing design. The operative images were a first version of a Recommended Onboarding curriculum concept as displayed in Figure 5, and a storyboard delivered in MURAL, a digital whiteboarding solution. The concept included a primer course aimed at preparing for the two-day Kick-off workshop, which leveraged *EdX 101: Overview of Creating an EdX Course* (EdX, 2014) content within it. The second part of the concept was the two-day workshop, culminating in the first content production "sprint" of the course About and introductory week material.

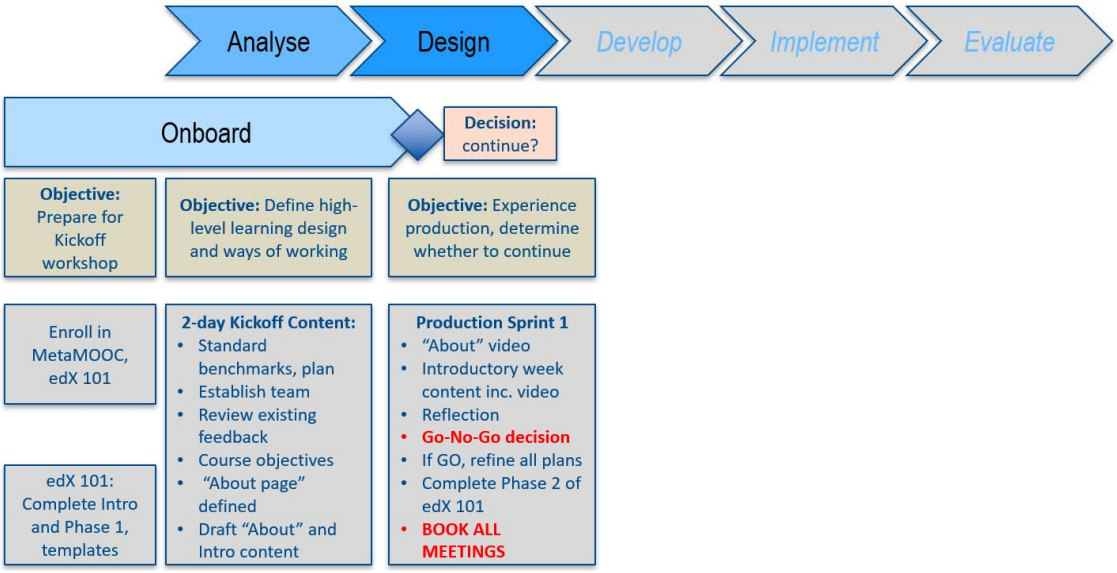

Figure 5: First Iteration of Recommended Comprehensive Onboard Concept

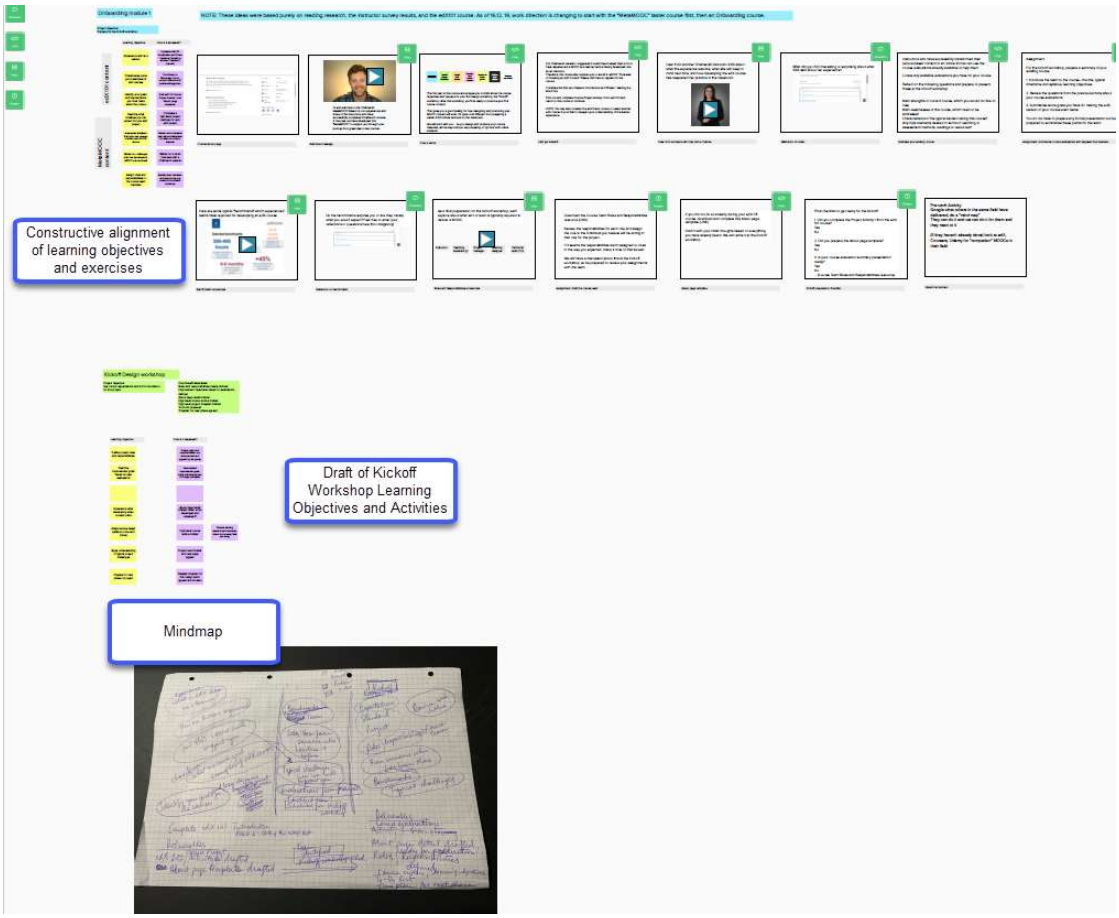

Figure 6: First Storyboard in MURAL Tool

The storyboard (see Figure 6) organised learning objectives for both the recommended course and Kick-off workshop, matched with assessment exercises or activities in line with the constructive alignment learning design method promulgated by John Biggs and Tang (2011) and recommended by EdX. This method "systematically align[s] the teaching/learning activities, as well as the assessment tasks to the intended learning outcomes…[by] requiring the students to engage [in] the *learning activities* required in the outcomes" (Biggs & Tang, 2011, p. 11). In this storyboard the constructive alignment is planned on the left-hand side, with yellow boxes indicating the learning objective and the matching learning activity next to it in a lilac box.

In order to craft learning objectives and choose an appropriate exercise, the author used a technique common to many educators, as explained in Arizona University's Teach Online materials (Smith, 2012): first, choose which concepts or nouns are important to cover, then choose an appropriate "action verb" at the desired cognitive level from a list mapping these according to Bloom's Taxonomy (USMx, 2019), then craft the learning objective, and finally select an activation exercise that will demonstrate learning.

The overall objective of this first design iteration's MOOC course was to prepare for the Kick-off workshop therefore, the Assessments were designed so that the instructor would bring them to the workshop prepared to discuss them and make decisions to drive the project forward. The alignment between the learning objectives and activations are described in Table 5.

Learning objective	Activation or Assessment	Rationale
Experience EdX as a learner	Complete EdX101 Introduction and Phase 1 (optional: [review] DemoX or another ChalmersX course)	Mentioned by ChalmersX veterans that it would have been helpful to experience a MOOC as a student first
Characterise some good examples of EdX courses	Contribute to Discussion forum, record reflections of positives/ negatives in discovered courses	Same as above, also activating the learner towards analysing and reflecting
Identify your goals and key decisions you must make about the course	Draft EdX 101 Course Project activity 1 and "About" page templates	First step of the Analyse step in the project, which is a project deliverable
Describe what timelines you can expect for your EdX project	Complete a high-level project roadmap for your EdX project	Activate the instructor toward comprehension of the time requirements
Incorporate feedback from your past courses to inform your MOOC course	Review and summarise past course evaluations for ideas on what to improve	Mentioned as a useful step in the literature
Relate to a colleague who has developed a MOOC and survived	Reflect on a video interview with a ChalmersX veteran	Same as above

Assign roles and responsibilities to the course team members	Identify team members and ensure they are invited to the Kick-off workshop	Introducing clarity and preparing all stakeholders for the Kick-off workshop

Table 5: First Design Iteration Constructive Alignment of the MOOC Portion

To indicate what type of user interaction is planned, each screen of the storyboard is marked in the top-right corner with the green icon for the primary interaction type available in EdX. These are as follows: HTML, Discussions, Videos and Problems (e.g. typical closed, image mapped input, drag and drop, numerical and math expression input, integration with third-party tools such as MatLab, and "open" assessments with peer grading). Each "screen" in EdX can contain multiple interaction types, for example an HTML section on top followed by a Discussion, however the author indicated the primary interaction that the learner would have on each screen. For completeness, the author included a photo of the first sketch on paper of a mind-map to document the design process.

To design the second portion of the recommended Onboarding curriculum, the author prepared an outline for the Kick-off Design workshop. The envisioned Kick-off Design Workshop incorporated typical activities from both Onboard and Analyse project phases, and it was anticipated that it would support and coach the project team through these phases (the 20% coaching aspect) in accordance with the 70-20-10 approach as described previously. The Kick-off Design workshop's primary objective was to *set correct expectations and a firm foundation for the project*. The workshop's expected **outcomes and deliverables** were:

- Roles and responsibilities clearly defined
- Improvement objectives based on evaluations defined
- About page detail drafted
- High-level course outline drafted
- High-level project time-plan drafted
- To-do list prepared
- Time-plan for next phase agreed upon

As in the MOOC portion, the author defined learning objectives and activations within the storyboard as described in Table 6.

Learning objective for Kick-off Workshop	Activation or Assessment	Rationale
Define project roles and responsibilities	Project roles and responsibilities are documented and agreed upon by the group	Key activity for any project team in the Onboard phase
Describe improvement goals based on past on-campus evaluations	Documented [course] improvement goals, which will become part of Design principles	Moving from Analyse to Design project activities
Experience what developing video content is like	About page detail drafted, video script developed [to be produced at the end of the workshop or later]	Veteran instructors in the literature and ChalmersX survey mention that this is one of the most challenging skills they had to learn. Therefore, sensitising the instructors to

		this early, with "low-risk" content, is expected to help them when they create course content.
Adapt lecture-based syllabus to the EdX format [including discussion of Constructive Alignment]	High-level course outline drafted Present existing research and resources that others in the same field are using	ChalmersX veterans mentioned this was time-consuming for them. Providing a tool can help them start to organise their thoughts. An early design recommendation from the Blended Learning team was to include a benchmarking activity to best practice MOOCs or other learning resources in the same field, because the team had found this to be very helpful in the past.
Apply understanding of typical project challenges	Project benchmarks and next steps agreed upon	Socialising the instructor to the concept of working in a project team with resource dependencies, milestones, and timelines. Agreed-upon timelines for all team members facilitate team-building.
Prepare for next phase of project	Detailed time plan for first design sprint agreed upon and booked	Clearly transitioning from the Onboard/ Analyse to the Design/Development phases.

Table 6: Learning Objective Alignment with Activities for Kick-off Workshop

The Blended Learning team reviewed the concept and the storyboard, and, although they liked the idea of the two-day Kick-off Design workshop, they essentially rejected the approach as inconsistent with *their* original design vision. It became clear to the author that the MetaMOOC primer course was not negotiable in terms of approach or even structure. For the first time, the Blended Learning team shared their design objectives for the course: It should reflect a maximum two-hour duration "study visit" learning experience for the potential instructor, with emphasis on working within a MOOC project culture, and furnish resources to use later in the project.

There were several ideas in the existing course prototype that were consistent with ideas in the first iteration of the Onboarding concept; however, the author acknowledged that her recommended concept would have required longer than two hours for the learner to complete. The existing course outline, which was already configured into the EdX Studio environment, loosely followed the ADDIE framework:

- Welcome and Introduction

- Prepare for Course Production (corresponding to Analyse, Design)
- Create Course Content (corresponding to Develop)
- Run a Course (corresponding Implement, Evaluate)

A significant amount of content existed in the Creating Course Content unit; however the learning needs as determined by the literature review were that emphasis should be placed on the earlier project phases. The team agreed that the author would limit any further design work to the "Prepare for Course Production" unit of the existing MetaMOOC primer course, which included sub-units of "Process Overview" and "Course Design." This agreement made the existing analysis of the literature and survey results according to the ADDIE model very useful, because the author had a list of common challenges and best practices from which to choose. The challenge, given that the entire course should only consume two hours, was to wisely select which of these concepts to emphasise.

3.2.2 Second Design Iteration: adapting to the existing framework

The next iteration required the author to revise the vision, compare the existing course prototype to the initial recommendation, find synergies, and redesign the assigned units in another storyboard or operative image. For consistency and a comprehensive approach, the author created a new recommended Onboarding curriculum (see Figure 7) but focused design efforts on the assigned units of the MetaMOOC primer course.

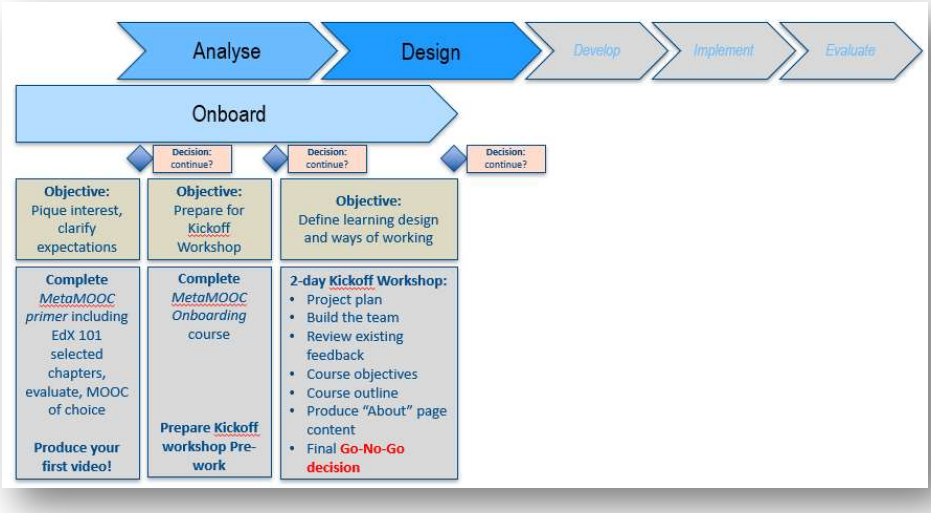

Figure 7: Revised Recommended Onboard Curriculum Concept

The second version of the comprehensive Onboarding curriculum is targeted not only at instructors but also members of the project team, such as teaching assistants or new production technicians. Its three modules span the Analyse and much of the Design phases of a MOOC project, including interventions to pique interest and clarify expectations using the first module, the MetaMOOC "primer." The primer's capstone exercise is to produce a "micro" video on any topic in collaboration with the Blended Learning production team, in order to transparently address the challenge most often mentioned by veteran MOOC instructors. This first foray into video production is followed with a reflective coaching discussion with the Blended Learning team's author/project manager, and the formal decision whether or not to continue to the next step.

The second recommended Onboarding module would include a more demanding MetaMOOC course, or even a second unit of the existing primer, containing several exercises requiring the participant to draft project deliverables in preparation for a two-day presence Kick-off workshop. If the learner determines after this course to continue, s/he will bring these items to the workshop for an intensive project planning, learning design, and team-building session. The capstone exercise for the workshop is to produce the About page content, which will later be used to market the course. The workshop provides the learner with the information and confidence required to decide whether to continue with the project. Assuming s/he decides to go ahead, the Design and Develop phases begin in earnest with a more structured set of tools and supervision than were previously afforded.

The next storyboard, shown in Figure 8, had the same structure as the first but included comments from the Blended Learning team's review (yellow squares) and the decisions agreed upon in the review meeting (blue squares). Additionally, the black circles with A in them indicate an activation of the learner, highlighting the constructive alignment between information presented and an activity designed to stimulate comprehension. The author attempted to include a good variety of content (HTML with links out to other sites, videos, resources and templates) as well as activities (discussions, problems with worked examples, short quizzes) in an effort to expose the learner to what types of content and activations are possible within the EdX platform.

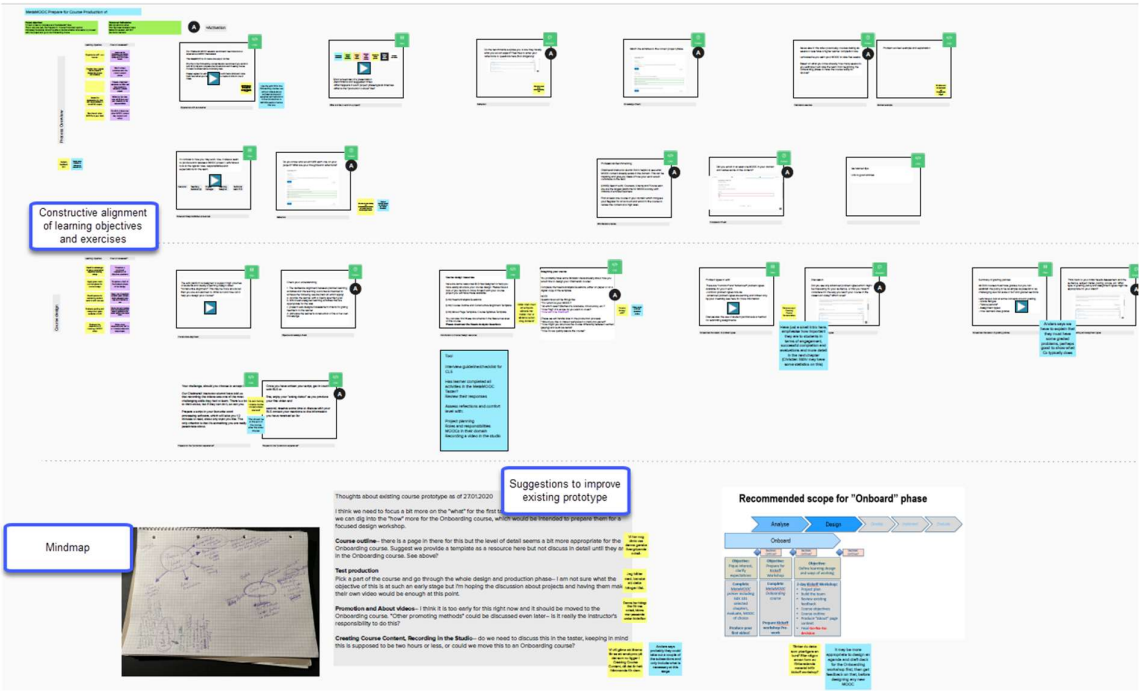

Figure 8: MetaMOOC Prepare for Course Design storyboard in MURAL Tool

The project objectives were redefined as:

- Requires two hours or less to complete, with a "study visit" feeling
- The learner should be able to decide whether s/he wants to proceed with the project.

The outcomes and deliverables of the course were redefined as:

- "Microproduction" video
- First high-level Analysis
- Reflection session with the Blended Learning Services team
- Go-No-Go decision

As in the first iteration, the author defined the learning objectives and assessments or activation activities for the Prepare for Course Production unit explicitly within the storyboard, as reflected here in Table 7:

Learning objective	Activation or Assessment	Rationale
Process Overview sub-unit		
Experience EdX as a learner	Enroll in *EdX 101* or *DemoX* or at least one MOOC in your domain	This was removed during the design review—it is undesirable to "drive the learners away" to other courses immediately
Visualise how a typical course project is divided into phases with timelines	Match phase activities with the correct project phase Prepare a high-level calculation on effort and time required to complete a sample project	Expose learners to different types of problems available in EdX with a very simple one, checking whether they had been listening to the video Sensitise learners to the time they should plan to devote to the project, expose them to the "worked example" concept which literature says is highly-rated by MOOC learners.
Assess the expectations for roles and responsibilities in the MOOC project	Reflect on the roles, who will fill them, and your reactions to the responsibilities	Activate learners to consider that they will not be alone in the project, they get support from the Blended Learning team, and they may need to obtain support e.g., from teaching assistants.
Benchmark other MOOCs in your field	Enrol in at least one other MOOC, review key content and indicate completion in a structured quiz question.	As suggested by veteran MOOC instructors as a valuable activity. Used the completion check as a further prod to ensure that the learner actually completes the step.
Benchmark other MOOC instructors' experiences	None, provided links to optional readings but no required assessment	The literature recommends speaking with veteran instructors as a helpful activity in the Onboard phase. This was later moved to the Welcome and Introduction unit along with an introduction to the

		ChalmersX course library. These easy-to-read resources are simply available to provide a wider perspective.
Course Design sub-unit		
Recall the advantages of using a constructive alignment learning design	Complete a structured assessment of objective questions	Ensure that the instructor understands why constructive alignment is so important in a MOOC context. Expose the learner to the different types of structured problem questions available in EdX.
Apply given tools and templates for course design	Complete a draft of the Analysis phase of the design [given a Needs Analysis questions template]	Activate learners to begin the Analysis phase of their potential project, make them aware of what one needs to consider, demonstrate that Blended Learning team has resources and expertise available to support them.
Recall options for evaluating student work in EdX courses	Given a list of available problem types, discuss which advanced ones may be of interest to use	ChalmersX instructors mention that authoring sufficient exercises was very challenging, yet learners respond well to having plenty of them. Activate reflection toward first design ideas.
Evaluate grading and assignment types available in EdX, [later added what ChalmersX courses usually have implemented]	Discuss what type of grading policy and assignment types might be applicable for the course audience and subject matter	Activate reflection toward first design ideas, generate questions.
Evaluate the experience of creating a MOOC video	Write a short manuscript and "act" in a 1-2 minute video with teleprompter	This was later moved to the "Creating Course Content-> Creating Videos" sub-unit

Table 7: Prepare for Course Production Constructive Alignment

The design review meeting of this storyboard revealed that, despite an earlier confirmation to the contrary, the Blended Learning team did *not* want to leverage EdX content *whatsoever* as part of the MetaMOOC "primer" course; rather, they wanted to provide a more personalised approach of the ChalmersX instructor experience. Although the team agreed during the design review that there might be too much content in the existing prototype--for example in the Creating Course Content and Run a

Course units--it was not decided what the full scope would be for this primer course, nor what the scope would be for the user evaluation.

3.2.3 Third Design Iteration: prototyping the operative image

The EdX *StudioX* course (EdX, 2020) was an essential tool for the author to begin prototyping the allocated course units within EdX Studio. Using the skills learned in this course, the author configured the structure of the units and created prototype content such as quizzes, an initial course analysis tool, a course design template, and screencast videos with closed captions. This prototype sits somewhere between an operative image and a specification in Stolterman and Löwgren's levels of abstraction (2004). It is a concrete product that the learner can experience; yet, it is not the final version, nor will the team create a written "specification" of the future course. Rather, the team simply iterates the design in the EdX Studio tool until it is ready to publish a new version. Figures 9 through11 contain indicative screen views of how the design environment looks for an author and for a learner (end user).

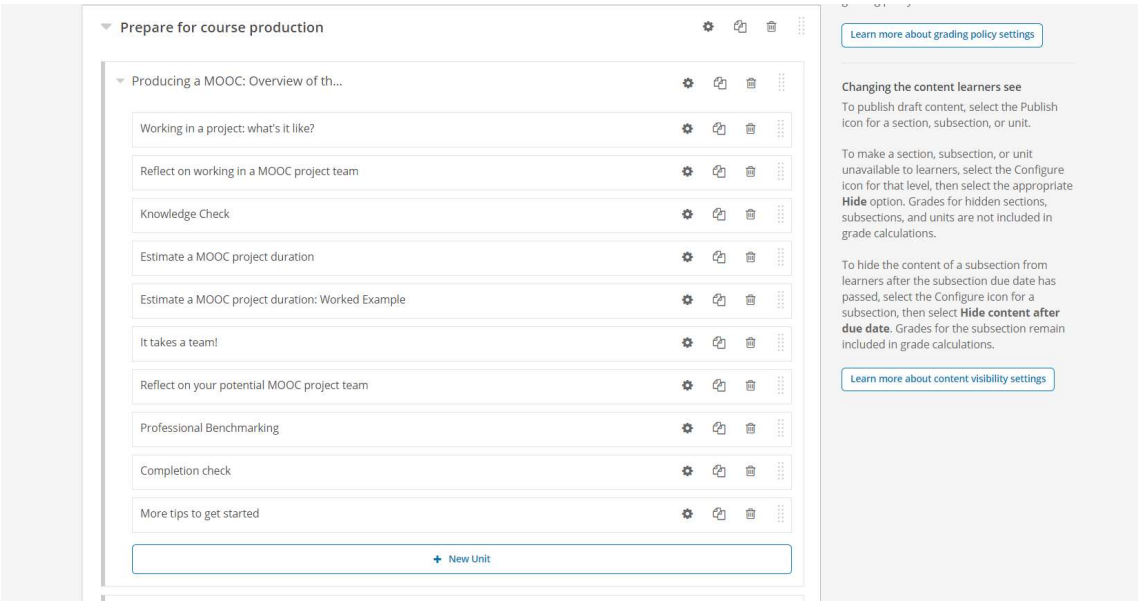

Figure 9: EdX Studio Design Environment—Course Outline, The Producing of a MOOC: Overview of the Process "Subunit"

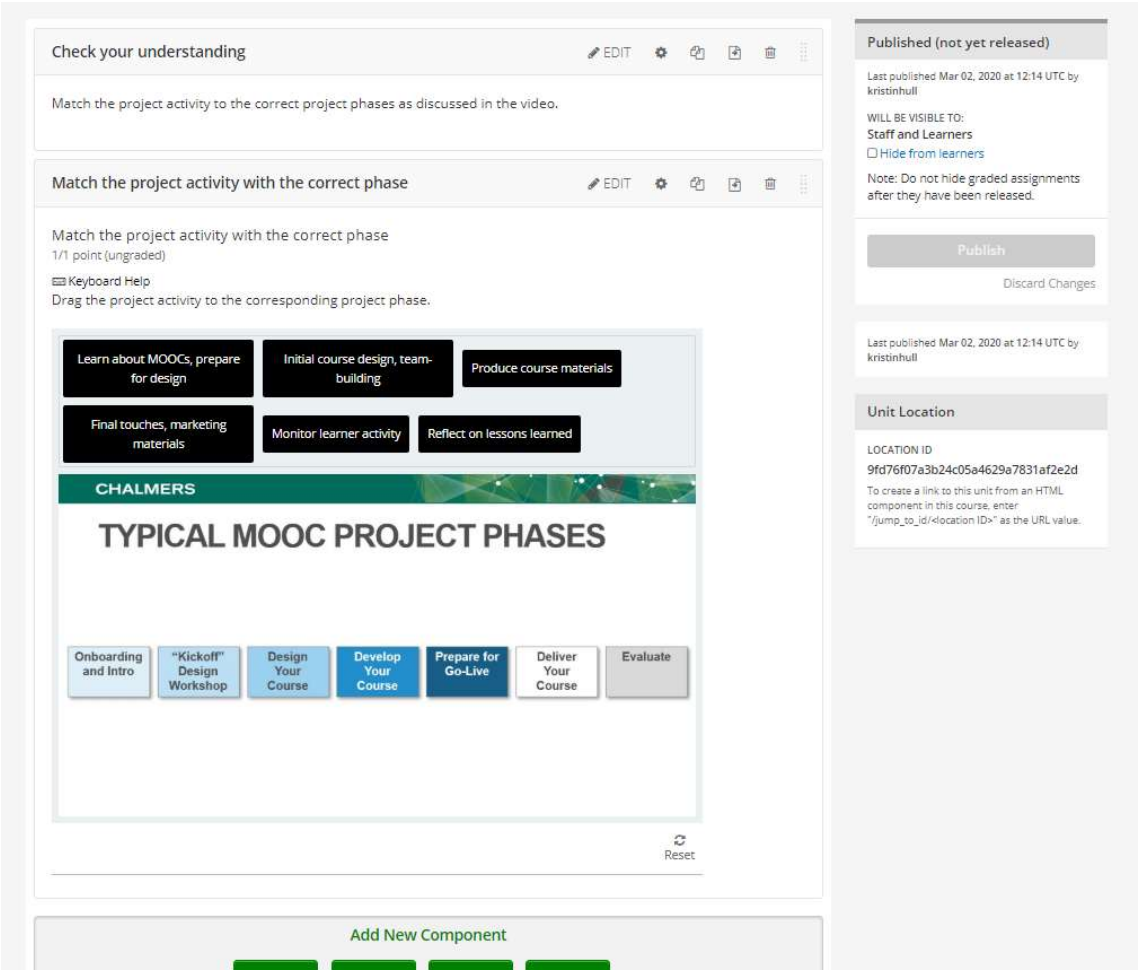

Figure 10: EdX Studio Designer View with Detail of a Drag-and-Drop "Problem"

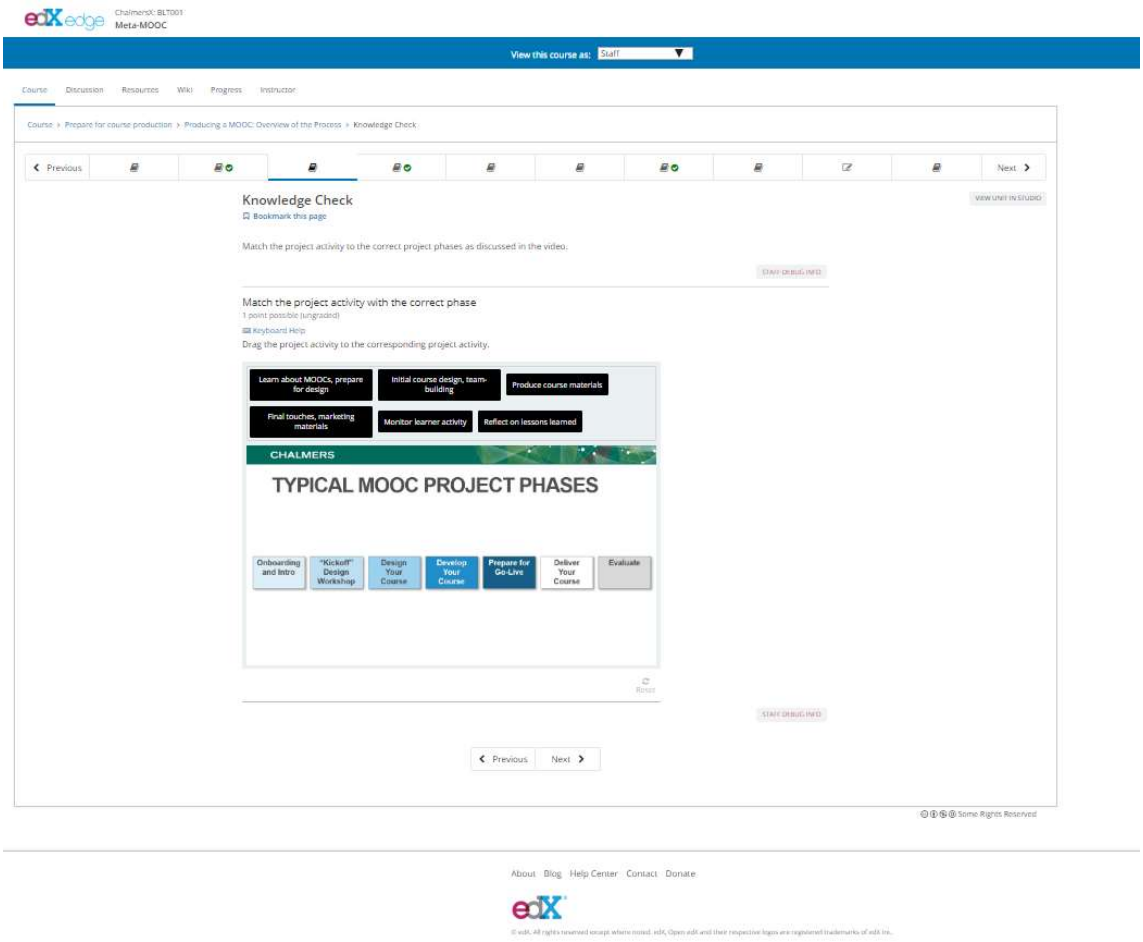

Figure 11: Sample Learner View of the Same Problem once Published within the Course

One of the learning objectives, "recall options for evaluating student work in EdX courses," included content about the various problem types. One of the course team members commented how important "good quality" and "plentiful" problems were to the most "successful" courses in terms of learner feedback. The author wanted to include some empirical data from the ChalmersX dataset but upon inspection, the only way to derive indicative data on this point would be by clickstream analysis. This did not seem worth the effort merely to include as an item in the course content. So, upon recommendation, the author included key concepts and a reference to Freeman et al. (2014) meta-analysis of studies of undergraduate STEM student exam success when instructors used "active" instruction techniques in the classroom versus lecture-only methods. Although it may seem a small detail, this is a significant point for MOOC instructors of a technical university and for Chalmers to understand. Students report that they prefer practice exercises more than almost any other course activity (Boyle et al., 2003); yet, the ChalmersX veterans mentioned that it was time-consuming for them to create good ones (*Chalmers Blended Learning Services,* 2019).

The design team focused on preparing their content at a sufficient, indicative level of maturity in time for evaluation, with the final course units including the following: *Welcome and introduction*, *Prepare for course production*, *Creating course content*, and *Run a course*. A final design review with one member of the Blended Learning team checked for any no inadvertent redundancies of content or anything missing from the initial plan. Additionally, the author communicated that there may have been too much material for only a two-hour learning intervention. The team had still not come to an agreement on how much of the course would be considered the primer and how much might be

assigned to the instructor who had committed to the course. The decision at this design review was to ask the evaluators their opinion, given the design objectives, and to make a decision based on their feedback.

At the end of this third design iteration, the learning design had telescoped from a comprehensive Onboarding blended learning experience to an introductory level “taster” MOOC. The design decisions became clearer in each iteration, including, finally, to exclude any existing EdX content in favour of a custom ChalmersX learning experience. There were still open questions about whether there was too much content for a two-hour learning time target, as well as whether the most compelling concepts had been included. With a working prototype, or design “operative” image available, it was the right time to perform a formal evaluation.

4 Development Project Evaluation

Evaluation happens constantly during a digital learning design project (Stolterman & Löwgren, 2004), whether it be informal discussions amongst the design team or more formal evaluations of prototypes with potential users of the product. The author leveraged the framework proposed by McKenney and Reeves in their comprehensive guide *Conducting Educational Design Research* (2012). This guide provides guidelines for how to evaluate a learning design at different stages of maturity, considering who the evaluators are, what should be evaluated, which method to use, and what the best types of questions to ask are.

According to McKenney and Reeves (2012), the "alpha" prototype is quite often a storyboard or some other useable artefact. Evaluation can be conducted by the design team (termed "developer screening"), expert external appraisers, or both. The evaluation questions should centre on whether the ideas underpinning a design are sound, and whether the design is feasible. The authors recommend a formal review of the alpha prototype with predetermined checklists or questions. The author considered the "alpha" prototype to be the storyboards and that the learning design was the product being evaluated in this stage. It was not deemed necessary to perform a formalised evaluation of the "alpha" prototype with the design team, although all decisions were documented within the prototype in case of questions later.

Review of the "beta" prototype was designed to be more rigorous. McKenney and Reeves (2012) define the "beta" as a working set of system components in a functional system. Because the EdX Studio is already a robust, fully-functional system that permits publishing finished content immediately, it provided a convenient method of providing an operative image or specification. McKenney and Reeves (2012) recommend a nine-step process to designing the evaluation. Table 8 summarises the choices about the evaluation that the author made according to this framework.

Designing the evaluation required the inclusion of an additional decision framework. McKenney and Reeves (2012) recommend expert appraisal as one potential method for "beta" testing, however they do not provide a definition of "expert" in this context. The author designed some questions according to the Technological Pedagogical Content Knowledge (TPACK) (Koehler & Mishra, 2005; Mishra & Koehler, 2006) model to gauge the expertise level of respondents who were not experienced MOOC instructors. The TPACK model is designed to capture the interplay of knowledge of technology, pedagogy, and content when designing and delivering digital learning solutions. The intersection of these three elements—Technical Knowledge, Pedagogical Knowledge, and Content Knowledge, produce four additional types of knowledge critical to fully integrated learning experience:

- Technical Content Knowledge: how to transform subject matter by using technology (e.g. simulations in physics)
- Pedagogical Content Knowledge: pedagogy which is applicable to teaching specific content (e.g. relevant pedagogical techniques, use of students' prior knowledge and epistemology for that domain)
- Technological Pedagogical Knowledge: how technology can support pedagogical goals (e.g. online collaboration)
- Technological Pedagogical Content Knowledge: understanding and negotiating the relationships between all three of the types of knowledge.

After defining the knowledge types as above, Koehler and Mishra (2005) assert that the TPACK model has implications for teacher professional development as well as well-integrated, coherent learning designs. In the context of this paper TPACK therefore becomes useful to evaluate the expertise level of the external evaluators who have not previously delivered a MOOC. See Table 8

below for a summary of decisions taken as well as section 8.3 Participant information for the corresponding background questions.

4.1.1 Method for Designing the "Beta" Evaluation

Empirical Design Evaluation Step and description		Decision taken by the author
1	Establish the focus: • What do we need to know now? • Formative goals (how to improve the design) and summative goals (will it work to engender a desirable phenomenon)	Formative goals: • Are the learning objectives sufficiently covered? • Is the learning design and experience within EdX Studio a positive one in this context? • What recommendations do the evaluators have for improvements? Summative goals: Will the participants: • Be able to complete the MetaMOOC course in two hours? • Have sufficient information to make a decision about whether to commit to a MOOC project?
2	Frame guiding questions • Which questions are appropriate for the product's stage of maturity, in this case beta version? • Does the intervention meet its goals?	As above—focus on the learning and design objectives, as well as learning experience
3	Select basic [evaluation] strategies • Choose the appropriate evaluation strategy corresponding to the product's maturity • For beta testing, the authors recommend choosing from developer screening, expert appraisal, pilot, or tryout	Selected expert external appraisal for the beta evaluation; however, "expert" is not clearly defined by McKenney and Reeves (2012). Included screening questions in the interview to determine level of expertise of the respondent, evaluating which dimensions of the Technical Pedagogical Content Knowledge (TPACK) framework were relevant (Koehler & Mishra, 2005; Mishra & Koehler, 2006). With the assumption the respondent is already a content expert in his or her domain, these aspects were selected as the priorities: • Pedagogical Knowledge • Technological Knowledge • Technological Content Knowledge • Technological Pedagogical Knowledge
4	Determine specific methods • Select the data collection method (e.g. interview, focus group,	Selected individual interviews in order to • Gather richer data and

	observation, checklists, etc.) to correspond to the basic evaluation strategy • (p 147, Table 6.4, Authors map all data collection methods as possible for interviews, with developer screening being less desirable)	• Reduce potential for group-induced bias, which is a potential drawback to focus groups Asked evaluators to reflect after one hour of reviewing the prototype, using the interview questions provided in advance. This is to mitigate any cognitive biases resulting from a time gap between reviewing the prototype and the face-to-face interview. Rejected observation because the learning technical solution is not being tested and this seems a more appropriate method for interaction design. Rejected checklists because they are too closed. However, the interview protocol contains some closed questions.
5	Draft and revise a planning document	Drafted an interview protocol with • Informed consent • Statement of researcher's role and potential bias as mentioned in step 7, requested the respondents give constructive feedback • Closed and open interview questions See the Appendix for the complete Interview protocol.
6	Create or seek [data collection] instruments	As in step 5, but the form of data collection will actually be the interview. Checked whether it is possible to report in analytics on learner engagement time with the course within EdX Studio, which, unfortunately, it is not. As a result, there is a question in the interview guide asking the learner to estimate the time they spent reviewing the course.
7	Collect the data • Select the participants • To compensate for the bias resulting from the designer also being the researcher (e.g. evaluator effect, expectancy effect of socially-desirable responses), it may help to describe to the respondents what the designer's role is and their real or potential influence on the data	See the *4.1.3 Method for Participant Selection* and the *4.1.4 Method for Collecting Data for the "Beta" Evaluatio*n sections

8	Analyse the data	See *4.1.5 Results and Analysis of the "Beta" Evaluation* section
9	Report the study	See the *5 Discussion* section

Table 8: Design of the Beta Evaluation Following Method Recommended by McKenney and Reeves (2012)

4.1.2 Method for Designing the Evaluation Instrument

The author drafted the Statement of Informed Consent, Disclaimer of Potential Bias in the Interview, Participant Information, and Interview Questions as shown in the Appendix. The method and documents were reviewed with the thesis advisor and a member of the Blended Learning team for comments. Once these were approved, it was necessary to decide how to collect the data efficiently and ethically. The author consulted the *Good Research Practice* guidelines (Swedish Research Council, 2017) to validate that all relevant ethical frameworks were considered. Please see the section *8.5 Ethical Evaluation of Data Collection* in the Appendix for a detailed description of evaluation and decisions taken.

4.1.3 Method for Participant Selection

The author decided to approach two experienced MOOC instructors and a minimum of two experts in the domain of learning, but who have never taught a MOOC before.

The rationale for this was the following:

- Experienced instructors will have quality input based on what they "would like to have known" before committing to a MOOC.
- Inexperienced instructors give a fresh perspective on the content and whether it represents what they would need to know before making a commitment.
- Interviewing a minimum of two respondents of each experience level will offer diverse perspectives versus having only one representative of this type.

Participants were selected by convenience sampling and approached based on professional relationships, i.e. who was expected to be most likely to want to help. This method may have introduced unintended bias, although it is impossible to anticipate what type. To counteract any potential cognitive biases during interviews, the author included a disclaimer in the interview protocol describing her role and asking specifically that the respondents offer constructive criticism without considering what an interviewer might "want to hear." Two experienced MOOC instructors and three non-experienced instructors agreed to evaluate the prototype and participate in an interview.

4.1.4 Method for Collecting Data for the "Beta" Evaluation

Finally, data collection for evaluating the prototype was planned: five qualitative interviews would be conducted with experienced MOOC instructors and pedagogical experts. Based on the approved interview protocol, the author created digital forms for the Statement of Informed Consent, Disclaimer of Potential Bias, Participant Information and Interview Questions within Microsoft Forms (see the Appendix for these in detail). Once the course prototype was prepared, the interview participants were enrolled in the course and sent an e-mail with links to the online forms. The participants were asked to spend one hour reviewing the course, then, as soon as possible after the review, to enter their reflections into the online form. Asking them to make notes directly after reviewing the prototype was

intended to ensure capture of immediate reactions without losing them in the one or two weeks between the prototype review and the interview.

The interviews were conducted in English following the structure of the online form, with the author confirming the answers submitted in the online form and eliciting clarifications or additional detail. The interviews were subsequently recorded and transcribed using Nvivo Transcription software. The author collated the results into two lists: one summarising answers to each interview question per respondent, and one adding feedback and suggestions according to each course unit. These results were subsequently shared with the Blended Learning team to decide on further actions.

4.1.5 Results and Analysis of the "Beta" Evaluation

The results are summarised according to the three portions of the interview protocol.

4.1.5.1 Participant information

As mentioned in the *4.1.4 Method for Collecting Data for the "Beta" Evaluation* section, the five interview respondents consisted of two experienced MOOC instructors and three inexperienced pedagogical experts. The two experienced instructors had delivered MOOCs in sustainable living and computer engineering. To gauge their level of expertise according to the TPACK model (as discussed in detail in the *4.1.2 Method for Designing the "Beta" Evaluation* section) the inexperienced respondents were asked for more details about their familiarity with various dimensions of this model. Each question was applied to a five-point Likert scale, which included descriptive guidance about which to select. The number 1 generally corresponded to having no expertise and 5 to being a researcher in that area (see the Interview Questions in the Appendix).

TPACK Dimension	Please rate your degree of agreement with these statements:	Answers
Pedagogical Knowledge	I am familiar with pedagogical theory and practice. 1-Not familiar at all 2-Somewhat familiar 3-Familiar: I have had some introductory courses in these topics 4-Quite familiar: I use these in my daily work but my main field is something else 5-Extremely familiar: I am a researcher in these topics	5-Extremely familiar: I am a researcher in these topics (n=3)
Technological Knowledge	I am familiar with digital learning solutions. 1-Not familiar at all 2-I have completed some e-learning courses as a learner on one platform 3-I have to use some digital learning solutions in my work, and have completed e-learning on more than one platform 4-Quite familiar: I have deep technical expertise as a system administrator or designer of digital learning solutions 5-Extremely familiar: I am a researcher in this field	3- I have to use some digital learning solutions in my work, and have completed e-learning on more than one platform (n=2) 2- I have completed some e-learning courses as a learner on one platform (n=1)

Technological Content Knowledge	I have expertise with digital learning content. 1- No expertise 2- Sometimes in my private life I find videos or other content to help me learn something new 3- I create digital learning content to instruct private or professional smaller-scale topics 4- I have evaluated options and contributed to digital learning content to support a complete course or other defined learning project 5- I am a researcher or practitioner with this as my primary field	4- I have evaluated options and contributed to digital learning content to support a complete course or other defined learning project (n=2) 3- I create digital learning content to instruct private or professional smaller-scale topics (n =1)
Technological Pedagogical Knowledge	I have expertise with digital learning pedagogy. 1-No expertise 2-I have heard about e-learning 3-I have taken some e-learning courses as a learner 4-I have explored and created digital solutions for learning which differ from my classroom approaches 5-I am a researcher or practitioner with this as my primary field	4- I have explored and created digital solutions for learning which differ from my classroom approaches (n=2) 3- I have taken some e-learning courses as a learner (n=1)

Table 9: Summary of Non-Experienced MOOC Instructors' Expertise According to the TPACK Model (N = 3)

The summary shows that, although these instructors had not created MOOCs before, they were well-qualified in pedagogical concepts and more experienced than the average professor in terms of their comfort level with digital content and technical pedagogy. They are likely not considered experts in digital learning solutions. This was a lesser concern for the evaluation, because the EdX Studio platform design and functionality in themselves were not the focus of the interviews.

4.1.5.2 Formative goals

The next portion focused on the formative goals of the interviews, gauging whether the learning objectives were sufficiently covered, whether the learning design and experience within EdX was a positive one in the context of being a new MOOC instructor, and gathering suggestions for improvements to the learning experience as a whole. Most of the respondents kept their review time to about one hour.

In their responses to the questions in this portion of the interview, the experienced MOOC instructors were generally quite positive about both delivering the learning as an EdX course, and about the content.

> *[having the learning experience within EdX was] wonderful…I know since I went through doing a MOOC, you have to think very differently from the way you develop what I'd like to call an on-campus course. So, having access to a MOOC that teaches how to develop MOOCs is excellent and may have a big impact.* (Respondent 2)

Respondent 4 found the overall experience to fulfil its purpose; however, some of the messages on time commitment could be stronger:

> *As a study visit with the Blended Learning team, it fulfils its purpose, you know, if you are just curious about the format, about the phenomena. As a study visit or their first encounter it works fine…[however] I know myself and if I saw this I would say, 'yeah, yeah, but I'll do it much better [than the benchmarks presented here]' It is presented in a very nice and polite way.* (Respondent 4)

The inexperienced instructors had a full range of reactions, from "rather negative," to neutral, to finding the course informative and inspiring. Respondent 5 said he found the learning experience "monotonous," but this is his impression of online learning in general. Respondent 3 imagined himself as a prospective MOOC instructor and said:

> *I found it pretty informative and it gives some good sense of what would be involved if I want to do this and what will I be obliged to do. So really that kind of sense of what does this involve? I think that's really conveyed and… that's really good for going into this decision.* (Respondent 3)

The most negatively-disposed respondent (Respondent 1) had several excellent constructive suggestions grounded in pedagogical best practices, for example:

> *Why wasn't my prior learning assessed there with me so that I could see my prior learning before I jump into the MetaMOOC? And why weren't there options to skip things if my primary learning was already there? Why reteach things that people already know? So, I would have asked for somebody to … make some forks in the design like, "you have answered yes to this, go to section 3." That's what I was wishing for.* (Respondent 1)

Respondent 1's learning experience suggestions included improving coaching tips in the exercises, and expanding the discussion of what assessments are possible to engage MOOC learners at higher cognitive levels.

The use of Constructive Alignment in the learning design, as well as the video on this subject, received some criticism. It was acknowledged as a very important pedagogical technique to keep in mind for any instruction, whether MOOC or classroom. Yet, respondents recommended highlighting in the course introduction that the activations (automatically-graded simple exercises) were there to demonstrate what is possible within the EdX Studio solution, acknowledging that for a university professor they may seem rudimentary or even "silly" (Respondent 3). The video on Constructive Alignment was seen as "too theoretical" according to Respondent 2, and Respondent 1 recommended that it be made optional. This was due to the theory being covered in a required Diploma of Teaching Higher Education course which all Chalmers faculty must complete within in the first two years of employment. Two respondents recommended touching on Constructive Alignment only briefly, instead showing examples of good MOOC course outlines to illustrate best practice.

4.1.5.3 Summative goals

The next portion of the interview was centred around how well the course met its design objectives of: first, a recommended learning time of two hours and, second, after completing the course, whether the learner would be comfortable in making an informed decision about whether to commit to a MOOC project.

All of the respondents said it would likely take between three to five hours to review the course content as planned, without completing the recommended activities. These activities were as follows:

- meet with an experienced colleague

- research MOOCs in your domain
- complete a first draft of a Needs Analysis
- write a script for a "microproduction" video
- schedule a video production/ reflection session with the Blended Learning team.

The inexperienced instructors all mentioned that there would be much more time required to speak with other stakeholders and answer questions that the MetaMOOC primer could not. For example as Respondent 5 said, *this isn't something I would expect the MOOC to give me, but I would have a lot of other questions like, will my boss let me devote time to this, how does it fit in with my other priorities, do I have the money to do this project?* (Respondent 5)

In terms of the value of the recommended activities, all of the respondents said that the reflection session with the Blended Learning team would be a valuable input for the decision. Three specifically mentioned the microproduction video as something that would be useful for them in terms of professional skill development, regardless of the final decision whether or not to produce a MOOC. Respondents 3 and 5 both said they would like more practical hands-on experience within EdX Studio to aid them in their decision, *"if I did all the exercises, did the trial recording, and maybe did a trial of creating EdX modules, arrange them into a couple of learning sequences, that would be enough information"* (Respondent 5). In summary, the respondents saw all of the recommended activities has having value in helping them make a decision. However, requiring all of them, as well as the content in the course, would make a two-hour time limit for the learning experience completely unrealistic.

The interview then reviewed each course unit to determine whether the content would further the design objectives and asked, with this in mind, what was missing. Specific perspectives from the experienced instructors are particularly useful for this portion of the interview. For example, Respondent 2 suggested being honest about the fact that there is very little possibility to re-use classroom material for the MOOC, *"don't fall into the trap that you think you have all of this on-campus material that should be easy to convert to a MOOC. Just the concepts. You have to build it from scratch. That's the bottom line."* (Respondent 2). He pointed out the advantage that MOOC material, in contrast, is very suitable to repurpose in the classroom. Table 9 summarises the responses for the course summative goals.

Course Unit-Subunit	Summarised responses	Exemplary Quotes
Welcome and Introduction	This content for this course unit is incomplete, but it should meet learning needs when it is finished. It needs to include: • assessment of prior knowledge • orientation to the course learning objectives • the reality that producing a MOOC is a fun and creative process • disclaimer about the automatically-graded exercises	*"What was lacking is that doing a MOOC is actually fun. You learn a lot and you need to experiment, think in new ways and open your mind to the medium."* (Respondent 4) *"The exercise with getting in touch with a colleague is great… [the learning experience within EdX is] good, because it's a possibility to get to know the system a bit for myself… Some of the exercises (notably the drag-and-drop design phase exercise) felt a little "silly", but pointing out that they are examples of what could be used may overcome this."* (Respondent 3)

Course Unit-Subunit	Summarised responses	Exemplary Quotes
Prepare for Course Production-Producing a MOOC	This content is essentially complete with some adjustments to the videos and exercises. Clarify that project deadlines are a team decision, not something the Blended Learning team forces on the teacher.	*"It was absolutely clear that I would need to seek support and potentially financing. I don't remember exactly the time budget but it was communicated that it was fairly extensive and a 'business commitment.'"* (Respondent 5) *"You have to present more of a reality check, that it really is a commitment and all of these people are depending on you. I think you said maybe ten hours a week but near the end we were working day and night because we were so late. I get the impression that it's so much easier than it really is!"* (Respondent 4)
Prepare for Course Production-Designing a Course	The content in this course unit was a good start in some respondents' opinion, in others' it needs significant adjustments. The Constructive Alignment video should be de-emphasised, rather briefly mention the concept with the assumption the learner is already familiar with it, and provide with good examples of course outlines. The About Page template is distracting in this unit and should be provided as an optional resource somewhere else. Instead, include more information about: • the process for designing your course "narrative" • the available exercise types and how they correspond to Bloom's taxonomy • assignments and evaluations at higher cognitive levels, specifically how to use peer grading for things like essays • Peer-reviewed research on best practices for assignments and exercises in MOOCs.	*"[Constructive alignment] is a super-important thing when it comes to the MOOCs. I didn't know it was called that but I've used it over the years…[however the I found this sub-unit] a little bit generic and theoretical. So maybe if it would be good to give some examples. Bring it more down to earth or hands-on."* (Respondent 2) *"One thing that I didn't find in the MOOC, which I struggled a lot with was…how do I build a narrative for my course? I cannot teach all of the things I want to because there was this limitation [of] four [instruction] weeks... So I had to prioritise…which are the important concepts and then, how do I build the narrative? I cannot get any feedback from the students so I have to make sure that they can follow it. I should be very careful in introducing concepts in such a way that I can build on those concepts and take it from there . Kind of building a house with bricks."* (Respondent 2). *"So, if I for example want my students to write an essay that reflects upon something, I would need to know what tools are [available] and how have other people squished a reflective essay into a MOOC, and what was the outcome? ...It would be wonderful if [the exercise types available] could be structured according to [Bloom's]*

Course Unit-Subunit	Summarised responses	Exemplary Quotes
		taxonomy which the teachers recognise from the pedagogy courses." (Respondent 1)
Create Course Content	This content is very useful but perhaps too comprehensive at this initial stage. Include some inspiration about filming "out in the field," not just in the studio and that the best time to plan for this type of project is during the summer period.	*"I didn't look at it in detail. I thought, "that's probably going to be helpful, but I didn't have the motivation to go through it." And I don't think that the teacher at the stage of deciding whether or not to do a MOOC needs that level of detail."* (Respondent 1) *"If I would not have started [my MOOCs] over the summer, I would not have been able to pull it off."* (Respondent 2)
Run a Course	This content is only outlined, not prototyped, so it is not possible to evaluate. Include information about what the teacher versus teaching assistants are doing whilst the course is running, specifically: • how to monitor activity with the analytics and dashboards • the requirement to make adjustments in real-time if there are any misunderstandings.	*"[I would like to see] what kind of data I can get to follow my students and their progression."* (Respondent 5) *"One of the roles of... teachers that I think is important is to catch misunderstandings...catching what the students are really thinking that might be counterproductive to the learning that's intended and possibly making interventions that...address misunderstandings and maybe even redesign parts of the MOOC [in real time]."* (Respondent 1)

Table 10: Summarised Feedback on MetaMOOC Primer's Ability to Address Summative Objectives

The next few questions reminded the respondents of the design (summative) objectives and asked in order to further these objectives,

- which concepts were very helpful and should absolutely be included,
- whether there were any which were completely unnecessary, and
- whether any concepts might not be needed immediately.

The respondents were positive about:

- how the investment of time was conveyed,
- the project team and process,
- most of the design templates, and
- experiencing a MOOC as a learner.

No portions of the course were labelled as unnecessary, but some suggestions for wording in the existing videos were offered.

Finally, the respondents mostly agreed that the:

- detailed information on video production,
- running the course, and
- Constructive Alignment

might be better left to a stage when there was a definite commitment to produce the MOOC. The author catalogued 70 suggestions according to the relevant course unit and prioritised these according to estimated impact and effort in order to assist the Blended Learning team with the next design iteration. Based on the richness of constructive feedback gathered at this stage, it would be useful to incorporate it all into another "beta" design iteration and approach the same respondents to evaluate this version.

Following this second beta design iteration, the next natural step would be to evaluate a gamma version of the course, which McKenney and Reeves (2012) define as a fully working version tested in a realistic environment. The objective in such an evaluation would be more summative in nature, in order to understand whether the intervention achieved any measurable changes in behaviour or results. At the time of writing, the Blended Learning team was not able to devote additional effort to developing the course content, nor were there any upcoming MOOC projects planned. Consequently, it was not possible to initiate an additional beta design round or deploy the course for a new MOOC team to gauge its impact.

To summarise the results of the design iterations to-date, the author focused on designing a custom ChalmersX learning experience within the EdX Studio platform including two concepts: preparing for course production and designing a course. The author then integrated these concepts in an existing course outline. The evaluated learning experience was in an indicative state of content production, intended to elicit feedback and suggestions, rather than presented as the finished solution. As in any design project, the evaluation elicited positive confirmation of the design, suggestions for improvement, and some conclusions about the approach as a whole.

The evaluators were, mostly positive about the formative goals of the evaluation—whether the learning objectives were sufficiently covered (by implication whether the correct learning objectives were present), and whether the learning design and experience within EdX Studio a positive one in this context. They confirmed the attraction of providing a learning experience *about* MOOCs within a MOOC, the same tool with which they would be expected to develop and deliver their courses. Although the inexperienced evaluators had all participated in digital learning in the past as learners, they saw the value in experiencing the MOOC first-hand. Moreover, it seemed the right interval in the design process to solicit expert feedback. The author used the course design objectives, literature, and the ChalmersX interviews to guide selection of learning objectives, but this was just an estimate of what should be included. The evaluated course content was purposely not produced at a mature state, so that it could still be adjusted without significant loss of effort. The evaluations suggest that the design was, in the main, effective for addressing learning needs, with some adjustments suggested.

These adjustments numbered approximately 70, and the ones expected to be most impactful included those listed below:

- introducing more pedagogical "touches" into the design, such as indicating where the learner could skip ahead, clearly stating learning objectives,
- discussing the process of designing a course outline and what support is available,
- indicating whether content would be mandatory or merely encouraged,
- keeping the audience (STEM researchers at the university level) in mind by providing more peer-reviewed references for assertions, and
- improving the coverage of assessments and exercises, particularly presenting these in light of Bloom's Taxonomy and fully exploring the potential of peer assessments in MOOCs.

The evaluations provided a necessary reality check to the course design (summative) objectives: first, a recommended learning time of two hours and second, after completing the course, the learner would optimally be comfortable to make an informed decision about whether to commit to a MOOC project. The evaluation demonstrated that these design objectives were not realistic; yet, the recommended activities were validated as very important. Requiring all these in conjunction with the course content, which was expected to take between three to five hours, demands that the course must be scaled-down if the two-hour time goal of the first design objective is to be achieved.

Considering the second course design objective, none of the inexperienced instructors felt that they would be completely prepared to commit to a project after only completing the MOOC and having a reflection session with the Blended Learning team. There were varying ideas of what they would need in order to make a commitment, including speaking with various stakeholders and learning more about how to use the EdX Studio platform, but all agreed the evaluated MOOC was insufficient to completely satisfy the objective of feeling comfortable enough to make a commitment. On a positive note, the course did seem to successfully sensitise prospective instructors to the scale and commitment required to participate in a MOOC project, and move them toward the next stage of seeking information.

5 Discussion

After evaluating a beta-level prototype of the MetaMOOC primer course, its use for new MOOC instructor Onboarding has many aspects to recommend it: The instructor experiences the MOOC environment as a situated learner, perhaps for the first time, the digitised course is a scalable and engaging way to deliver information, and it can pique the learners' interest to make further investigations into potential participation in a MOOC project. However, the ambition to provide a two-hour "study visit" learning experience was proven to be inadequate to fully explore all recommended best practices or indeed furnish information that the evaluators themselves stated they would need in order to feel comfortable to commit.

As is the case for reflection on any project, one is compelled to question whether the original problem statement, assumptions and design objectives were appropriate. Namely, was it correct to assume that the root cause of ChalmersX projects not being delivered on time was a lack of knowledge on the part of potential MOOC instructors, and that a good Onboarding programme realised in a digitised two-hour learning experience was the best way to address the root cause? Were there really no other potential reasons, such as go-live dates being unrealistic or lack of sufficient project resources? There seemed to be resignation to the university working culture being at odds with the structured nature of IT projects, which needed to be mitigated rather than addressed directly. The solution given to the author was to deliver content targeting symptoms (i.e. the professors must get started on their project deliverables earlier and understand that other people are depending on them), rather than any examination of what additional root causes or solutions might be applicable, or how the learner would be assisted in transferring the learning to performance as a project team member. In these assumptions, the bulk of the responsibility for improvement seems rather unfairly placed on the instructor, who. after all, is completely new to the domain.

Interestingly, EdX offers standard courses for new MOOC team members, which take the learner between four to five hours each to complete (EdX, 2014, 2020) and don't begin to scratch the surface of the lessons learned that the author collected from the literature. Even the scaled-back design (summative) objectives for this project (namely of the learner being able to make a decision about whether to commit to a MOOC project after spending two hours on MetaMOOC Primer) proved to be unrealistic. Hence, the assumption that two hours of learning would result in significant learning transfer, or improved performance as a MOOC project member, was something the author questioned from the beginning of the project. An objective observer could conclude that there may have been a case of the Blended Team employing the "law of the instrument" or "Maslow's hammer" cognitive bias. This bias is documented in several fields and involves over-reliance on a familiar tool. Maslow wrote, "*I suppose it is tempting, if the only tool you have is a hammer, to treat everything as if it were a nail."* (Kaplan, 1964; Maslow, 1966, p. 15) The Blended Learning team likely had more tools available than their significant expertise at producing MOOCs to consider as solutions to the problem. Yet there remains the appearance of a clear preference for this single course of action.

These reflections correspond with the author's original recommendation for a comprehensive blended learning Onboarding approach, with conscious "go/no-go" decision points after each module. The MetaMOOC course is a solid starting point and presents several advantages as a structured professional learning experience; yet, there is too much decisive content needed to fit into two hours' learning time. This implies that any complete Onboarding experience must necessarily address other important activities, including but not limited to the following: video production, EdX Studio skills, team-building, and project planning. Furthermore, the evaluated design contains content that is most applicable for the instructor during project phases later than Onboarding. Simply making content available for reference as part of Onboarding, with the knowledge that the learner will have to review it during later project phases, does not constitute structured support. Even if later project phases were not stated as the primary challenge by the Chalmers Blended Learning team, providing focused support at the right time is still desirable.

Consequently, the author stands by the recommendation to structure the Onboarding experience as a blended-learning curriculum as discussed in the beginning of this project. However, instead of considering Onboarding in the early project phases only, a more comprehensive professional development approach would offer structured support for the instructor throughout the entire project. Offering formal content when needed (for example on how to monitor the analytics and dashboards right before the Implement phase), rather than front-loaded during Onboarding means the learner is provided the information just before it is needed to activate. Considering again the 70-20-10 framework (McCall et al., 1988), just-in-time support spans all project phases, potentially even into the Evaluate phase, and instead of simply delivering content, "bakes in" best practices to project governance, deliverables, and management, as well as daily ways of working. It includes structured go/no-go decision points and team consensus on matters such as roles and responsibilities and project milestones. To consciously build the team addresses the assertion that structured IT projects are a challenging cultural fit for a university environment. Furthermore, it ensures that all project team members understand how they support and are dependent upon one another to complete the project.

Such a curriculum aims to follow the recommendation of Johnson et al. (2018) that each type of learning—Experiential, Social, and Formal—consciously supports the other two types and is structured to be delivered at the point of need rather than only in the initial project phases. This proposed curriculum would not only be targeted to the instructors; it would include teaching assistants and project team members, as appropriate. The following Table 11 summarises this revised recommendation.

Order of instruction	Module	Objectives	Summarised Content	Key "Deliverables"
1	MetaMOOC Primer EdX course	Pique interest, clarify expectations	• Intro to MOOCs • Working in a Project Team • Project Benchmarks • Needs Analysis • Develop a Course Outline • Activities and Exercises • Grading Policies	• Microproduction video • Reflection with Blended Learning Team • Go/No-Go: Decision whether to continue
2	MetaMOOC Advanced Part 1	Prepare for Kick-off Workshop	• Creating Course Content: Videos and EdX Studio • Existing MOOCs in the domain: prepare a summary and what this course could uniquely contribute • Summarise existing course feedback • Draft course objectives • Draft course outline • Draft "About" page video manuscript	• Prework for Kick-off Workshop completed • Go/No-Go: Decision whether to continue
3	Two-Day Kick-off Workshop	Define the learning design and	• Build the team • Review existing feedback	• Course objectives complete

		ways of working *as a team* Commit to the project plan and timelines *as a team*	• Course objectives • Course outline • Project plan • Produce "About" page content and video	• Course outline complete • Project plan complete • "About" page content and video complete • Go/No-Go: Decision whether to continue
4	MetaMOOC Advanced Part 2	Prepare for Go-Live	• EdX analytics and dashboards • Monitor Discussion activity • Adjust MOOC based on feedback • Prepare for Go-Live activities	• Marketing e-mails and social media prepared
5	Reflection and Evaluation (,5 day workshop)	Gather Lessons Learned Develop plan to implement enhancements	• Reflect on Content, Design, Delivery, Logistics, Technology, Analytics, Course Survey, Team Dynamics, Project Plan etc. • Decide on next steps	• Next steps, deadlines and owners defined • Celebration—team recognises their success and celebrates together

Table 11: Revised Recommended 70-20-10 Professional Support Approach

This fully-formed professional support package should ideally include standard tools and project resources to underpin it. The author recommends creating a project toolkit including templates and a standard project plan with activities as collected in the author's analysis of the literature. A standard plan would include estimates of effort based on the time and resource benchmarks collected from the literature (Graham, 2015; Maxwell et al., 2018) and distribute time and resources across the project phases as recommended by the The Australian Government (2014). The standard plan should be subject to evaluation and adjustment after collecting utilisation data from completed projects.

The Chalmers Blended Learning team may also consider in the future how it allocates dedicated project management time to guide and coach the entire project team, perhaps as a predefined percentage of time throughout the project. The team currently consists of highly-skilled practitioners in STEM education who also excel at content production and provide outstanding support to the instructors. Yet, the team admitted that in the past their approach may have been too hands-off with the intent of being "respectful" to their colleagues. The MOOC veterans gave feedback in the survey suggesting they would be glad to have more structure and guidance. Therefore, more consciously including project management as an allocated project resource may assist in progressing activities according to plan.

5.1 Weaknesses and Limitations

The evaluation exposed the challenge of employing the constructive alignment technique to encourage learning at higher cognitive levels as recommended by the revised version Bloom's Taxonomy used at Chalmers in the University Teaching and Learning course (Anderson, Krathwohl, & Bloom, 2001). There were three reasons for this: the design objective of limiting participation to two hours' learning

time, the reality that learners will be taking the course alone in the future, rather than with a cohort to interact with, and finally the technical limitations of exercises available in EdX Studio. In an effort to introduce some short reflection on the information made available, the author included the Discussion functionality in several places. However, this feature is most thought-provoking when there are other participants with which to collaborate. Intending to engage the learner at the Apply, Analyse, Evaluate and Create levels, activities were included in the design such as: speaking with an experienced colleague and reflecting on the conversation (Evaluate), researching a MOOC in the learner's domain (Analyse and Evaluate), drafting an initial course Needs Analysis (Apply), calculating a sample project estimate of effort (Apply, Analyse), and preparing a microproduction video (Create). The evaluators deemed these activities to be very useful but far too time-consuming to make mandatory. By contrast, the automatically-graded exercises such as matching project activities with correct phases or objective multiple-choice questions engaged the learners at the lower Remember and Understand levels. The evaluators saw value in providing them for demonstration purposes but pointed out they were not sophisticated enough for the target learner in the case of the MetaMOOC. The technical limitations of the platforms was cited as a challenge in the literature and by the ChalmersX instructors (Chalmers Blended Learning Services, 2019; Richter & Krishnamurthi, 2014; Yao & Suen, 2018) and accordingly became obvious in the evaluation of this course.

Furthermore, this project was diminished somewhat in impact by limited available resources from the ChalmersX Blended Learning team to develop the Welcome and Introduction unit, as well as to participate in any further development after the first beta evaluation. This limitation was due to significant environmental factors requiring the team to de-prioritise the project. The evaluated content was mainly limited to the design efforts of one individual, which creates bias in selecting learning objectives for the beta design. The advantage of evaluation at this early stage of the design has provided invaluable external guidance on improvements.

A consideration of the evaluation design is revealing in terms of potential improvements as well as the importance of reliability and validity. As the design (summative) objective of being able to commit to the MOOC project (a "go" decision) proved to be unrealistic, perhaps a more realistic question would have been whether the evaluator could definitely make a "no-go" decision based on the information provided. In terms of reliability of the evaluation design, the qualitative nature of the evaluation questions and discussing these in the context of an interview makes it doubtful that the instrument would produce the same results each time, even with the same evaluators. Indeed, the author noticed that the respondents often answered later questions during their answers to the earlier ones. Providing these questions in an online form in advance was meant to have the respondents record their immediate thoughts after reviewing the prototype. The author then had to integrate these written responses with what was said in the interviews, in order to catalogue the responses and suggestions, which is subject to bias of the single researcher. A small sample size of five respondents to such a qualitative evaluation instrument could imply that the results do not have adequate external validity, and that a positivistic survey of a larger sample size could produce more generalisable results. However, consider the context. The audience for the learning design is meant to be only a few dozen people at a specific university, and the content is meant to reflect a custom perspective to how that organisation works. It takes a minimum of one hour to review and reflect on the prototype in the survey, which is a significant amount of time to request from even five evaluators. Therefore, the author asserts that external reliability is not a crucial consideration for the evaluation in this situation.

During the design of content about exercises the following questions arose:

- What empirical studies are available which examine the relationship between positive outcomes (such as student engagement, completion and positive learner feedback) when increased numbers of "high-quality," "active" learning techniques and exercises are included in a MOOC?
- Furthermore, what defines a "high-quality" exercise?

Because these questions were not considered critical-path priorities for the project, significant time to investigate was not allocated to searching for literature on them. However, these benchmarks would offer incentive for ChalmersX teams to devote the effort required to create sufficient number and quality of exercises to their courses.

In the next design iteration, it would be of interest to consider the TPACK framework (Mishra & Koehler, 2006) as a construct for the learning design, in addition to the ADDIE framework and 70-20-10 model (McCall et al., 1988). The TPACK framework covers all aspects of instructor professional competence in digital instruction and it could be an additional idea to ask instructors for example, to self-assess their TPACK competence and suggest learning activities based on each dimension the instructor wants to improve.

5.2 Implications for Practitioners

The project, whilst modest in scope, offers interesting implications for learning designers, educators, and finally other researchers in the field of MOOC education. The learning designer is not always a dedicated team member, and indeed ChalmersX projects rely somewhat on the university professor taking on this role. Designers always have an obligation to ask the right questions, the most important ones being, "are we sure that there is a learning need present," "what do we think are the root causes of the business challenge we are experiencing," and "what do you want the learner to do with this information?" Although the author attempted to ask these important questions, many of the decisions about the problem and learning design had already been made months before. The "shell" solution looked to the uninitiated observer as though it was only at a conceptual stage; however, in reality, the client had put a lot of thought into each bullet point, thought, or note. In this situation the designer must be realistic about one's ability to further shape the project trajectory, then focus on executing as well as possible with the scope available. On a positive note, this project confirms that expert evaluation is invaluable, and one doesn't have to wait for a fully-formed prototype for it to adjust course, thereby conserving project resources and delivering a better product with each iteration.

Educators may find this compilation of challenges and best practices from a wide variety of sources interesting reading, even if only to gather benchmarks for comparison. Practitioners who are considering delivering a MOOC would do well to evaluate typical challenges, by speaking to someone with experience and reviewing the literature, and decide whether such a project is realistic for them. If so, a risk mitigation assessment may help with developing a sound project plan. If the author had any chance to influence EdX, the recommendation would be to take advantage of the findings in the literature to develop a better, clearer set of project tools and templates to accompany the standard courses that already exist. EdX materials (EdX, 2013, 2014) are well-produced instructional content, but they, in the author's opinion, fail to nudge the learner toward learning transfer: understanding how to implement a project.

5.3 Implications for Researchers

As a contribution to the domain, one must consider the implications this project has for researchers. Although the literature domain for instructor-focused research is smaller than for other topics as mentioned in the *2.3 MOOCs and Instructor Experiences: a Nascent Domain* section (Sari et al., 2019), there is still an ample body of work available. Future research could attempt to evolve the material into a consistent framework based on cumulative case-studies. Recalling that the source material is almost exclusively based anecdotal self-reporting, other forms of data collection could also be developed. In current form, the literature is challenging to generalise and the results are only available to a very determined practitioner seeking guidance. Yet, these are the foundations of research for a very new configuration; without them, it would have been impossible to focus on further directions of inquiry.

One idea is to start with collating the research and organising it, as has been done in this thesis. The natural next step would be to develop a best-practice project framework, standard plan, and set of tools to make the research practical. Regrettably, this wealth of knowledge and experience is not easily accessible or consumable by those who would benefit from it most: the MOOC project teams, and this this difficulty in accessibility points out a gap between researchers and practitioners. Researchers in this area could explore ways to build bridges with the other stakeholders in the entire MOOC ecosystem, such as MOOC providers and practitioners, in order to present their findings in a practical way.

An additional implication is the question that emerged during the literature review: What frameworks exist for defining a "successful" MOOCs beyond simple learner completion or engagement metrics? One could analyse project teams who had delivered MOOCs defined by these frameworks as successful, to discover what Onboard and project support activities they employed. Linking results with inputs in this way could potentially add a more evidence-based aspect to the domain, beyond the collection of anecdotal reflections currently available. Such work would be expected at a minimum to contribute to a sound method for defining realistic success objectives when a MOOC team is designing their course.

6 Conclusions

This learning design study was performed in the context of a successful MOOC development team wishing to enhance project execution. More specifically, the ChalmersX Blended Learning team sought approaches that would influence MOOC instructors to engage in project activities more quickly in the earlier stages, in order to allocate resources adequately throughout the project and allow sufficient time before go-live for reflection, evaluation, and improvements. The Blended Learning team's judgement was that they had not provided sufficient information to instructors in the past about what working on a MOOC realistically entails. It seemed crucial to help instructors make a well-informed decision about their commitment so that they understood the importance of getting started earlier and collaborating with the multidisciplinary team. The Blended Learning team believed that a "MetaMOOC" study-visit type of course, delivered digitally over the same MOOC technology platform they would develop their prospective courses, was the best solution to address this requirement.

Informed by a review of research literature, a survey of experienced ChalmersX instructors, and EdX standard learning materials, the author led three rounds of iterative design of an instructor Onboarding learning concept. The first alpha version recommended blended learning based on the 70-20-10 model, which by the third design round had devolved to include just the MetaMOOC digital course. The first two alpha iterations were storyboards which included considerations of constructive alignment learning design and the types of interactions available within the EdX Studio solution. These alpha versions were evaluated by the Blended Learning team and the design adjusted accordingly. The third iteration was a fully-functioning prototype course with indicative content, or beta version, within the EdX learning platform. The beta version was initially reviewed by the Blended Learning team in preparation for formal evaluation by experts outside of the team.

The formal evaluation included questions vetting the expertise of external respondents and elicited feedback about the formative (learning objectives) and summative (design objectives) goals of the course. The evaluators selected were a combination of experienced and non-experienced MOOC instructors who were asked to imagine they were considering creating a MOOC. These five external experts evaluated the course and were interviewed individually using a standard set of questions. Their evaluation demonstrated that the learning objectives were addressed reasonably well; however, the design objectives of being able to complete the course within two hours and confidently making a decision to commit to a MOOC project were unrealistic. Rather, the course provided enough information so that the learner could have potentially decided *against* a MOOC project or *in favour* of gathering *more* information required to make a decision. The evaluation method, instrument, and timing were appropriate and provided some 70 suggestions for improvement to the learning design.

The project was restricted by some portions of the course being incomplete and de-prioritisation by the Blended Learning team due to environmental factors. As a result, it was not possible to incorporate the suggestions into another design iteration. Additionally, the author questioned whether the problem and solution as originally defined were actually the correct ones. However, the project was already at a stage which limited significant reinterpretation, and it was necessary to design the most useful product with the constraints provided. This experience demonstrates implications for even experienced learning designers, to always pose the correct questions and be involved as early as possible in project definition discussions. Despite the somewhat limited scope, the prototype appears to offer a good starting point for future ChalmersX instructors, affording a scalable, engaging, and situated learning experience in a MOOC environment.

The author's collation of challenges and best practices from the literature into the ADDIE framework furnishes a useful baseline for educators seeking to embark on a MOOC project or develop a set of project policies, tools, and templates for their organisations' MOOC programmes. The domain does not currently offer any other standard framework to design project team onboarding, evaluate project

best practices, or decide what constitutes a “successful” project. Once such frameworks exist, comparing them to what actions successful MOOC teams have taken to onboard and provide performance support would be a valuable addition to the domain.

Eight years after the birth of MOOC platforms, their popularity indicates no sign of diminishing. Indeed, with the unusual circumstances of Covid-19 in 2020, learning from a distance is anticipated to increasingly become the norm. Higher education institutions will likely become more committed to digital education, potentially with an enhanced proportion of learners coming from the world of MOOCs or similar distance learning paradigms. Equipping their instructors and learning teams with the right learning and support will further their ability to address the “new normal.”

7 Reference list

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8 Appendix

8.1 Statement of Informed Consent

We would like to ask you to participate in a research study on the Chalmers Blended Learning MetaMOOC Primer course on EdX Studio. This document contains information about the study and what your participation would involve.

8.1.1 What is the study and why do you want me to participate?

The research study is conducted by Kristin Hull, a student at the University of Gothenburg International Information Technology and Learning programme, (hereinafter "Researcher") as part of her Master's Thesis. The purpose of the study is to implement and evaluate a learning design intended to “onboard” new ChalmersX instructors. Your participation is important because you offer perspective on what concepts are essential during this stage of a MOOC project.

8.1.2 How will the study be conducted?

As a participant in the study you will:

- Review a prototype version of a course delivered in EdX Studio for one hour
- Reflect on your experience given a set of questions
- Participate in a 30-minute interview about the questions, in English
- Be voice-recorded to best document the interview
- Answer demographic questions about your expertise with MOOCs and digital learning

8.1.3 Which data will be collected and analysed?

The Researcher will collect and analyse the following "User Data" for the study:

- The voice recording from the interview
- The transcription of the interview

The interview data will be transcribed, analysed and reported as qualitative results. The Researcher confirms that this User Data will only be used for the purposes of the study, during the retention period defined below.

8.1.4 What will happen with my personal data?

All data collected as part of the study will be handled confidentially according to the General Data Protection Regulation (2016/679). Voice/video recordings and transcriptions from the interview will be stored in such a way that no unauthorised persons can gain access to them.

The personal integrity of all participants will be protected in the reports from the study that could be published as follows:

The participants' name will not be declared in the study. Sensitive information will be removed or anonymised. However, the interview transcription including demographic information such as research field and prior experience with teaching MOOCs, will be disclosed.

In accordance with the General Data Protection Regulation, you have the right to request access to the data collected about you in the study and to request its deletion or modification. If you would like to access your data, contact the Researchers or the Research Supervisor within 6 months from the date stated on the signed consent form. Johanna Wallin (dataskydd@gu.se), data protection officer at the University of Gothenburg, can also be contacted if you have concerns about the way your data is handled. If you are dissatisfied with the way that your personal data is handled, you also have the right

to report your concerns to the Swedish Data Protection Authority, which is the relevant regulatory agency.

8.1.5 For how long will my personal data be stored?

The original voice/video recording will be retained from the Researchers for a maximum period of six months from the date stated in this consent form, beyond which time this User Data will be destroyed.

However, transcribed data from the interviews and reports from the study could be published as part of the Thesis.

8.1.6 Participation is voluntary

Your participation in this study is voluntary, therefore no compensation shall be offered. It is up to you to decide whether or not to take part in this study. If you decide to participate, you will be asked to sign a consent form. After you sign the consent form, you are still free to withdraw at any time and without giving a reason by contacting the Researcher.

You are free to contact the Researcher to seek further clarification and information about the study. The Researchers might contact you to request a clarification or a follow-up interview which you then will decide to accept or decline.

8.1.7 How can I get information about the results of the study?

You are not required to engage with the results of the study but you are welcome to contact the Researchers listed below to discuss the study results.

Researcher:
Kristin Hull (gushullkr@student.gu.se)
Research Supervisor:
Christian Stöhr (christian.stohr@chalmers.se)

Educational Institution:

University of Gothenburg

Department of Applied Information Technology
SE412 96 Göteborg
Address: Forskningsgången 6, 417 56 Göteborg

Department of Education, Communication and Learning
Address: Läroverksgatan 15 Box 300, 40530 Göteborg

8.1.8 Consent to participate in the study

I have received written information about the study and have had the opportunity to ask questions. I can keep the information provided to me.

Name: *

I declare that I have read the conditions for participating in the study: *

I agree that my User Data may be used for the purposes of the study by the Researcher in accordance with the terms defined above: *

I agree to participate in the study.

8.2 Disclaimer of potential bias in the interview

Thank you again for your time in agreeing to review the ChalmersX MetaMOOC and provide your feedback in this interview.

I am a graduate student in the University of Gothenburg International IT and Learning Master's Degree programme. My role in the MetaMOOC project is as an associate author, and this project forms the subject of my master's thesis. I will take the results of these interviews back to the Blended Learning team to improve the design and will also document your feedback in my thesis.

I will do my best to avoid bias whilst interviewing you, although this of course can happen as this is inherent in human interaction. The primary objectives of the interview are first, to validate the learning design and second, to gather your suggestions for improvement. Please do not feel obligated to give me answers you might believe I prefer, or worry that you will offend anyone if you offer criticism and constructive feedback. The objective is to use your input to create the best product possible to help future MOOC instructors.

8.3 Participant information

Field of research:

Are you an experienced MOOC instructor? yes/no

If you selected no:

Please rate your degree of agreement with these statements:
I am familiar with pedagogical theory and practice.
1-Not familiar at all
2-Somewhat familiar
3-Familiar: I have had some introductory courses in these topics
4-Quite familiar: I use these in my daily work but my main field is something else
5-Extremely familiar: I am a researcher in these topics

I am familiar with digital learning solutions.
1-Not familiar at all
2-I have completed some e-learning courses as a learner on one platform
3-I have to use some digital learning solutions in my work, and have completed e-learning on more than one platform
4-Quite familiar: I have deep technical expertise as a system administrator or designer of digital learning solutions
5-Extremely familiar: I am a researcher in this field

I have expertise with digital learning content.
1- No expertise
2- Sometimes in my private life I find videos or other content to help me learn something new
3- I create digital learning content to instruct private or professional smaller-scale topics
4- I have evaluated options and contributed to digital learning content to support a complete course or other defined learning project
5- I am a researcher or practitioner with this as my primary field

I have expertise with digital learning pedagogy.
1-No expertise
2-I have heard about e-learning
3-I have taken some e-learning courses as a learner
4-I have explored and created digital solutions for learning which differ from my classroom approaches
5-I am a researcher or practitioner with this as my primary field

8.4 Interview questions

If you have the time, please fill in your immediate reactions to the MetaMOOC prototype which you reviewed within this form, then I will follow up with you during the face-to-face interview.

First I want to ask you some questions about the **learning experience** and how it related to our learning and design objectives.

In the given context of being a new, potential ChalmersX instructor, what is your reaction to delivering this learning experience within the EdX platform?

Did you observe the use of the constructive alignment learning design technique?

If you could describe the learning experience overall in three words (the technology platform, content, and learning design), what would they be?

How much time do you estimate you spent previewing this course prototype?

Do you expect that when the course is complete, you could complete it within two hours?
Yes/No

If you said, No, how long might you think it would take you?

We have embedded some "observable outcomes" into the course, which would be activities you would complete as the learner. These are:

- Microproduction video
- First high-level Analysis notes
- Reflection session with Blended Learning team

Which of these, if any, would you find as helpful inputs to a decision about whether to commit to producing a MOOC?

The design team's objectives for this course is that first, it should not take the learner longer than two hours to complete and second, the learner is comfortable to make an informed decision about whether to commit to a MOOC project. If you have never instructed a MOOC before, this is fine, please imagine that you are considering becoming a MOOC instructor for a ChalmersX course in your domain.

Were these **course units and their learning objectives** covered to a degree adequate that you would have sufficient understanding of the expectations of you as a future MOOC instructor?

Welcome and introduction Become acquainted with the BLT and the members' expertise Distinguish differences between MOOC and on-campus teaching	Yes No Not sure

Relate to experiences shared by instructors who have already delivered a MOOC Visualise how you would use EdX Studio to create your MOOC	
Comment?	
Process Overview Experience EdX as a learner Visualise how a typical course project is divided into phases and timelines Assess the expectations for roles and responsibilities in the MOOC project Benchmark other MOOCs in your field	Yes No Not sure
Comment?	
Course design Recall the advantages of using a constructive alignment learning design Apply given tools and templates for course design Recall options for evaluating student work in EdX courses Evaluate grading and assignment types available in EdX Evaluate the experience of creating a MOOC video	Yes No Not sure
Comment?	
Creating course content: Employ best practices when creating a manuscript Visualise how studio recordings are best performed Deploy tools and techniques for recording using a camera and microphone Exercises-- this is a duplicate to the previous section Recall considerations for setting up discussions Ensure your content respects copyright	Yes No Not sure
Comment?	
Run a course Administer an EdX course Determine which factors are important considerations when re-running a course Correctly use elements stored outside of the MOOC	Yes No Not sure

Comment?	

Considering the course content as a whole, would you feel that you have sufficient information to give a clear yes or no decision on whether to commit to producing a MOOC?

Remembering the design objectives: that you should have sufficient information to make a decision about committing to a MOOC within about two hours:

Are there any parts of the course which you found exceptionally helpful or positive to definitely include?

Are there any parts of the course which you found completely unnecessary?

Are there any parts which are interesting, but would be more helpful at a later time, i.e. assuming the learner decides to commit to a project?

What concepts if any, do you find are missing from the course and should be included?

8.5 Ethical Evaluation of Data Collection

The evaluation as it was designed included a small amount of personal data on the digital forms and voice recordings of the interviews as well as transcriptions. However, the participant and interview questions were not designed to collect very sensitive personal information e.g. about medical history or criminal records. Rather, the questions are purely about the evaluator's professional background and opinion of the prototype. The author thus considered the Good Research Practice guidelines section 4.3, the "Four Concepts" of collecting, storing, and archiving research material, and section 9.1 Personal data handling to be the most applicable to this design project.

The "Four Concepts" include: Secrecy, Professional Secrecy, Anonymising or De-identifying, and Confidentiality. Of these, the final two are applicable. As a result, the researcher committed to anonymising the interview data and releasing it only in this anonymised form to the Blended Learning team and the research supervisor.

Section 9.1 Personal data handling, especially in accordance with the EU's General Data Protection Regulation was the additional consideration. Personal data was collected in the form of name through an online form, and storing a digital recording of interviewee's voices during an interview and finally a transcription. Of the subject rights available to EU citizens in terms of data collection, storage and archiving (European Commission, 2020) the author focused on:

- Informing participants on the disposition of their personal data in the Statement of Informed Consent
- Consideration of where collected data was stored
- Anonymising personal data as described above
- Destroying the data within a maximum of six months from the date the evaluator completes the Statement of Informed Consent.

Storage of collected data was the most complex consideration of these four. The author evaluated a few online questionnaire tools and settled on a personally-licensed version of Microsoft Forms. Other free tools (Google Docs, Survey Monkey) did not offer sufficient commitment to keeping the data within EU, and there was no tool available through Gothenburg University or Chalmers, though this would have been the preferred option. If a private citizen licenses Microsoft Office 365 from within the EU, their Microsoft Forms data is stored in centres within either the Netherlands or Ireland (Microsoft, 2020). The interview recordings and transcripts were stored on the author's Gothenburg University Microsoft OneDrive account. At time of writing Gothenburg University IT department had not confirmed the data storage location, however if it is consistent with what is stated for private citizens, OneDrive data is also stored in Ireland or the Netherlands. With this evaluation the author considered all relevant ethical criteria to have been planned for.