



MODULE CODE: ECPT6006

**ASSESSMENT COMPONENT: A Critical
Evaluation of the Role of Digital Innovation in
Professional Practice**

STUDENT NAME: Matthew Drummond

STUDENT NUMBER: 2011426

Use of Generative AI in Assessment

(Lecturer to indicate Yes or No against each element)

RESEARCH	For this assessment, you can use Generative AI to support you in research, including searching for bibliography, using tools to summarise, compare and interrogate materials.	Yes ☒ No ☐
STRUCTURE	For this assessment, you can use Generative AI to support you in structuring your submission, including creating a draft argument structure, identifying parts and headings, etc.	Yes ☒ No ☐
PROOFREADING	For this assessment, you can use Generative AI to check your own text/creation for grammatical and syntactical mistakes, including rephrasing of your own work within specific standards.	Yes ☒ No ☐
WRITING	For this assessment, you can use Generative AI to create text for submission.	Yes ☐ No ☒
CREATIVE	For this assessment, you can use Generative AI to create creative materials, such as images.	Yes ☒ No ☐
PROGRAMING	For this assessment, you can use Generative AI to create and check code.	Yes ☐ No ☒
NONE	For this assessment, you are not allowed to use any type of Generative AI support. This includes research support, structure support, writing/proofreading support and creative support.	Yes ☐ No ☒

AI Acknowledgement

I confirm that I have not used any AI tools in the research and creation of this assignment.

I confirm that I have not presented any AI generated materials as my own work.

I confirm that I have copies of my drafts, notes, and other resources I used, which I may be asked to provide in evidence.

Contents

Introduction	2
The Role of Creativity and Digital Innovation.....	3
Common Frameworks for Embedding Digital Technologies.....	3
The RAT Model	4
The SAMR Model	4
The TPACK Model	5
The TIM Model.....	6
Implementing Model Frameworks in Professional Practice	7
The Digital 2030 Strategic and Standards Frameworks.....	7
Selection and Justification of Appropriate Teaching Tool	10
Application of Innovative Technologies	13
Evaluation and Reflection	19
References	22

Introduction

This assignment aims to provide a critical evaluation of the role of digital innovation in post-compulsory education professional practice. Digital innovation within education is not merely the adoption of new hardware but is the innovative application of technology to transform teaching and learning practices. The demand for innovative digital teaching practices is driven by employers as well as educational policy in order to meet the changing needs of learners - equipping graduates with robust digital skills for the jobs of both today and tomorrow.

The purpose of this work is to examine how digital technologies and digital innovation can be purposefully integrated into a pedagogical framework to enhance meaningful learning. It will explore the synthesis between pedagogical theory, content knowledge, and technological application, moving beyond simple technological substitution toward transformative practices. Digital innovation in this field is defined not merely as the adoption of new hardware, but as the innovative application of technology to fundamentally transform teaching and learning practices. In Wales, this necessity is codified through the *Digital 2030 strategic framework* which envisions a "lifelong learning ecosystem" where technology is seamlessly integrated into delivery to enhance the learner experience. Furthermore, practitioners have a professional and legal obligation under the *Well-being of Future Generations (Wales) Act 2015* to ensure that digital connectivity supports the creation of a prosperous, resilient, and more equal nation.

The purpose of this work is to examine how digital tools can be purposefully integrated into pedagogical frameworks to facilitate meaningful learning that is *active, constructive, collaborative, and authentic*. It explores the crossover between pedagogical theory, content knowledge, and technological application, moving beyond simple substitution toward transformative practice. The discussion is structured into four key sections:

- A literature review considering frameworks such as SAMR and TPACK
- The selection and justification of industry-specific surveying tools (GNSS and drone photogrammetry), based on their unique relevance to the construction industry.
- Theoretical alignment of the deployment of these technologies with the Digital and professional standards, as well as an established technology integration model.
- A critical evaluation and reflection on the implementation process.

The Role of Creativity and Digital Innovation

The contemporary educational landscape is undergoing a fundamental paradigm shift, moving from a model focused on the provision of instruction to one dedicated to the greater experiential digital learning that produces digitally literate learners. This shift is inextricably linked to the ubiquity of digital technologies in all aspects of our lives (Keengwe, 2023). This fundamentally changes the requirements of 21st-century learning environments; digital innovation in educational practice is no longer an optional enhancement but a strategic necessity, driven by the need to prepare learners for a workforce where digital capability is as foundational as literacy and numeracy (Laurillard, 2017).

The nature of learning is quickly evolving alongside the pace of technological innovation. While younger students are often considered *digital natives*, practitioners must avoid assuming all students possess high levels of digital literacy. The abilities of individual learners to use digital tools can vary significantly and educational provision must provide for both the capable and those less so. Consequently, teaching professionals must implement technologies in a considered way, thinking carefully about the pedagogy of integrating a technology into subject delivery. Teachers are now expected to become digital leaders and champions in the classroom, expert not only in their subject matter but proficient in the delivery of that subject matter in a technologically integrated way (Keengwe, 2023). This role requires a commitment to Continuous Professional Development (CPD), keeping abreast with the pace of technological development and deployment can be a burden on educators.

There are several well-established frameworks or models that can guide the implementation of technologies within education, these frameworks to greater and lesser degrees provide a structure to which to plan and evaluate the delivery of a subject in a technologically enhanced way.

Common Frameworks for Embedding Digital Technologies

To move beyond the ad-hoc adoption of digital tools and instead use innovative digital technologies in coherent and considered way, implementation must be grounded in robust theoretical frameworks that evaluate how technology transforms the nature of learning. The

literature suggests that these frameworks generally categorise technology use into two broad camps: *Enhancement* - doing the same thing better, and *Transformation* - doing things that were previously impossible or impractical without the innovative technology.

The RAT Model

The *RAT model*, developed by Joan Hughes (2006), provides a self-assessment tool for practitioners to categorise the effect technology has on their educational practices.

Replacement: Technology is used as a different (digital) means to deliver the same educational content without changing the pedagogy.

Amplification: Technology increases the efficiency, effectiveness, or productivity of existing practices, but the underlying tasks remain the same.

Transformation: Technology leads to the invention of entirely new instruction, learning objectives, or curricula. A key implication of RAT is that it encourages practitioners to critically reflect on whether a tool is merely a modification an old activity or a truly innovative way to deliver a curriculum.

The *RAT model* is primarily critiqued for being a retrospective evaluation **tool** rather than a planning framework. While it effectively categorises technology's impact, it offers little proactive guidance for teachers during the instructional design phase (Şık et al.,2026). Furthermore, the definitions can be ambiguous making it difficult to distinguish between *amplification* and *transformation* in a way that meaningfully informs teaching. There is a risk that it prioritises the appearance of integration over genuine pedagogical improvement (Vasileva et al., 2026).

The SAMR Model

The *SAMR model*, developed by Dr Ruben Puentedura (2012), is perhaps the most widely cited framework for categorising technology implementation into four levels of complexity. The model consists of two main stages, each with two steps.

Stage One: Enhancement

Includes **Substitution** - where tech acts as a direct substitute with no functional change, and **Augmentation** - direct substitute with functional improvement.

Stage Two: Transformation

Modification - tech allows for significant task redesign, and **Redefinition** - technology allows for the creation of new tasks, previously not possible before the introduction of the technology.

The *SAMR model* is frequently criticised for its lack of peer-reviewed theoretical grounding, with most information originating from blog posts and presentations rather than empirical studies (Hamilton et al., 2016). A major flaw of SAMR is its absence of instructional context, as it evaluates technology usage without adequately considering specific learning objectives, student populations, or teacher preparation. The model's hierarchical ladder structure is also contested, *Redefinition* can be perceived as being superior to *Substitution*, but often the latter is the more appropriate choice for certain contexts. (Reiser & Dempsey, 2012).

The TPACK Model

While RAT and SAMR focus on the *output* of technology use, the *TPACK framework* (Technological, Pedagogical & Content Knowledge) introduced in 2006 by Mishra and Koehler focuses on the *knowledge* required by the teacher.

Drawing on Shulman's (1986) concept of Pedagogical Content Knowledge (PCK), TPACK argues that effective digital innovation occurs at the intersection of *Content Knowledge (CK)*, *Pedagogical Knowledge (PK)*, and *Technological Knowledge (TK)*. The core implication of TPACK is that pedagogy must come before technology. A teacher must first understand the subject (CK) and the best way to teach it (PK) before selecting a tool (TK) that communicates that content and supports that specific pedagogy. This prevents technology for technology's sake and ensures that digital innovation is purposeful.

The TPACK framework is widely respected but faces significant criticism regarding its practicality and precision. Research indicates that the boundaries between its seven constructs—such as Technological Content Knowledge (TCK) and Technological Pedagogical Knowledge (TPK)—are frequently blurred, making it challenging for educators to classify specific classroom actions (Angeli and Valanides, 2009).

This lack of precision can undermine the framework's utility for researchers and practitioners alike. While conceptually useful, *TPACK* is often described as too theoretical and lacks concrete, granular guidance on what specifically to revise to improve a lesson (Mcleod, 2015). *TPACK* assumes a high level of expertise across the three distinct domains, which may be overwhelming without extensive, continuous institutional support.

The TIM Model

The *Technology Integration Matrix (TIM)* provides a more granular approach than the previous models, crossing five levels of technology integration - Entry, Adoption, Adaptation, Infusion, and Transformation with five characteristics of the learning environment - Active, Collaborative, Constructive, Authentic, and Goal-Directed. This creates a 25-cell matrix that allows for highly specific targeting of professional development. For example:

Active Learning

Moves from students passively receiving information (Entry Level) to using tools in extensive and unconventional ways (Transformation Level).

Collaborative Learning

Progresses from "individual student use of tools" to "collaboration with peers and outside resources in ways not possible without technology". Unlike simpler models, TIM emphasizes that meaningful learning environments must be active, constructive, and authentic for digital innovation to be successful.

The *TIM* is often viewed as overly complex and cumbersome for daily use. With its 25 distinct cells crossing five levels of integration with five environment characteristics, practitioners may find it confusing to navigate. While it attempts to provide a common language, critics note that it has not been formally validated in literature to the same extent it has been adopted by institutions. There is a call for more evidence-based data on how it informs best practices in schools (Vasileva, and Misheva, 2026).

Furthermore, because *TIM* intentionally focuses on the intersection of pedagogy and technology (TPK), it may inadvertently downplay the critical role of subject-specific content knowledge (CK), which is central to models like *TPACK*. This "techno-centric" risk means the

matrix could be used as an assessment endpoint rather than a means to achieve specific student-centred learning outcomes (Vasileva, and Misheva, 2026).

Implementing Model Frameworks in Professional Practice

These frameworks are not mutually exclusive but rather complementary approaches for evaluating teaching practice. *SAMR* and *RAT* serve as ladders to measure the degree of change in a lesson. *TPACK* identifies the specific professional knowledge gaps a teacher may need to address through CPD. *TIM* offers the most comprehensive assessment framework, linking technology directly to the attributes of meaningful learning, although it can be viewed as an overly complex a model.

For the educational professional, the choice of framework depends on the goal - if the focus is on lesson redesign, *SAMR* or *RAT* are ideal. Although, the *SAMR* model could lead educators to believe that they must always reach the *Redefinition* level. However, *transforming* practice is a matter of progression rather than an immediate requirement for every lesson. If the focus is on teacher capability - *TPACK* is essential. If the focus is on deeply mapping the learning environment, *TIM* can provide the necessary detail.

The Digital 2030 Strategic and Standards Frameworks

True digital innovation is defined by improvements in teaching and learning practice rather than the novelty of using the technology itself, practitioners are encouraged to move away from trivial usage and toward transforming practices that would almost be impossible without digital technologies. The strategy emphasizes that innovation should also be inclusive, accessible, and bilingual, while preparing citizens for global economic participation (Welsh Government, 2019). In Wales, this necessity of embedding digital technology into educational delivery is outlined in the Digital 2030 strategic framework, which envisions post-16 learning providers seamlessly integrating technology into delivery to enhance the learner experience.

It moves away from viewing technology as an optional add-on and instead places it at the core of a learning. It is built upon eight core aims designed to set a strategic direction for the post-16 sector. These aims establish clear standards for digital skills, ensuring learning is enhanced through appropriate technology, and increasing the coherence and accessibility of digital

delivery. Crucially, the framework recognizes that innovation refers to improvements in teaching and learning practice rather than the novelty of the technology itself. A practitioner might use relatively simple digital technologies to enable transformative practices that would otherwise be impossible, rather than a more sophisticated digital tool that does not enhance learners' experiences. In educational practice, this means creating a *lifelong learning ecosystem* that is responsive to future trends and current challenges. ensuring that digital literacy enables learners to work and learn from anywhere, thereby reducing socio-economic inequalities.

While the strategic framework provides the vision, the *Digital Standards Framework* provides the practical pathway for practitioners (Welsh Government, 2020). These standards are explicitly linked to the existing *Professional Standards Framework for Teaching Supporting Learning in Higher Education* to ensure they are aligned with the sector's identified priorities (Advance HE, 2023). The standards are divided into ten central themes, each describing specific outcomes for professionals.

The Digital 2030 Strategic and Standards Frameworks operate within a wider ecosystem governed by the Well-being of Future Generations (Wales) Act 2015. It applies the Act's five principles of Long-term, Prevention, Integration, Collaboration, and Involvement to digital innovation. By doing so, the framework ensures that digital connectivity is not just about technical skill, but about building a *prosperous, resilient, and more equal Wales*.

A critical feature of the Digital Standards is the three-level approach to professional progression: *Exploring, Embedding, and Transforming*. These levels are designed to be technology agnostic, focusing on the purpose of the activity rather than the specific tool used.

Exploring Level: Practitioners develop fundamental digital skills and use technology primarily to replace traditional practices in a *like-for-like* fashion. This level aligns with the *Substitution* stage of the SAMR model.

Embedding Level: Practitioners use technology to become more effective or efficient, seeking new ways to develop innovative practices through collaboration. This aligns with the *Augmentation* stage of SAMR.

Transforming Level: At this highest level, practitioners use technology to develop entirely new practices that would largely be impossible without digital intervention. They act as digital champions, coaching and mentoring others. This level maps to the Modification and Redefinition stages of SAMR.

Selection and Justification of Appropriate Teaching Tool

This section provides a selection and justification of technologies integrated into a surveying and highway design module taught across Quantity Surveying, Construction Management, and Civil Engineering at UWTSD.

The use of each technology can be mapped against different levels of technological and digital integration outlined by both the *Welsh Digital 2030 standards* which in turn allows a similar alignment against the *SAMR* model, demonstrating a synergy between technological innovation, pedagogical theory, and professional practice.

Within construction, accurate measured surveys are the backbone of most projects, industry is innovating quickly, moving away from traditional slow and cumbersome methods and towards rapid, high-density data acquisition. Two of these technologies that the construction sector has adopted over the last few years are:

GNSS¹ Device: Used for capturing accurate spot coordinates via satellite signals.

Drones (UAVs): Used to create photogrammetry-derived 3D models of built and natural environments.

Although the two technologies may not be viewed as typical ‘teaching tools’, in the context of the modules learning outcomes, there is rationale to view them as such.

The incorporation of these two technologies into the curriculum is driven by the need for industry readiness, and the need for construction professionals capable of evaluating and/or utilising these technologies within their roles. Although learners themselves may not actually end up using the technologies directly within their current or future roles, they may be involved within the procurement and specification of a survey, for which they will need to understand the workflow of each method and their limitations. This need is best served by involving the learners in authentic learning – involving them with real world tasks in meaningful contexts through the use of industry standard technologies. This modules’ learning aims are to *provide learners with the digital skills in measured surveys and highway*

¹ Global Navigation Satellite System – the abbreviated term GNSS is almost always used.

design, with the outcomes requiring that learners are able to conduct and evaluate measured surveys using digital technology. The strategy developed to meet this learning outcome was to integrate the use of digital surveying technologies into the core delivery of the module, with the tasks set in the module assessment requiring the data captured during the practical tasks and demonstrations. This strategy for achieving the module outcomes could be shown to demonstrate good alignment to the following *Welsh Digital 2030 standards and SAMR model* stages:

5.2 – *Developing my practice as a teacher in a specialism: I incorporate recent digital and technological changes in my specialism into teaching and learning where I can.* **Exploring** level within the 2030 standards framework - equivalent to the **Substitution level** within the SAMR model.

7.1 – *Digital content and resources: I find innovative ways to use existing or new tools and technologies to create learning objects. I use digital resources and content in creative ways to design and run learning experiences not otherwise possible.* Falls within the **Embedding** level in the 2030 framework, this can be considered to equate with the SAMR models **Augmentation** level.

9.2 – *Learners’ digital capabilities: I work in partnership with learners to enable them to develop and apply their digital capabilities in creative and innovative ways or in unexpected contexts. I help learners use digital technology to solve real world problems.* The exercises learners were set strongly aligns with the level **Transforming**; this is comparable to either the **Modification** or **Redefinition** level in the SAMR model. In the context of the specific exercises’ learners were tasked with, it is argued that the threshold for **Redefinition** was reached, as the use of point cloud data derived from the drone photogrammetry allowed learners to capture survey features that were not possible with traditional methods or even the GNSS device

9.3 – *Supporting learners’ employability: Where appropriate I use industry-specific digital platforms and tools with learners to equip them for the workplace. I make use of employer requirements I’m provided with to incorporate workplace digital attributes into the student learner experience.* Finally, the 2030 standard 9.3 described falls within the **Exploring** stage of the framework, equivalent to SAMRs’ **Substitution** level.

Consequently, the selection of GNSS and drone photogrammetry moves beyond the mere adoption of hardware to a critical application of authentic learning that directly addresses the needs of the modern construction professional. By mapping the use of the technologies against the Welsh Digital 2030 standards, and equivalent SAMR levels, it has been demonstrated how this technological integration has transitioned the learning from simple digital enhancement to a fundamental transformation of practice. This alignment ensures that the curriculum not only meets current professional standards but that the pedagogical approach provides a robust, evidence-informed foundation for student engagement, ensuring graduates possess the evaluative and technical capabilities required in evolving professional landscape.

Application of Innovative Technologies

The following section details the use of the GNSS, and drone photogrammetry derived point cloud data used with the module *ACBA4017 Digital Surveying and Highway Design*. A specific lesson plan is not included as the use of these technologies spanned across several sessions of the module, instead the module overview which includes the module aims, learning outcomes and indicative content is included.

Module Code	ACBA4017
Title	Digital Surveying and Highway Design
Date	07/05/2024
Level	4
Credits	10
Pre-Requisites	None
DBS Check	May be required ☐ Not required ☒

AIM(S)

- To provide learners with the digital skills in surveys and highway design.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- conduct and evaluate measured surveys using digital technology.

INDICATIVE CONTENT

- Introduction to practical Surveying: History and different classifications of surveying.
- Introduction to surveying equipment types and measurement: Traditional and modern surveying equipment.
- Emphasis on application of digital survey equipment such as GNSS, Total Station and Drones including demonstration classes.
- Application of digital survey tools in conducting measured surveys (Demonstration class on drones application in measured surveys).
- How the Internet of things, Artificial intelligence, big data, predictive analytics, automation and robotics are utilised within construction.
- Road alignment: design of vertical and horizontal curvature on the highway.
- Introduction to highway design including flexible and non-flexible paving.
- Sustainable highway design.

Study Time Allocation

The study time for the module is divided as follows:

Activity type	Hours	Percentage
Scheduled learning	24	24%
Independent learning	76	76%

Figure 1: ACBA4017 Digital Surveying and Highway Designs module overview



Figure 2: Photo of learners using the GNSS device (credit: Andrew Lewis - UWTSD photographer)

The GNSS device allows the capture of spot coordinates, the process of surveying with this device is to identify features of interest, place the device on that feature, and record the coordinate of that feature along with a corresponding feature code/description. To capture the curblines of a road for example, spot coordinates are recorded every 3-5m (closer on bends) along the edge of the curb. These spot coordinates are then converted into points and imported into CAD (Computer Aided Design) software, AutoCAD in this instance. These points are then manually connected by lines to create a 2D representation of the area surveyed. GNSS is mostly suited to ground features (curb lines, pathways, manholes etc.) Some features are impossible to capture accurately with this device, one example being the exact diameter, height and location of a lamppost.



Figure 3: Screenshot of captured spot coordinates imported into AutoCAD and overlaid on an Ordnance survey base map.



Figure 4: Drone used to capture images used in the production of a photogrammetry derived point cloud.

The drone is programmed to fly an automated flight path, this flight path is calculated by the flight control software based on parameters such as flight height, image overlap percentage, camera resolution and so on. Learners were not able to fly the drone themselves due to license and legal restrictions but were able to observe the flight taking place and learn the key aspects of carrying out the flight.

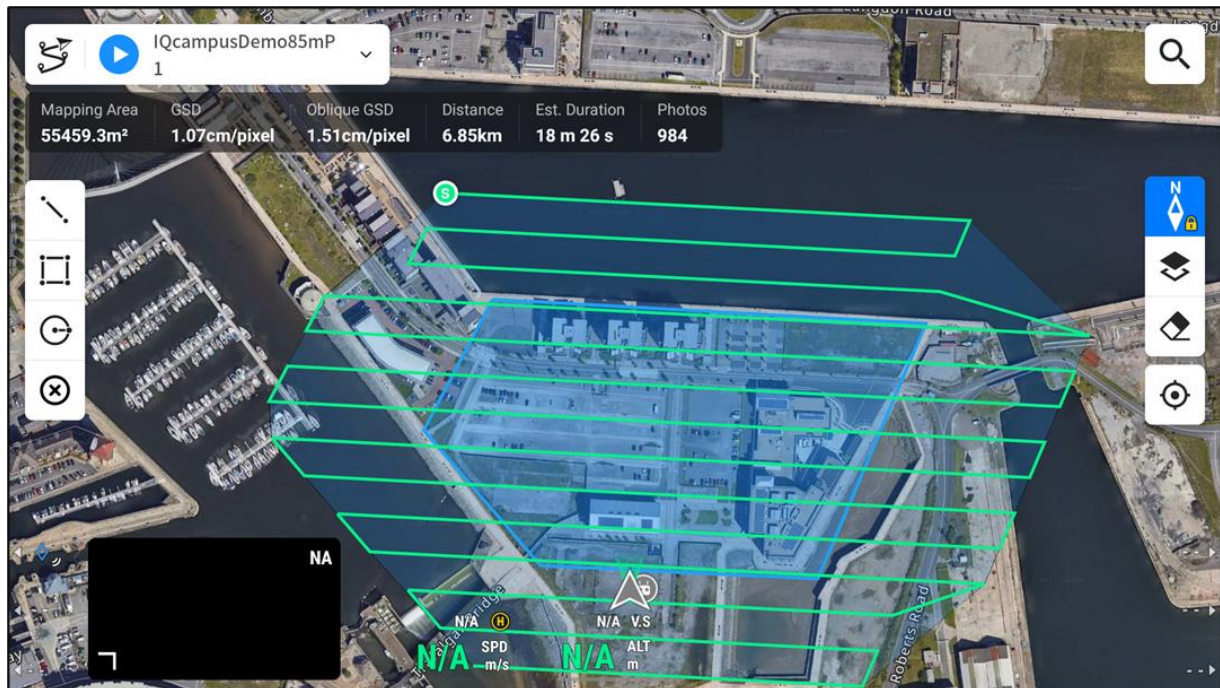


Figure 5: Screenshot of the automated flight path calculated by the flight software.

The flight captured 984 photos from a range of angles and locations along the flight path. Those images are imported into photogrammetry software that identifies common features between the photos and 'stitches' them together to create a point cloud. Learners did not process the photos in the photogrammetry software themselves but were shown screen recordings of the process and the important considerations for processing this data.

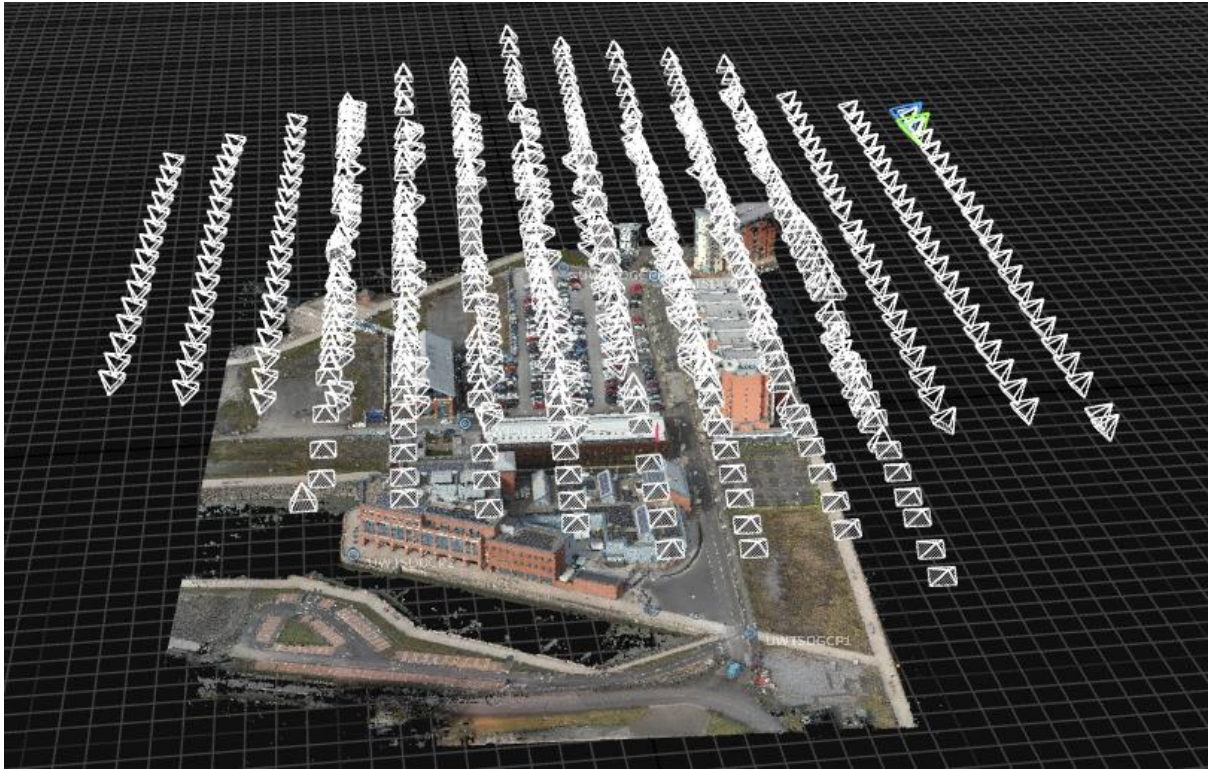


Figure 6: Screenshot of the generated point cloud in the photogrammetry software (RealityCapture) – floating triangles represent the location and orientation of the captured photographs by the drone.

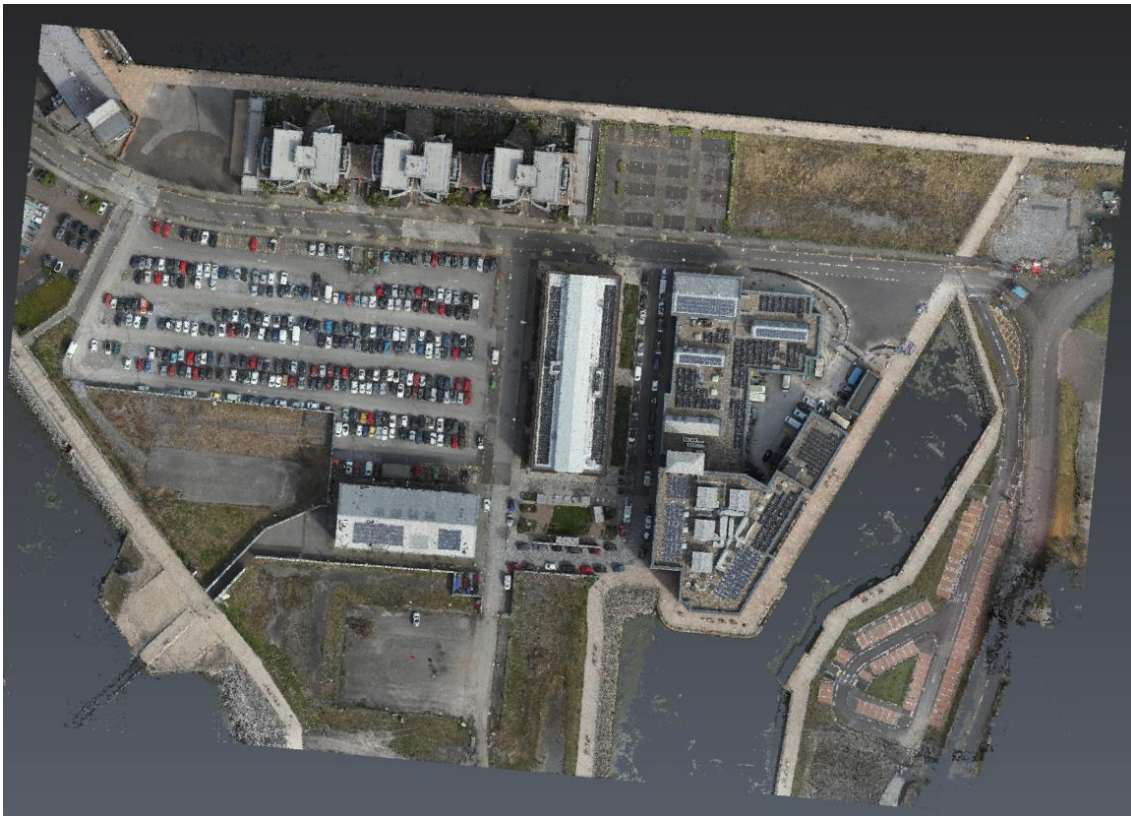


Figure 7: Plan view of the finalised point cloud in the orientation it will be drawn on in AutoCAD

The learners were then shown how to import the finalised point cloud data into AutoCAD and create linework to draw the required features. For this exercise learners were tasked with drawing the immediate road system and building footprints of the UWTSD IQ campus.



Figure 8: AutoCAD linework of IQ campus buildings and road system derivedd from the point cloud.

Evaluation and Reflection

The process to evaluate the implementation of technology into the module has been evaluated using the *Gibbs' (1988) Reflective Cycle*. This framework ensures the evaluation moves beyond mere description toward a systematic understanding of the synthesis between innovation and professional practice.

1. Description - The Factual Account

The implementation involved two industry-standard data acquisition tools used across several sessions of the Level 4 module ACBA 2017 Digital surveying and Highway Design. For the GNSS task, students were organized into rotating groups of four, with each group allocated two hours to capture spot coordinates of a road network using a **GNSS device**. In a subsequent session, a drone demonstration was conducted using a DJI M350 aircraft equipped with the 45MP P1 camera. Due to Civil Aviation Authority (CAA) licensing restrictions and operational manual requirements, students could only act as observers and were not permitted to pilot the drone. The resulting photogrammetry-derived point cloud was visualized in the following session through a live demonstration in the Reality Capture application going through the workflow that was used to create the point cloud. Students were then tasked with producing a 2D topographic survey in AutoCAD using the point cloud.

2. Feelings: The Professional Perspective

The experiences through the GNSS and drone sessions was characterized by some degree of stress and professional anxiety, principally concerns the equipment may fail to work as intended. Operating a large DJI M350 drone in the presence of 24 students increased the potential risk, necessitating a heavy focus on risk assessment and safety management in addition to the instructional delivery. Furthermore, the GNSS device failed to maintain a Real-Time Kinematic (RTK)² fix when operating up close to buildings due to satellite obstruction. This technical failure in an unpredictable context significantly increased instructor stress, highlighting the burden of maintaining complex technologies work as intendeds during live

² RTK fix requires robust connection to satellites, without it, the accuracy of the data collected degrades significantly.

delivery. While learners were enthused and engaged with the drone demonstration and data output, there was an underlying sense of intimidation from learners regarding the scale and complexity of the data.

3. Evaluation: Impact on Teaching and Learning

The intended learning outcomes were achieved, as students successfully produced a measured survey in AutoCAD from the GNSS, but also more importantly, the drone data. The primary success was learner engagement; the novelty of the drone acted as a significant hook, prompting many good technical questions from learners during the demonstration. However, a critical limitation was identified in the passive role students assumed during the drone flight and photogrammetry processing. While the GNSS task allowed for active, group-based learning, the data collection and initial data processing of the drone was functionally a demonstration rather than a hands-on application.

4. Analysis: Theoretical Synthesis

Linking this experience to the *SAMR model*, the use of the drone data to create survey outs could be argued to represent **Redefinition** of the task. Because the GNSS tool lost its functional utility close to buildings, the drone provided a way to capture features that were previously inconceivable or physically impossible with the GNSS device in that specific micro-environment. This transition from digital enhancement (GNSS) to transformation (Drones) confirms that the curriculum successfully moved beyond simple like-for-like substitution. Furthermore, the activity facilitated authentic learning by situating students in a real-world engineering challenge using industry-standard tools, which is a core attribute of meaningful learning. However, the GNSS failure reinforces the importance of having contingency plans for when technology fails. Although during the session the failure of the GNSS provided a learning opportunity to demonstrate the limitations of GNSS devices in built up areas.

5. Conclusion: Critical Insights

The implementation satisfied several professional requirements, specifically *PSF 2023 Core Knowledge K4* regarding the appropriate use of technology. It also aligned with many of the **Digital 2030 Standards** outlined in the *Selection and Justification* chapter. A key insight gained is that while high-end technology like the drone drives engagement, it also introduces significant safety and technology failure risks that can overshadow pedagogical goals. The experience proved that digital innovation is not defined by the device itself, but by its ability to solve real-world problems that traditional tools cannot.

6. Action Plan: Future Practice

To improve future delivery, the following steps will be taken:

- **Scaffolding the Role of the Student:** To move students from *passive observers* to *active participants*, future sessions will incorporate screen-recorded tutorials of the photogrammetry processing stage, then the opportunity to allow students to attempt the data synthesis themselves.
- **Managing Group Size:** The operational risk of 24 observers will be mitigated by splitting the flight demonstration into smaller cohorts, facilitating closer interaction with the flight control software.

References

- Advance HE (2023) *Professional standards framework for teaching and supporting learning in higher education 2023*. Available at: <https://www.advance-he.ac.uk/> (Accessed: 14 May 2026).
- Angeli, C. and Valanides, N. (2009) 'Epistemological and methodological issues for the conceptualization, development, and assessment of ICT–TPCK: advances in technological pedagogical content knowledge (TPCK)', *Computers & Education*, 52(1), pp. 154–168. Available at: <https://doi.org/10.1016/j.compedu.2008.07.006> (Accessed: 16 May 2026).
- Gibbs, G. (1988) *Learning by doing: a guide to teaching and learning methods*. London: Further Education Unit [Cited in source 13, 17].
- Hamilton, E., Rosenberg, J., & Akcaogulu, M. (2016). *The substitution augmentation modification redefinition (SAMR) model: a critical review and suggestions for its use*. Association for Educational Communications & Technology. DOI 10.1007/s11528-016-0091-y
- Hughes, J., Thomas, R. and Scharber, C. (2006) 'Assessing technology integration: the RAT–replacement, amplification, and transformation-framework', Society for Information Technology & Teacher Education International Conference. March. Association for the Advancement of Computing in Education (AACE), pp. 1616-1620.
- Keengwe, J. (2023) *Innovative digital practices and globalization in higher education*. Hershey, PA: Information Science Reference.
- Laurillard, D. (2017) *Skills and lifelong learning: digital skills in further education*. London: Government Office for Science.
- McLeod, S. (2015) 'Facilitating administrators' instructional leadership through the use of a technology integration discussion protocol', *Journal of Research on Leadership Education*, 10(3), pp. 227–233.
- Mishra, P. and Koehler, M.J. (2006) 'Technological pedagogical content knowledge: a new framework for teacher knowledge', *Teachers College Record*, 108(6), pp. 1017-1054.
- Puentedura, R.R. (2012) *SAMR: background and exemplars*. Available at: https://www.hippasus.com/rrpweblog/archives/2012/08/23/SAMR_BackgroundExemplars.pdf (Accessed: 15 May 2026).
- Reiser, R. A., & Dempsey, J. V. (2012). *Trends and issues in instructional design and technology* (3rd ed.). Boston: Pearson.
- Shulman, L.S. (1986) 'Those who understand: knowledge growth in teaching', *Educational Researcher*, 15(2), pp. 4–14.

Şık, N.Ü. and Taşar, M.F. (2026) 'A systematic review of the technology integration planning (TIP) model in educational contexts', *Hellenic Journal of STEM Education*, 5(1), pp. 19-30. Available at: <https://doi.org/10.51724/hjstemed.v5i1.63> (Accessed: 29 May 2026).

Vasileva, M. and Misheva, K. (2026) 'Integration of digital technologies in social studies education in Bulgarian schools – a comparative analysis and evaluation bas', *Contemporary Educational Technology*, 18(2), ep649

Welsh Government (2015) *Well-being of Future Generations (Wales) Act 2015*. Available at: <https://www.legislation.gov.uk/anaw/2015/2/contents> (Accessed: 15 May 2026).

Welsh Government (2019) *Digital 2030: a strategic framework for post-16 digital learning in Wales*. Available at: <https://gov.wales/digital-2030-strategic-framework> (Accessed: 14 May 2026).

Welsh Government (2020) *Digital 2030: digital standards framework for post-16 education in Wales*. Version 1.2. Cardiff: Welsh Government.