An Integrated Framework for Online Digital Transformation Management Courses

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Abstract: This study analyses the design and repeated delivery of a fully online master's-level course, Digital Transformation Management (DTM), taught at a Finnish university of applied sciences in 2022–2024. Because digital transformation is simultaneously strategic, organisational and technological, it demands integrative, higher-order learning, yet research on online business education has concentrated on comparing delivery modes rather than on how such integrative subjects should be designed and assessed at course level. The study asks how DTM learning outcomes can be constructively aligned in a fully online format, how individual and group assessment can be combined to support higher-order learning, and what design principles can be derived for comparable courses. It uses a design-based case study across three course iterations. The material comprises course documentation, Moodle-based learning tasks, assessment instructions and rubrics, the group development assignment and peer- and self-assessment materials, anonymised end-of-course student feedback, aggregate completion and grade indicators, and the instructors' documented observations, analysed through constructive alignment, the Community of Inquiry framework and the literature on authentic, peer and self-assessment. Evidence shows how feedback on quiz focus, assignment scope, deadline clustering and peer-review quality was converted into specific design changes, and how the four recurrent tensions of online delivery (pacing, group coordination, feedback quality and the calibration of peer assessment) were addressed inside the assessment design rather than by retrospective control. The contribution is an integrated framework for designing fully online, integrative master's-level courses, organised around four interdependent components: alignment and authenticity, multi-source and fair assessment, feedback and iterative improvement, and collaboration and social-presence support. The framework shows how constructive alignment, the Community of Inquiry and multi-source assessment combine into a single assessment architecture for a subject whose strategic, organisational and technological dimensions must be learned together, and offers transferable design principles for educators developing digital-era business curricula online.

Keywords: Digital Transformation Management, Constructive Alignment, Online Course Design, Multi-Source Assessment, Design-Based Case Study

1. Introduction

Digital transformation has become a defining concern for organisations across sectors, requiring managers to rethink strategy, business processes, organisational structures and the human side of work (Vial, 2019; Verhoef et al, 2021; Hanelt et al, 2021). The capability to lead and manage such transformation, digital transformation management (DTM), is therefore an increasingly relevant learning outcome in master's-level business education. It is also difficult to teach: Because digital transformation is simultaneously strategic, organisational and technological, it cannot be reduced to a tool, a method or a single theory, and it requires the analytical, evaluative and creative operations at the upper levels of Anderson and Krathwohl's (2001) taxonomy.

The challenge is particularly pronounced in master's programmes taught fully online. Online delivery offers flexibility and access for working professionals, but group work has to operate without the routine cues of a physical classroom, peer assessment has to be designed rather than improvised, and teaching presence needs to be deliberately enacted rather than assumed (Garrison et al, 1999; Garrison and Arbaugh, 2007). Designing a course that is demanding, coherent and workable at a distance is therefore a non-trivial task.

The paper matters for education research for two reasons. First, guidance on how to design and assess DTM courses is thin relative to the importance of the subject: the skills organisations need for digital transformation are considered wide (Bouwmans et al, 2024), yet research on digital transformation in higher education concerns mainly institutions' own digitalisation (Benavides et al, 2020), and research on online business education has concentrated on comparing delivery modes rather than on course-level design for integrative subjects (Arbaugh, 2014; Whitaker et al, 2016). Second, the paper incorporates three documented iterations of the same course together with the evidence that prompted each refinement, the cumulative design knowledge that design-based research aims to produce (see Anderson and Shattuck, 2012).

The course examined is a fully online master's-level DTM course at LAB University of Applied Sciences in Finland (LAB), delivered annually from 2022 to 2024, which connects strategic analysis, process redesign and the human

dimension of digital transformation through asynchronous Moodle activities, a collaborative development assignment and structured peer review. Three research questions guide the paper:

- RQ1: How can the learning outcomes of a DTM course be constructively aligned in a fully online format?
- RQ2: How can individual and group assessment be combined to support higher-order learning in this domain?
- RQ3: What design principles can be derived for future fully online master's courses requiring integrative, practice-oriented learning?

The contribution is twofold: a transferable framework for designing and evaluating fully online master's-level courses in DTM, and a demonstration of a design-based case study that integrates documented design choices and anonymised evidence of student experience across iterations.

2. Literature Review

2.1 Digital Transformation as a Domain of Managerial Learning

Digital transformation is conventionally defined as a process in which the use of new digital technologies triggers strategic responses through which organisations seek to alter their value creation paths, while managing the structural changes and barriers that affect outcomes (Vial, 2019). It is more than the adoption of technology, in that digitisation, digitalisation and digital transformation are stages of increasing scope, the last of which impacts business models, value-creation logics and organisational boundaries (Verhoef et al, 2021; Hanelt et al, 2021). To become competent in DTM, students must therefore learn to read the interaction of strategic, organisational and technological forces in a particular case and to plan, implement and evaluate transformation initiatives accordingly. This constitutes a higher-order task of analysis, evaluation and creation (Anderson and Krathwohl, 2001) that activities and assessments must develop.

2.2 Prior Research on Teaching Digital Transformation Management Online

Two streams of prior research are important when considering the design of an online DTM course, and both leave the course-level design question open. The first (Bouwmans et al, 2024) concerns what such a course should develop and synthesises studies of the skills organisations need for digital transformation into six skillsets and skills that encompass digital work, entrepreneurship, evidence-based work, collaboration and communication. This confirms that DTM competence cannot be certified by testing technological knowledge alone. Where higher education and digital transformation are studied together, the focus is typically the digitalisation of institutions themselves rather than curricula for managing transformation (Benavides et al, 2020).

The second stream concerns how management education in general should be delivered online. Research on online and blended business education has concentrated on comparisons between delivery modes and on institutional, faculty and technology factors, leaving the design of individual courses in integrative subjects comparatively unexamined (Arbaugh, 2014; Whitaker et al, 2016), while the persistent challenges of online group projects are well documented (Chang and Kang, 2016; Donelan and Kear, 2024). This extant literature is missing an account of how a course whose content is itself integrative can be aligned, assessed and iteratively refined online.

2.3 Constructive Alignment in Higher Education Course Design

Constructive alignment (Biggs, 1996) is a widely used framework for designing courses in which learning outcomes, teaching activities and assessment tasks reinforce one another. Its premise is that students engage with what they are assessed on. In other words, if an assessment requires reproduction, students study for reproduction regardless of stated outcomes, whereas if outcomes and assessments are aligned around the cognitive activity the course is meant to develop, learning activities can be designed to support that activity. Boud and Falchikov (2006) extend the logic to long-term learning, arguing that assessment should equip students for evaluative judgement beyond the course rather than only certify a moment of performance. For a DTM course, the consequence is that strategic analysis, process redesign and human-side considerations mean that assessment should require students to integrate the three dimensions in relation to practical transformation problems, and learning activities should help develop that capacity progressively.

2.4 The Community of Inquiry and the Design of Online Courses

In fully online environments, alignment is necessary but not sufficient: courses must also create the social and cognitive conditions for higher-order learning to occur asynchronously. The Community of Inquiry framework (Garrison et al, 1999; Garrison and Arbaugh, 2007) identifies three presences that must be deliberately enacted online: teaching presence (design, sequencing and feedback structures), cognitive presence (tasks requiring analysis, integration and resolution) and social presence (communication norms, group structures and visible participation). Persistent online-group challenges are partly artefacts of weak presence in one or more of these dimensions (Chang and Kang, 2016; Donelan and Kear, 2024).

2.5 Multi-Source Assessment: Authentic, Peer and Self-Assessment

A course of this kind also needs an assessment architecture that combines individual and group evidence of learning and draws on more than one source of judgement. Three streams of literature inform it: First, authentic assessment aims to replicate the cognitive demands and performance standards of professional practice, synthesised by Villarroel et al (2018) into realism, cognitive challenge and evaluative judgement, and is associated with gains in engagement, self-regulation and employability skills (Sokhanvar, Salehi and Sokhanvar, 2021). Second, peer and self-assessment make individual contribution and reasoning visible in ways that group products cannot. Peer assessment can support learning and approximate teacher judgements when criteria are clear and students are prepared (Topping, 1998; Falchikov and Goldfinch, 2000; Double, McGrane and Hopfenbeck, 2020), its timing and specificity matter because structured opportunities during a project can influence behaviour while work is in progress (Brooks and Ammons, 2003), and its fairness requires transparent rubrics, structured reflection and instructor moderation within a larger assessment architecture (Dochy, Segers and Sluijsmans, 1999; van den Berg, Admiraal and Pilot, 2006). Third, feedback is useful only when students can make sense of and act on it. For instance, Carless and Boud (2018) describe feedback literacy as appreciating feedback, making judgements, managing affect and taking action, capacities that are particularly consequential online, where feedback is usually written and temporally distant from the work it concerns.

3. Method

3.1 Research Approach

The paper uses a design-based case study. Design-based research studies an educational design in its real setting through iterative cycles in which each implementation informs the next, involves the practitioner-researchers in both design and analysis, and aims to derive theoretically grounded, transferable design principles (Design-Based Research Collective, 2003; Anderson and Shattuck, 2012). The single case is the DTM course, analysed as a designed pedagogical intervention (see Puusa and Juuti, 2020) across its 2022, 2023 and 2024 implementations. The unit of analysis is the course design rather than individual students, and the purpose is to derive transferable design principles rather than to test student-level effects.

3.2 Data and Their Collection

Four types of material were collected at the end of each implementation and archived by the instructors. First, course documentation for each iteration: the syllabus and intended learning outcomes, the weekly plan, the Moodle task instructions and quizzes, the development-assignment brief, and the assessment rubrics and grading criteria. Second, student course feedback, which was collected via LAB's standard end-of-course feedback survey, administered anonymously online to all enrolled students and consisting of Likert-scale items on workload, clarity of objectives and assessment, and overall rating, plus open-ended comments. The response rates ranged from 36% in 2022 to 39% in 2024. Third, aggregate performance indicators from the student register: enrolments, completion and pass rates and the grade distribution for each iteration. Fourth, the instructors' observations, recorded in writing after each implementation, including responses to student feedback that drew on both the feedback and the instructors' notes and were discussed with students in the final online session.

3.3 Analysis

The analysis followed four steps consistent with design-based research (Anderson and Shattuck, 2012). First, the design of each iteration was reconstructed from the documentation, and each documented design decision was tagged for its relationship to (a) the constructive alignment of outcomes, activities and assessment, (b) the

combination of individual and group assessment and (c) the three presences of the Community of Inquiry; for example, the requirement that the team deliverable address strategy, process and people was tagged (a) and cognitive presence, and the cross-group peer review (b) and social presence. Second, the documented design was compared with the implementation evidence: open-ended feedback comments were grouped into recurrent themes by both authors independently and then reconciled, and rating items and indicators were compared across iterations descriptively. Third, each change between iterations was traced back to the evidence from the preceding iteration, yielding the evidence-to-change chains in Table 1. Fourth, the cumulative learning was synthesised into the design propositions in Table 2. The indicators are used descriptively, not as causal measures, because cohort composition varied and the content evolved.

3.4 Trustworthiness, Researcher Position and Ethics

Both authors designed and taught the course. This gave them access to the design rationale but also placed them in an insider position. Credibility therefore rests on triangulation across the documentation, the student feedback collected through the institutional survey independently of this study, the register indicators and the instructors' notes. Dependability rests on the documented trail from each piece of evidence to each design change, while transferability rests on the description of the case and the stated boundary conditions of the framework, as suggested by Lincoln and Guba (1985). Ethically, the study is a retrospective analysis of teaching documentation and of anonymous feedback and indicators that LAB collects for quality assurance. Under the Finnish guidelines for research with human participants, ethical review is required only for designs that, for example, deviate from informed consent, intervene in participants' integrity, involve minors, or expose participants to strong stimuli or a risk of harm (TENK, 2019). Since none applies here, no ethical review was required for this study.

4. Case Context

The DTM course is a fully online 5 ECTS master's-level course delivered annually to students in business, engineering and design programmes at LAB. Its intended learning outcomes are that students can analyse the relationship between strategy and digital transformation, assess the effects of digital solutions on business processes and on people and their work, and plan the implementation and management of digital transformation initiatives. It runs in Moodle and combines asynchronous individual activities with a collaborative development assignment in small teams, accompanied by structured peer review. Its content draws on academic research and on the digiUP project (2019–2022), in which co-development with nearly 30 small and medium-sized enterprises produced practice-based knowledge and tools for managing transformation. Across the three iterations the course was refined on the basis of the evidence described in Section 3, while its three-part structure (strategic analysis, process redesign and the human side) remained unchanged.

5. Findings

The findings are organised around the three research questions. Table 1 summarises the cohort and feedback indicators, the recurrent feedback themes and the design changes made in response. The following subsections interpret this evidence.

Table 1: Cohorts, evidence and design changes across the three iterations

Iteration	Cohort and Indicators	Evidence (Recurrent Feedback Themes)	Design Changes for the Next Iteration
2022	• Passed the course / all registered students: 37/42 (88.1 %); • Course feedback average (1-5 scale): 3.3	• Some quiz items rewarded detail rather than understanding • Assignment brief read as calling for a technical solution rather than for managing its introduction • Clustered deadlines created workload peaks • Teams asked for guidance on organising collaboration	• Quiz items rewritten to target conceptual understanding • Assignment brief clarified to focus on managing transformation • Deadlines harmonised and staggered • Collaboration guidance and interim check-ins added

Iteration	Cohort and Indicators	Evidence (Recurrent Feedback Themes)	Design Changes for the Next Iteration
2023	• Passed the course / all registered students: 52/60(86.7%); • Course feedback average: 3.7	• Clarity and coherence of tasks rated higher than in 2022 • Peer reviews varied in depth and specificity • Concern about bias and variability in within-group ratings	• Peer-review rubrics clarified and worked examples of constructive critique provided • Instructors reviewed within-group ratings and rationales • Role of peer evaluation in grading stated up front
2024	• Passed the course / all registered students: 65/73 (89.0 %) • Course feedback average: 3.8	• Activities widely described as cohesive and challenging in a worthwhile way • Assessment perceived as fair, rigorous and well-orchestrated • Recognition of individual effort within group work valued	• The course resumed in spring 2026 as a self-paced version taught in English.

5.1 Constructive Alignment of DTM Learning Outcomes in a Fully Online Format (RQ1)

Across the iterations, each learning outcome was mapped to specific activities and assessments. Asynchronous individual tasks (guided readings and concept quizzes) developed foundational knowledge of the strategic, process and human dimensions of digital transformation and required analysis beyond recall. They prepared students for a collaborative development assignment in which teams produced a transformation plan for a real organisation that had to integrate all three outcome areas. Structured cross-group peer review required students to evaluate other teams' plans against the same criteria. What students had to learn was thus what they had to do and be assessed on (cf. Biggs, 1996). The evidence indicates that the alignment largely worked as intended but required tuning. Feedback on the first iteration identified two misalignments, quiz items that rewarded detail rather than understanding and an assignment brief that several teams read as a call to design a technical solution rather than to manage its introduction (Table 1). Both were corrected for the following iteration, course evaluations improved across the three runs, and the 2024 cohort widely described the activities as cohesive and challenging in a worthwhile way. Constructive alignment was therefore feasible and, on this evidence, effective online, provided that the alignment of individual tasks with the integrative outcome is checked against student experience rather than assumed from the design.

5.2 Combining Individual and Group Assessment for Higher-Order Learning (RQ2)

The course used a multi-source assessment architecture that generated evidence of individual reasoning, of the quality of each team's joint output and of each student's contribution to it. Individual Moodle quizzes required each student to articulate their understanding independently. The development assignment required each team to integrate the strategic, process and human dimensions into a single transformation plan. Assessment was based on a rubric evaluating alignment with the assignment brief, the appropriateness of the problem framing and proposed solution, the balance of the plan, source criticism and use of evidence, visual communication, language quality, and presentation quality. Cross-group peer review exposed teams to alternative transformation approaches, and structured peer and self-assessment, with transparent rubrics and guided reflection prompts, made individual contribution and judgement visible alongside the group product. The final grade combined a pass/fail pre-assignment, individual Moodle assignments (30%) and the group development assignment (70%), the latter evaluated on the LAB master's 1–5 scale by teacher assessment (carrying the greatest weight) together with inter- and intra-group peer assessment.

The evidence indicates that the architecture supported higher-order learning. Completion and pass rates were high in all three iterations (Table 1), and students reported that individual preparation enriched the team output because each member brought prepared insights to the collaboration. Feedback also indicated four tensions inherent in online delivery, pacing, group coordination, feedback quality and the calibration of peer assessment, each met by the incremental change recorded in Table 1. The calibration measures in particular addressed concerns about bias and variability in peer ratings. By the third iteration, students widely perceived the assessment as fair, rigorous and well-orchestrated. The assessment structure remained the same across 2022–2024, while the support around it changed over time.

5.3 Design Principles for Future Online Master's Courses (RQ3)

The findings across iterations are synthesised into an integrated framework for designing fully online, integrative master's courses, summarised in Table 2. Its four interdependent components, alignment and authenticity, multi-source and fair assessment, feedback and iterative improvement, and collaboration and social-presence support, each draw on an established literature: constructive alignment (Biggs, 1996), authentic, peer and self-assessment (Topping, 1998; Falchikov and Goldfinch, 2000; van den Berg et al, 2006), feedback literacy (Carless and Boud, 2018) and the Community of Inquiry (Garrison et al, 1999; Garrison and Arbaugh, 2007). The contribution is their combination into a single assessment architecture for a subject whose dimensions must be learned together. The principles are transferable starting points grounded in the case evidence, not validated prescriptions.

Table 2: An integrated framework for designing fully online, integrative master's courses

Component	Design Principles (what to do)
1. Alignment and authenticity: constructive alignment of outcomes, tasks and assessments through authentic, integrative tasks demanding higher-order work	• Map every learning outcome to a corresponding task and assessment criterion • Set authentic, real-world tasks requiring synthesis across all dimensions of the subject (here, strategy, process and people)
2. Multi-source and fair assessment: evidence across individual and team work, with peer and self-assessment under instructor oversight to keep contribution visible and grading fair	• Combine individual tasks with a collaborative assignment • Embed rubric-based peer and self-assessment, and have instructors review and calibrate peer judgements so individual effort is visible and group grades remain reliable
3. Feedback and iterative improvement: explicit criteria and timely, recurring feedback that students can act on before final submission	• Make criteria explicit through clear rubrics for every task and peer review • Stagger deadlines and add interim review points so formative feedback arrives early enough to be used
4. Collaboration and social-presence support: deliberate support structures of teamwork and presence in fully online settings	• Anticipate coordination and engagement problems in virtual teams • Provide collaboration guidance, designated roles, scheduled check-ins and cross-group peer review to strengthen social presence and equitable participation

6. Discussion

The case illustrates the practical value of constructive alignment as a design heuristic where content is inherently multidimensional. Because digital transformation requires students to integrate strategic, process and human-side analysis (Vial, 2019; Verhoef et al, 2021), a course built around that requirement must make integration visible in activities and assessment, not only in outcome statements. Where alignment was in place, students engaged with the integrative work the field demands (Biggs, 1996; Boud and Falchikov, 2006); where it slipped, as with the first-iteration quizzes and assignment brief, students re-interpreted the outcomes in line with the narrower assessment they actually faced. The online setting makes this visibility more consequential, since classroom cues cannot compensate for its absence.

The case also extends the Community of Inquiry framework (Garrison et al, 1999; Garrison and Arbaugh, 2007) by showing how assessment design itself contributes to the three presences: 1) teaching presence through the sequencing of Moodle activities, rubrics and feedback structures, 2) cognitive presence through tasks requiring integration across the three dimensions of digital transformation and 3) social presence through the collaborative assignment and structured peer review, where coordination, contribution and judgement became visible across the team. The persistent tensions of online group projects (Chang and Kang, 2016; Donelan and Kear, 2024) were thereby reframed as design problems addressed inside the assessment architecture rather than as control problems managed retrospectively.

Third, the case contributes to debates on multi-source assessment. Authentic, peer and self-assessment are well-established components of assessment design (Topping, 1998; Falchikov and Goldfinch, 2000; van den Berg et al, 2006; Villarroel et al, 2018; Double et al, 2020) but are usually described separately. Here they operate as

one architecture, wherein authentic tasks generate the integrative work, peer and self-assessment generate evidence of individual contribution and judgement alongside the group output, and feedback is designed to be acted on within the course (Carless and Boud, 2018). This responds to the research gap where online business education has traditionally concentrated on delivery modes rather than on course-level design for integrative subjects (Arbaugh, 2014; Whitaker et al, 2016).

This study has limitations: it concerns a single course at a single institution, the indicators are descriptive, cohort composition varied, student-level cognitive outcomes were not measured directly, and the feedback evidence is limited to survey respondents. The design propositions are therefore transferable starting points, and future work could measure student perceptions of fairness and alignment under this design, compare the architecture with alternative configurations, and examine its applicability to other digital-era management curricula.

7. Conclusion

The paper has analysed how a fully online master's-level DTM course was designed and refined across three iterations, and how the evidence from each iteration was converted into design changes. Its contribution is an integrated framework of four components (alignment and authenticity, multi-source and fair assessment, feedback and iterative improvement, and collaboration and social-presence support) showing how constructive alignment, the Community of Inquiry and multi-source assessment combine into a single architecture for a subject whose strategic, organisational and technological dimensions must be learned together.

Ethics Declaration

The study is based on course documentation, learning materials, the instructors' documented observations, anonymous end-of-course student feedback collected by LAB University of Applied Sciences for quality assurance, and aggregate performance indicators from the student register. No additional data were collected from students; no identifiable student data or verbatim quotations are reported, and findings are presented at cohort level. Under the Finnish National Board on Research Integrity guidelines (TENK, 2019), this retrospective analysis of anonymous and aggregate material did not require ethical review, and none was sought.

AI Declaration

ChatGPT was used to format the reference list to the conference style and to translate material from Finnish into English. Claude (Anthropic) was used in language editing the final revised version of the paper to ensure adherence to the maximal word count limits of the conference guidelines, resulting in some changes in sentences, structuring and style. The choice of literature, the analysis and the final wording were determined by the authors, who reviewed, edited and verified all AI-assisted suggestions.

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