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PropTech Education Integration Framework (PEIF)

Integrating Innovation and Digital Technology in Real Estate Higher Education

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Acknowledgements

Executive Summary

The accelerated growth of digitisation in real estate operations and practice has led to the emergence of a contemporary real estate specialist area commonly referred to as "PropTech". Despite the tremendous growth in the deployment of digital technologies and IT systems to solve real estate problems, there has been a disproportionate growth in scholarly work, particularly in PropTech education.
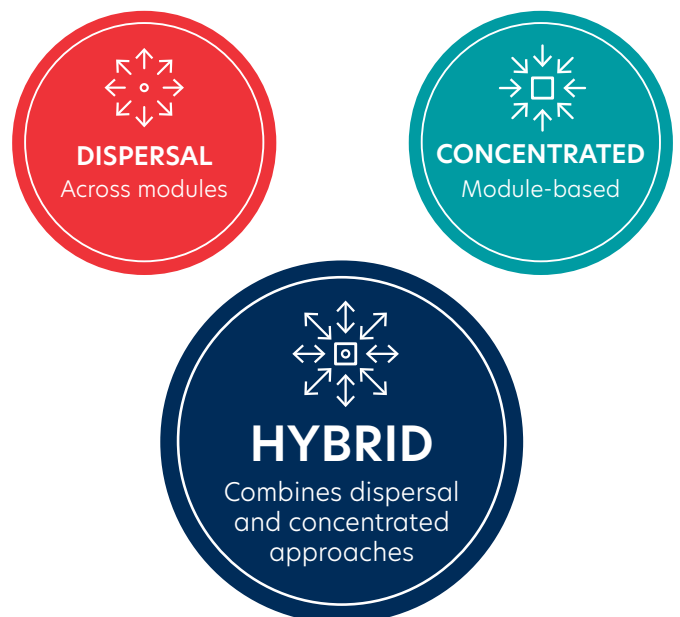
The higher educational system is a major real estate education vehicle; therefore, integrating PropTech in real estate higher education has the potential to further transform the PropTech space. This creates real estate professionals with adequate knowledge, skills and behaviours through exposure to PropTech which can then be applied in practice. There is currently no evidence-base through which PropTech can be integrated in the real estate higher education curriculum. Additionally, there is no PropTech pedagogical and practical framework that can guide educators to provide teaching and learning support to real estate students in higher education.

Creating a PropTech education integration plan and pedagogical framework has the potential to provide real estate students with the requisite knowledge and skills required to get actively involved in PropTech and to develop tools to improve the various real estate operational and market inefficiencies. This research, therefore, develops a framework through which PropTech, its underlying mechanism and other real estate innovations can be efficiently and effectively integrated in real estate higher education curriculum. Furthermore, the research provides relevant pedagogical and practical considerations that can support the integration plan

The research objectives are summarised below:

1. To identify the key practical and pedagogical approaches that can be explored in PropTech education integration

2. To develop a practical and pedagogical framework that can support the integration of PropTech in real estate higher education

3. To evaluate the feasibility, viability and practicality of the PropTech education integration framework

The PropTech Education Integration Framework (PEIF) is inspired by a mix of market and research-led pedagogy which led to the synchrony of academic materials and industry-based insight. In carrying out this research, real stakeholders (educators and students), stakewatchers (real estate and PropTech professionals and practitioners) and stakekeepers (professional bodies and institutions) were identified. Using a combination of purposive and snowballing sampling techniques, 10 interviews and two focus group sessions were organised, and these were simultaneously supported with multiple consultative sessions. The data from these exercises were analysed using thematic and content analysis, and the findings from the data analysis served as the basis for the PEIF. It proposes a PropTech education integration through the three major approaches below:

DISPERSAL
Across modules

CONCENTRATED
Module-based

HYBRID
Combines dispersal and concentrated approaches

The PEIF recognises the importance of integrating PropTech in the real estate higher education curriculum either through the introduction of modern digital IT/digital technology across the existing real estate modules (dispersal approach) or through the development of a new module to introduce PropTech and other soft skills to real estate students (concentrated approach). It is however recommended that the combination of both concentrated and dispersal approaches (hybrid/blended approach) may be a more effective and efficient approach to PropTech education integration.

The key insight from the survey component of the research is summarised below:

- 86% of respondents believe that PropTech will become more relevant over the next decade

- 97% of respondents confirm that integrating PropTech in the real estate higher education curriculum is important

- 99% of respondents believe that soft skill integration should accompany the integration of PropTech in real estate higher education

- 89% of respondents agree that real estate students who do not have the basic skills and appreciation for data and analytics are likely to struggle in professional practice

- 52% of respondents have a preference for the hybrid/blended PropTech education integration approach in comparison to the other two integration approaches

The implementation of this framework is expected to increase the scope of innovation and digitisation among real estate students and this can potentially expand the PropTech and real estate innovative space with economic, physical/spatial, environmental and social benefits.

Photo: Sean Pollock

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Glossary of terms

- **BPF**: British Property Federation

- **Curriculum**: the subjects that comprise of a course of study in an institution

- **Empirical**: Based on verifiable observation, experiment, practical or experiential evidence

- **PropTech**: Application of digital and IT systems/tools to real estate operations and practice

- **Pedagogy**: Systematic ways of teaching and providing learning support

- **PEIF**: PropTech Education Integration Framework

- **Purposive sampling**: A form of non-probability sampling where researchers rely on their own judgement to select participants in a study

- **RICS**: Royal Institution of Chartered Surveyors

- **Soft skills**: Mainly social skills which typically are indirectly gained through formal educational and informal activities and engagements e.g., communication, interpersonal, time management, teamwork, leadership etc.

- **Snow-balling sampling**: A form of sampling where existing participants suggest or recruit future participants from their network of friends or acquaintances

- **SPR**: Society of Property Research

- **Stratified sampling**: A form of sampling method where participants are partitioned into sub-groups of a population

- **UKPA**: UK PropTech Association

Photo: Tom Rumble

1.0 Introduction and Background

IT and digital systems have become pervasive in traditional real estate markets, creating a contemporary branch of real estate typically referred to as "PropTech". PropTech has spread through the value chain and ecosystem of real estate, leading to significant changes in real estate systems and practice, and creating new value services. PropTech tools and platforms (which are mainly internet-based) have led to significant changes across the areas of operations and services which built environment professionals support and advise (RICS, 2020). One example is the use of various software and digital tools to execute complicated valuation exercises, and another is changing housing search and viewing patterns following the emergence of integrated brokerage and online accommodation search platforms. Despite the substantial advancement in PropTech and associated innovations, there has been a disproportionate growth in PropTech-related scholarly work, particularly in PropTech education. Some elements of the application of IT and digital systems to real estate have been part of the curriculum in the last few decades; however, these elements of the curriculum have evolved at a much slower pace than the global digital transformation which has created the PropTech specialism.

While many real estate courses and programmes, particularly in the UK, have not yet taken concrete steps to integrate PropTech in their curricula, some programmes and courses have made efforts to update their curricula to accommodate this integration in the last few years. Some of these attempts have been through the development of a PropTech module or short suite of contact sessions, while a few others have been through a wider integration across a few existing modules within the course. There is however no evidence that either of these integration approaches is research-based, neither is there an existing standardised or evidence-based approach to formally integrating PropTech in real estate higher education. Because higher education is a major real estate education vehicle, integrating PropTech has the potential to further transform the PropTech space by creating real estate professionals with adequate knowledge, skills and behaviours through exposure to PropTech which can then be applied in practice. A PropTech education integration framework that has been developed following extensive reviews and empirical rigour therefore provides valuable insights. This further has the potential to enhance the economic, physical, environmental and social efficiency and effectiveness of real estate operations and practice.

This research was undertaken to develop a pedagogical and practical framework to enhance and sustain the integration, delivery and assessment of PropTech in real estate higher education. The research began by identifying the current approaches adopted by real estate programmes in integrating PropTech in their curricula. Following this assessment and a series of rigorous empirical exercises, three major integration approaches have been developed and proposed. The framework has been subjected to several levels of reviews, evaluation and feedback from real estate and PropTech practitioners, educators, students and professional bodies. This report is a product of extensive consultation and will thus be a valuable guide for real estate educators, particularly Programme Directors and Heads of Department/ Schools on the various approaches and methods that can be explored to effectively integrate PropTech in their curricula. It also provides a practical and pedagogical framework that can enhance and sustain the integration of technology and innovation in real estate higher education. The framework ultimately aims to make real estate graduates more aware of real estate innovations and digital applications as well as other skills which can enable them to lead future innovations.

2.0 Relevant Literature and Related Work

Proposing the integration of an emerging specialism (such as PropTech) in an existing area of education requires the consideration of key pedagogical and practical reflections and strategies. This research considers some key literature in three core areas that are applicable to the PropTech education integration: the first is a macro-level consideration of curriculum development to accommodate an emerging specialism; the second is a more micro-level focus on pedagogical consideration; and the third is a review of selected literature on the approaches and methods of integrating emerging areas of practice and operations in already existing fields of education.

2.1 Curriculum Development

For a new or emerging specialisation to be fused in an existing or established knowledge area in higher education, there is a need to engage in some level of curriculum development. The curriculum is considered a core foundational element of higher education and is thus crucial in higher education effectiveness. The theory and practice of curriculum development in education has remained an important area of scholarly and academic focus. Earlier studies suggested that knowledge and basic skills are foundation stones of curriculum development; however, more recent studies have advocated a move away from these narrow traditional views. For instance, Fish (2013) advocates a move away from traditional approaches based on skills and specialised knowledge to more informed balance of teaching, learning and scholarship approaches in pursuit of intellectual enhancement, moral behaviour and the appreciation for aesthetics. This study also suggests that the design, implementation and assessment elements of curriculum management should encompass both technical skills and development of learners "as a whole person". This idea is reinforced by Khan & Law (2015) who further advise that curriculum development necessitates designing programmes of study (study plans), teaching strategies, resources allocation, specific lessons, assessment, and faculty development. Additionally, they recommend that higher education should respond to changing environments through positive learner-centred and competency-based curriculum in order to produce graduates with adequate knowledge, skills and adaptability.

The learner-based paradigm demonstrates the close relationship between curriculum development and students' learning process. The study of Nygaard et al. (2008) particularly highlights the importance of students' learning processes, plans and programmes in curriculum development efforts through a variety of synchronous and asynchronous activities. Three key areas are specifically considered: knowledge (content), skills (soft and hard skills) and competencies (application of knowledge and skills to aid performance, impact and problem solving). Nygaard et al. (2008) recommend that higher institutions should review their learning requirements to prepare and support students to be able to adapt to a world with new roles, technologies and various competencies to enable them to manage flexible jobs in changing markets, societies, businesses, and technologies, particularly in the current rapidly changing, knowledge-based, and data-driven atmosphere. These ideas are particularly relevant in curriculum development plans such as the PEIF.

Data has become an essential aspect of curriculum development and it is increasingly recognised

in decision making in educational development. The study of Wolf (2007) provides insight on the importance of data-informed educational development through a three-stage process. The first stage entailed the curriculum visioning which involved the assessment and evaluation of the curriculum through broad-ranging consultation. This stage focused on the curriculum assessment, programme objectives, development/redevelopment and program focus. The second stage of the curriculum development involved the mapping and development/redevelopment of the programme structure. It also entailed matching foundational content and programme objectives to current and future courses, and the revision of

gaps, redundancies and opportunities. The third stage is the stage of alignment, coordination and development which involved the alignment of programme and course objectives, alignment of foundational and course content and alignment of program and course learning experience. These stages were then followed up with activities such as workshops and meetings to assess the effectiveness, adequacy and appropriateness of the developmental plan. The PEIF incorporated these aspects of data-based integration; similarly, real estate educators in higher institutions should ensure that their PropTech education integration plans are data-driven and evidence-based.

2.2 Pedagogy

Pedagogy refers to systematic ways of teaching in an orderly logical manner. According to Khan & Law (2015), pedagogy needs to be centred on interactive activities where both learners and teachers participate actively.

2.2.1 Pedagogical categories

Khan & Law (2015) highlight the importance of social interaction between the teacher and the student through a diverse range of teaching and learning methods. They classify pedagogy in two

broad categories: formal/systematic and informal/less systematic methods. The less systematic/formal methods include open classroom discussion, report writing, verbal presentation, lecturing, brainstorming, role play, Q/A, memory-based learning, observations, field visits, study tours, social meetings, and interviews; while the formal/systematic category includes case-based learning, collaborative learning, project-based learning, problem-oriented learning, service-based learning, and research-based learning (as shown in Figure 1).

Figure 1: Pedagogical Classifications

INFORMAL	FORMAL / SYSTEMATIC
› Open classroom	› Case-based learning
› Report writing	› Collaborative learning
› Lecturing	› Project-based learning
› Brain storming	› Problem-oriented learning
› Q/A (Questions and answers)	› Service-based learning
› Memory-based learning	Research-based learning
› Observations	
› Field visits and study tours	
› Social meetings/gatherings	
› Interviews	
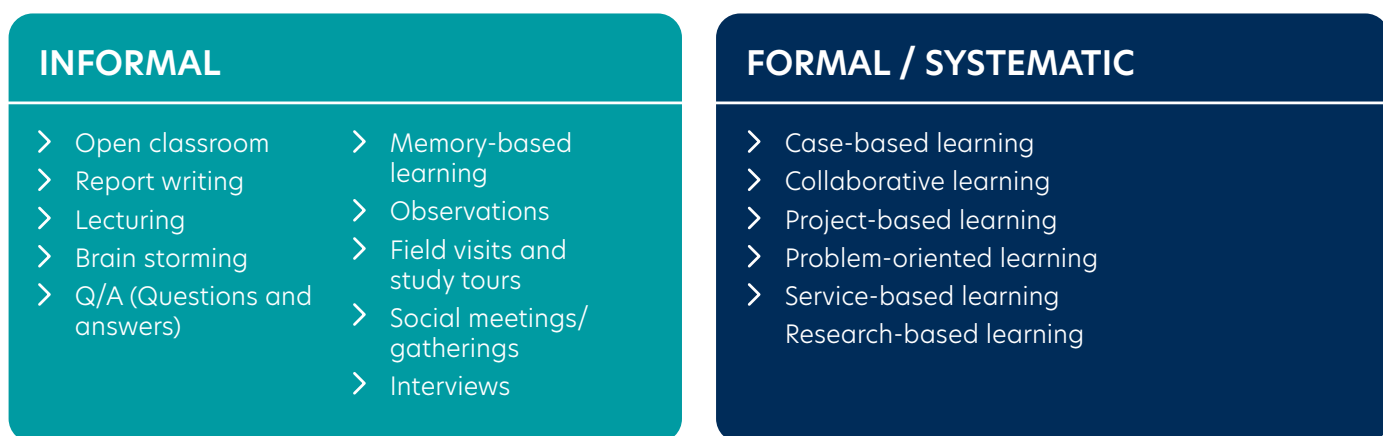
Source: Authors' Illustration, 2021 (adapted from Biggs, 2012)

In case-based learning, students may be asked to read, discuss, and analyse real life complex situations such as cases or scenarios, while collaborative learning may require students to collect information about certain subjects or emerging issues in the field of study and share them with peers in the class. In project-based learning, learners may be asked to design a product prototype, a service or building. In a problem-oriented learning approach, students are assigned specific real-life problems to solve, while service-based learning entails students learning from being involved in community services, internship programmes and other social welfare programmes. In research-based learning, students are asked to carry out formal research on a specific topic or subject assigned by a teacher; this research work may consist of designing a research proposal, research development, research presentation and publication.

The different formal and informal approaches and methods of learning delivery and support have their pros- and cons, particularly given the variation in course/programme dynamics, programme structures and overall institutional objectives and strategies. Application or implementation of these methods and approaches will therefore depend on the educational philosophy, teaching goals, curriculum and course structure. Furthermore, pedagogy must be dynamic, diverse and interesting, accounting for varying learning styles and teaching approaches (Khan & Law, 2015); thus, a blend of methods and approaches should be considered whilst maintaining a learner-centred approach (see Loo, 2004 for further insight on learning styles vis-à-vis learning preferences).

2.2.2 The taxonomy of educational objectives

The taxonomy of educational objectives is an important pedagogical framework for classifying statements of students' learning objectives. This framework takes roots in Bloom's taxonomy of 1956 which proposed a measuring tool and also served as a common language on learning goals to facilitate communication across persons, subject matter and grade levels. It was also the basis for determining the specific meaning of broad educational goals and similarity of educational objectives, activities and assessments in a unit, course or curriculum. The structure of the taxonomy created a range of categories in the cognitive domain: knowledge, comprehension, application, analysis, synthesis, and evaluation (as illustrated in Figure 2), and this has been applied to modern higher education. The apparent argument is that pedagogical objectives should ultimately aim to support learners' transition from the domain of knowledge (at the base of the inverted pyramid) to the domain of production and creativity at the pinnacle of the pyramid (see Krathwohl, 2002). It is therefore the educator's duty to organise the teaching and learning context in a way that all learners have the opportunity to

Figure 2: Structure of Bloom's Taxonomy in the Cognitive Domain

6 **CREATING** (generating, producing)

5 **EVALUATING** (synthesis, checking, critiquing)

4 **ANALYSING** (correlating, differentiating, organising, attributing)

3 **APPLYING** (executing, implementing)

2 **UNDERSTANDING** (comprehending, interpreting)

1 **REMEMBERING** (knowledge, memorising)
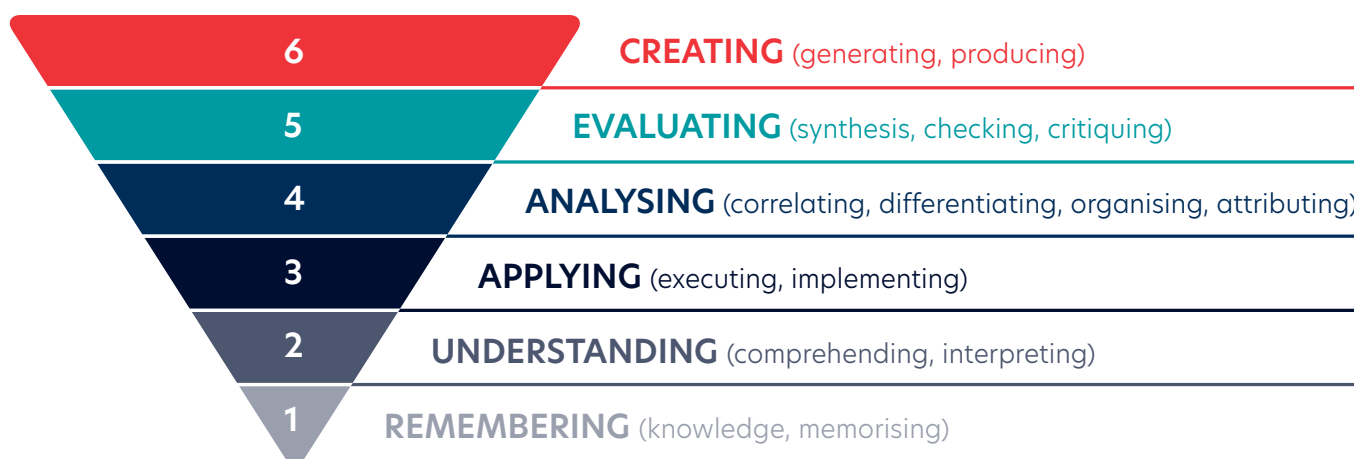
Source: Authors' illustration, 2021

use the higher-order learning processes, and this can be achieved when all components of learning are aligned such that objectives express the kinds of understanding that are required from students and the teaching context motivates students to undertake the learning activities likely to enhance those understandings (Biggs, 2012). In a similar line, assessment tasks should align with the appropriate stage of the learning order. Furthermore, it should specify what is required of students and how well the objectives have been met.

Following this, the integration of PropTech in real estate higher education should, therefore, ultimately aim to support real estate students through the transition from the basic knowledge and understanding of real estate innovations and digital systems to the realm of creativity and innovation. Educators should support students to develop the ability to critically evaluate the effectiveness of PropTech technologies and identify potentials for further growth and development beyond their current scope of utility. One of the ways through which this can be achieved is through a high

level of student engagement and active learning. Krathwohl (2002) suggests that educators should move from passive standard lectures to more active problem-based learning approaches which could significantly reduce the gap between learners that are more inclined to academics and those that struggle in standard academic activities (as illustrated in Figure 3).

In line with the application of the taxonomy of educational objectives, engagement and cognitive potential, PropTech education integration plans should ensure that learners are supported through high-level engagement and active learning as opposed to passive learning and low-level engagement. This may suggest that the learning element of the PropTech education integration plan enables learners to transit from merely memorising theory, concepts and ideas to engaging actively with the teacher and learning materials in order to enhance creativity and innovation. This is even more important, given that PropTech is underpinned by innovation, creativity and the ability to think outside the box. This approach can further facilitate the identification of problems

Figure 3: Illustrating Teaching Methods, Level of Engagement and Resultant Cognitive Potential
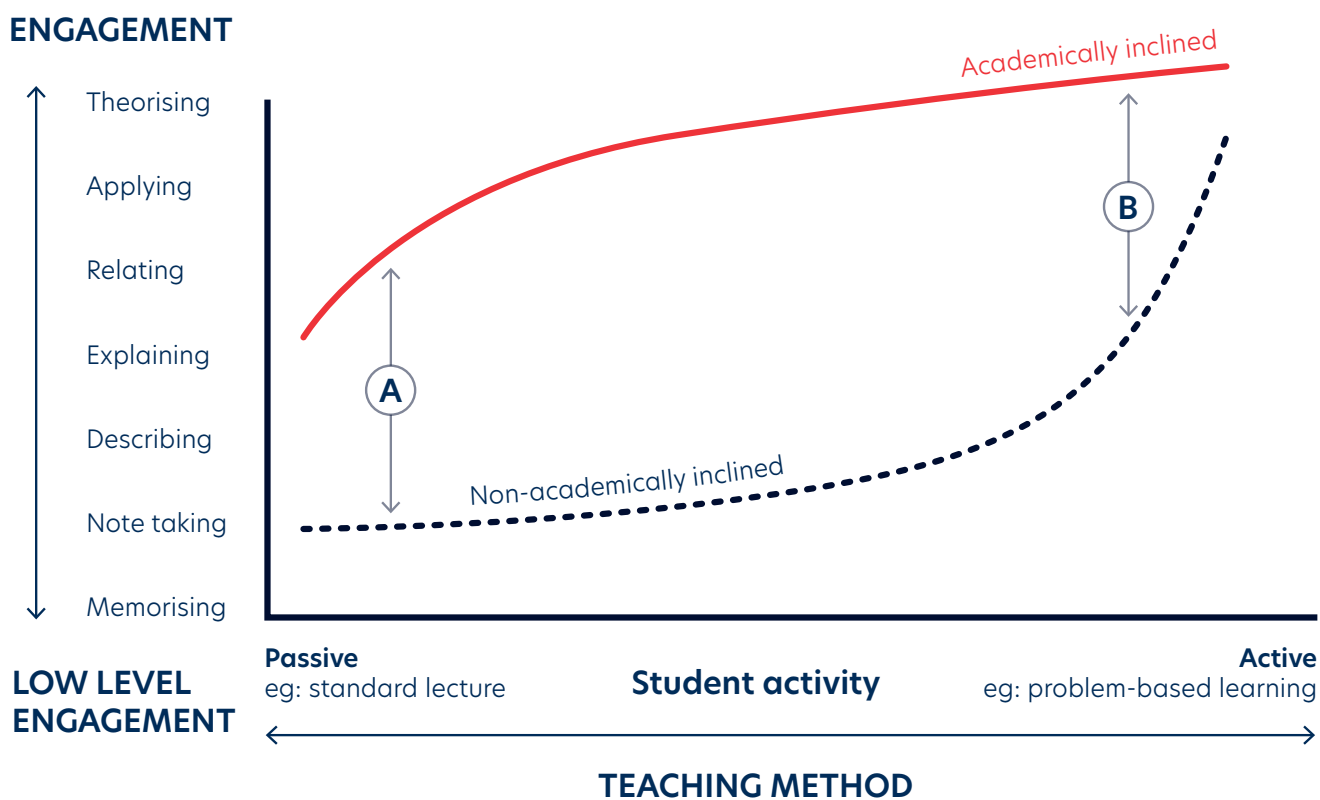
Source: Authors' Illustration, 2021 (adapted from Biggs, 2012)

within the real estate sector which have been solved through a platform approach. Identifying the elements of innovative digital real estate tools and systems, particularly the problems which they address, can serve as a scaffold for the development of solutions to other real estate problems. .

2.2.3 The model of experiential learning (ELM)

Kolb's (1984) model of experiential learning (ELM) is an important pedagogical framework that is well established in the education literature, and it has been applied across diverse fields of higher education studies. The theory suggests that learning development is accomplished by higher-level integration and expression of non-dominant models of dealing with the world. It translates experience into concepts which in turn guides the choice of new experiences. Learning is conceived as a four-stage cycle starting with concreate experience which forms the basis for observation and reflection upon experiences. These observations are further assimilated into concepts and generalisations about experiences that further guide interactions with the world. Two independent perceiving processing dimensions (namely the concrete experience-abstract conceptualisation and the active experimental-reflective observation) are proposed with four quadrants (accommodator, diverger, assimilator and converger) reflecting four learning styles. These models suggest that learning involves the acquisition of abstract concepts that can be applied flexibly across a range of situations and that the drive for the development of new concepts and ideas

is driven by new experiences. These positions are particularly relevant in the PropTech realm where new concepts and ideas are constantly being developed. The model further illustrates that learning is a process where knowledge is created through the transformation of experience; thus, effective learning can be achieved when the learner moves through the cycle of four stages. The first stage involves concrete experience and this is followed by observation of and reflection on the experience; these subsequently lead to the formation of abstract concepts (analysis) and generalisations (conclusions) which are then used to test hypotheses in future situations, resulting in new experiences (Loo, 2004).

Ronchetto, et al. (1992) suggest that teaching methods should be tailored to various learning styles, particularly in some education fields such as marketing where a wide variety of learning styles exist. The model of experiential learning therefore provides a platform for the assessment of learning methods against some of these learning styles. For instance, Loo (2004) observes that while projects and small group discussions were seen as helpful for those classified at the active experimentation end of the active experimentation-reflective observation dimension, lectures were not seen as helpful to their learning. These perspectives are essential for developing learning frameworks for real estate education where a wide variety of learning styles should be adopted to cater for the variation in students' backgrounds and potential areas of specialisation.

2.3 Integrating Emerging Specialisations in Existing Fields of Study

Integrating new and emerging specialisms in an already existing educational field of study has been approached from different angles, although, it should be noted some integration plans and implementation were either not documented or published. The research of Gupta et al. (2015) particularly relates to PEIF and is therefore a key reference literature. The study was motivated by the inadequacy of business

finance graduates to fit into the emerging field of big data, analytics and business intelligence (BI). The study therefore provided an integration framework for BI, big data and analytics in the curriculum through the introduction of undergraduate specialisations and an MSc course in business information systems. A key finding in this study is the importance of soft skills in enabling graduates adapt to the growth

REAL STAKEHOLDERS

STAKEWATCHERS

STAKEKEEPERS

Source: Authors' Illustration, 2021

in industry demand for an IT-skilled business and finance workforce. The integration plan was through a curriculum re-development which aimed to balanced knowledge base and students' expertise with industry needs. The framework therefore incorporated multi-level feedback evaluation from educators, students and professionals during and after the development phases. The incorporation of students in their integration plan is particularly remarkable and commendable, as other studies (such as Khan & Law, 2015 and Riding et al., 1995) do not report that students were included in their integration plans. They also adopted a multi-level methodical approach combining a literature review, expert interviews, focus groups and surveys and the data therefrom were subjected to empirical analysis. These elements have been particularly accounted for in the PEIF development.

Although the methodological approach in Gupta et al. (2015) is broad-ranging, the application of the stakeholder framework to the selection of the participants consulted in the PEIF development was also considered. Fassin (2009) classifies stakeholders in three main categories: real stakeholders (those with a direct stake in the integration), stakewatchers (those with interest but with indirect stake) and stakekeepers (regulators) (shown in Figure 4).

The stakeholder framework has been used as a reference point in selecting participants to provide useful insight on educational development. Lagoke et al. (2020) particularly identify legitimacy, interest and influence as key considerations in stakeholder selection. Focusing on the influence element, Lagoke et al. (2020) identified and targeted stakeholders with a direct influence on the university curriculum in meeting industry standards. The stakeholder categories (of Fassin, 2009) form the basis for stakeholder selection and this will be further exemplified and illustrated in section 3.0.

3.0 Research Design and Strategy

This research and resulting framework have been developed based on grounded theory with a synchronism of market and research-led pedagogy. The framework followed a review of literature, desktop studies, observations, interviews, focus groups and other formal and informal broad-ranging consultations. Several interviews were conducted, and a focus group session was also organised with senior managers and CEOs of leading UK-based PropTech and real estate firms. Further interviews were conducted with heads of real estate departments, senior real estate educators and programme directors. In addition to these, several consultations were held with the UK PropTech Association (UKPA) and the Royal Institution of Chartered Surveyors (RICS). After identifying the initial participants using the stratified and purposive sampling techniques, further participants were selected following recommendations from the initial participants (snowballing). Data from each stage of the research was analysed and this was fed into the framework development process. A significant proportion of the framework development was based on qualitative data and analytical techniques; however, some quantitative data and descriptive analysis were deployed through an online-based survey. The stages of the framework development are itemised below:

Stage 1
The research began with six unstructured and semi-structured pilot interviews with PropTech and real estate industry leaders. The aim was to have a good balance of "traditional" real estate and PropTech professionals. The data from the interviews were analysed using content and thematic analysis, which provided unique perspectives and insight on themes, topics, learning outcomes, modes of delivery and assessment. This led to the development of the first version of the framework (PEIF v1).

Stage 2
Following this, the PEIF v1 was subjected to extensive discussion and critiquing through a focus group session which consisted of six real estate and PropTech industry leaders who had not participated in the first set of interviews. The data from the focus group session was also analysed to develop the second version of the framework (PEIF v2).

Stage 3
Having gained sufficient depth of insight from key industry players, we sought to gain further insight on the feasibility and practicality of the proposed framework; we therefore subjected the PEIF v2 to further discussion and analysis through semi-structured interviews with senior real estate educators. We extended the invitation to participate in the interviews to 10 real estate departmental/school heads and programme directors with the aim of maintaining a balance between geographical coverage and institutional ranking and status. For educators, we particularly sought to have a balance of Russel Group and post-92/new generation universities, and for student participation, a blend of undergraduate and postgraduate students was the priority. However, only four educators responded and participated in the interviews. Unfortunately, no student agreed to participate in the interviews, with most of the invited students stating that they had insufficient knowledge on PropTech. Using content and thematic analysis, the data from these interviews were analysed and the insight drawn from the findings served as the basis for the development of the third version of the framework (PEIF v3).

Stage 4
At stage 4, we extended the framework draft for wider consultation and engagement through conference and webinar presentations, consultations, a focus group session and an online survey. This was open to a wider community of real stakeholders,

stakewatchers and stakekeepers. The focus group invitation was sent out to 6 participants in total: one member of the UK PropTech Association senior executive team, two educators, one student, one real estate professional and one PropTech industry leader. However, the student invited to the focus group session declined the invitation, citing the lack of confidence in discussing PropTech. The survey was administered online using survey monkey to a wider range of real estate professionals, educators, professional bodies and students. These surveys were also promoted on social media, conferences and other networks, and the aim was to get a wider

pool of feedback on the feasibility, viability and practicality of the integration plan. The results from this survey are reported and analysed in Section 6 and the feedback from all the engagements was used to develop the final integration plan (presented in Section 4.0). In addition to these, consultations were also held with the RICS.

Figure 5 provides an illustration of the four stages of the framework development, while Figures 6 and 7 show the participant categories and the key themes that the interviews and focus group sessions were centred around respectively.

Figure 5: The Four Stages of the PEIF Development

STAGE 1
- Pilot interview
- Semi-structured interviews
- Development of the PropTech Education Integration Framework version 1 (PEIFv1)

STAGE 2
- Focus group session 1
- Development of the PropTech Education Integration Framework version 2 (PEIFv2)

STAGE 3
- Semi-structured interviews
- Development of the PropTech Education Integration Framework version 3 (PEIFv3)

STAGE 4
- Dissemination/further consultation
- Focus group session 2
- Online survey
- Development of the PropTech Education Integration Framework version (PEIF)

Source: Authors' Illustration, 2021

Figure 6: Categories of Participants in the Framework Development

REAL STAKEHOLDERS
- Educators
- Students

STAKEWATCHERS
- Real estate professionals
- PropTech practioners

STAKEKEEPERS
- Professional bodies
- Relevant associations & institutions

Source: Authors' Illustration, 2021

4.0 Key Findings and Discussion

The key findings from the data collection and consultations are summarised below; these have been grouped in the four broad themes shown in Figure 7:

Figure 7: Main Themes in Interviews and Focus Group Sessions

THEME 1: FUTURE OF PROPTECH
Where do you see PropTech going in the next decade and what practical tools / approaches / methods can be adopted to support real estate graduates to drive future innovation and digital solutions?

THEME 2: SKILLSET
What are the key skills that real estate students need to ensure that they can contribute significantly to real estate innovation and digital solutions, and how would you prioritise these skills?

THEME 3: LEARNING AND STUDY SUPPORT
What training and teaching methods would be most appropriate for incorporating PropTech in the current real estate programmes and how should students' knowledge and understanding of real estate innovations and digital technology be tested and examined?

THEME 4: INDUSTRY SUPPORT / CONTRIBUTION
How can real estate educators partner with real estate firms and professionals to ensure that students develop the requisite skills for real estate innovations and digital technology?

Source: Authors' Illustration, 2021

THEME 1: The present and future of PropTech

1. PropTech has indeed changed the landscape of real estate operations and practice in the last few years. The application of digital applications to real estate is likely to remain very relevant in the foreseeable future, although the buzzword "PropTech" could fade off as technology in real estate becomes the new norm.

2. Technology in real estate should not be perceived as a product in itself; rather, it should be seen as a tool to enhance real estate operations and practice.

3. Data is (and will remain) valuable in real estate innovation and digital technology; data science and analytics is therefore expected to remain very relevant (and highly valued) in real estate operations and practice for the foreseeable future.

4. The formal incorporation of PropTech in the real estate curriculum has the potential to further expand innovation and creativity in real estate. This can further improve the efficiency and effectiveness of real estate operations and practice in the long run.

THEME 2: Skillset

1. In addition to technology, other soft skills such as professionalism, creativity, innovation, entrepreneurship, business, and communication should also be included in the PropTech education integration plan. These soft skills have driven the technological advancement in real estate in the last few years and should therefore be promoted with the technological skills.

2. Employers and recruiters in the field of real estate are increasingly recognising the role of innovation and technology in real estate operational and business success; hence, real estate students who can combine the core knowledge in real estate with other soft skills and digital technology are likely to stand out and be more employable.

3. Professionals are also evolving to incorporating the technical skills needed to develop their knowledge and proficiency in contemporary innovations and digital applications to real estate.

THEME 3: Pedagogy (learning and study support)

1. The active integration of PropTech in the current real estate courses and programmes in higher institutions is a step in the right direction and the proposed education integration framework is valuable.

2. PropTech education integration may not necessarily require the in-depth training of real estate students to be data scientists; rather, the focus would generally be increasing the awareness, knowledge and understanding of some of the broad areas of data, analytics and technological tools as they apply to real estate. Advanced modules and courses on more in-depth insight on data, analytics and technology as they apply to real estate may however be explored to support students that have more profound interests in these areas.

3. The fundamentals of real estate practice and operations such as economics, law, agency, valuation etc should not be undermined. They remain fundamental to real estate operations and practice; thus, the integration of innovation and technology in the real estate curriculum should not be seen to be replacing fundamental theory.

4. Some real estate innovations may not directly be classified as "technology" (e.g., shared spaces, remote working, short-let etc), although these innovations are driven, enhanced and sustained by technology. These should therefore be incorporated in the PropTech education and innovation integration plans as they are also relevant in the current real estate space.

5. The overall objective of the integration plan should reflect the potential of PropTech to enhance the economic, environmental, social and physical efficiency of real estate operations and practice.

6. PropTech cuts across a very broad range of real estate products, operations and services; it therefore seems unlikely that PropTech will become a stand-alone course or an education specialisation in the near future.

7. The assessment component of PropTech education should be through a range of approaches such as coursework, case studies, and projects. Because of the practical nature of PropTech, exams will not be suitable to test students' knowledge and understanding in this area.

THEME 4: Industry support and contribution

1. A lot more will be achieved if professional bodies and organisations such as the RICS, UKPA, BPF SPR play more active roles in leading the integration of PropTech and innovation in real estate higher education through different channels. The RICS, for instance, currently has data management as one of the mandatory competencies at level 1. This can be increased to level 2 to ensure that professionals have more than just knowledge of data and data management but also engage with this on a higher level. PropTech and innovation can also be introduced as a pathway to encourage real estate students to develop an interest in some of these areas. Consultation with the RICS revealed that the new pathways and competencies framework was launched in August 2018 and new competencies related to PropTech (such as big data, open data, smart cities and intelligent buildings) were incorporated. Furthermore, the UKPA may consider organising debates, seminars and associated events in higher education institutions to increase students' exposure and understanding of PropTech and real estate innovation.

2. PropTech and real estate firms should increase collaboration and partnership with real estate departments/schools to support the PropTech education integration drive. The relationships may be in form of guest lectures, webinars, events, internships and scholarships.

5.0 The details of the Framework

5.1   Integration Approaches

Due to the disparity in the philosophies, objectives and priorities of institutions of higher learning, particularly real estate courses (as stated in Sections 2 and 3), a "one-size-fits-all" PropTech education integration approach would be unfeasible. Two primary integration approaches are therefore proposed (dispersal and concentrated); a secondary approach (hybrid or blended) is further proposed to provide a blend of the two primary approaches. These three approaches are shown in Figure 8).

Figure 8: Integration Approaches
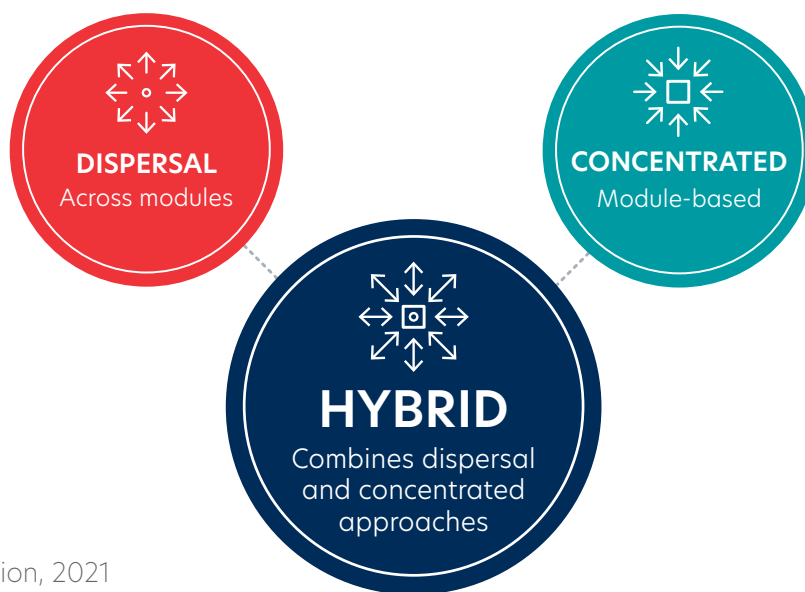
Source: Authors' Illustration, 2021

5.1.1 Dispersal approach

One of the methods through which PropTech and innovation can be integrated real estate higher education is the dispersal approach. Considering the heterogeneity of real estate (by sector, asset class, operations and practice), digital and IT applications and innovations may be better integrated in the existing real estate course/programme structures in alignment with the core real estate practice and operational areas. This can take different forms.

One form of dispersal could be through the various real estate asset classes: residential, commercial and operational real estate (as illustrated in Figure 9a). This approach may be sensible from a practice point of view, as real estate practice and specialisms are typically based on asset (or sub) classes. From an educational point of view however, this may be more difficult to implement considering the many overlapping aspects of the real estate asset classes and the fact that these asset classes are typically spread across various modules. Adopting this
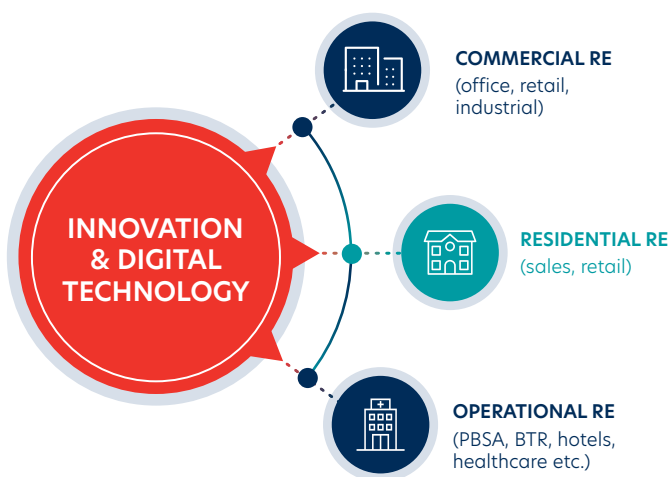
method of dispersal will therefore require a complex cross-module collaboration to be effective.

A more practical dispersal approach, however, could be through the core real estate modules (as illustrated in Figure 9b).

As shown in Figure 9b, modules such as real estate planning, development, finance, valuation/appraisal, investment, portfolio management, asset/property management, agency/brokerage, law and land management would be the most efficient and effective channels of integration. The module aims, learning outcomes and assessment on these core modules would therefore need to be modified to integrate real estate digital technologies and other innovations.

Some of the IT and digital applications have already been integrated in the higher education systems of some of the core specialist areas highlighted in Figure 9b, albeit from a non-real estate perspective. For instance, IT and digital application to construction (such as BIM and ConTech) is already a core specialism in some higher institutions. Furthermore, digital technology has also been integrated in some finance and business management courses (creating areas such as FinTech and blockchain). These can therefore serve as further channels of integration to corresponding real estate practice and operational areas.

Figure 9a: An Asset-class Dispersal Approach to PropTech Education Integration

COMMERCIAL RE
(office, retail, industrial)

INNOVATION & DIGITAL TECHNOLOGY

RESIDENTIAL RE
(sales, retail)

OPERATIONAL RE
(PBSA, BTR, hotels, healthcare etc.)

Source: Authors' Illustration, 2021

Figure 9b: A Module-based Dispersal Approach to PropTech Education Integration

Planning & Land Management

Development & Construction

INNOVATION & DIGITAL TECHNOLOGY

Valuation, Investment & Finance

Asset/Property Management, Agency & Brokerage

Law & Conveyance

Source: Authors' Illustration, 2021

5.1.2 Concentrated approach/method

A second approach for the integration of PropTech and innovation in real estate higher education is the concentrated approach (illustrated in Figure 10). The major mechanism for integration using this approach is the development of a module to introduce students to the importance of innovation and technology in real estate in a bid to enable them to appreciate the values of these phenomena.

This mode of integration may require the development of a new module on most real estate programmes at all levels (undergraduate/postgraduate; full-time/part-time). An introductory module will particularly be useful for students with limited IT background. This module may be best delivered in the first semester/term of study to ensure that students develop foundational knowledge, theory and skills on PropTech and other real estate

Figure 10: A Concentrated Approach to PropTech Education Integration
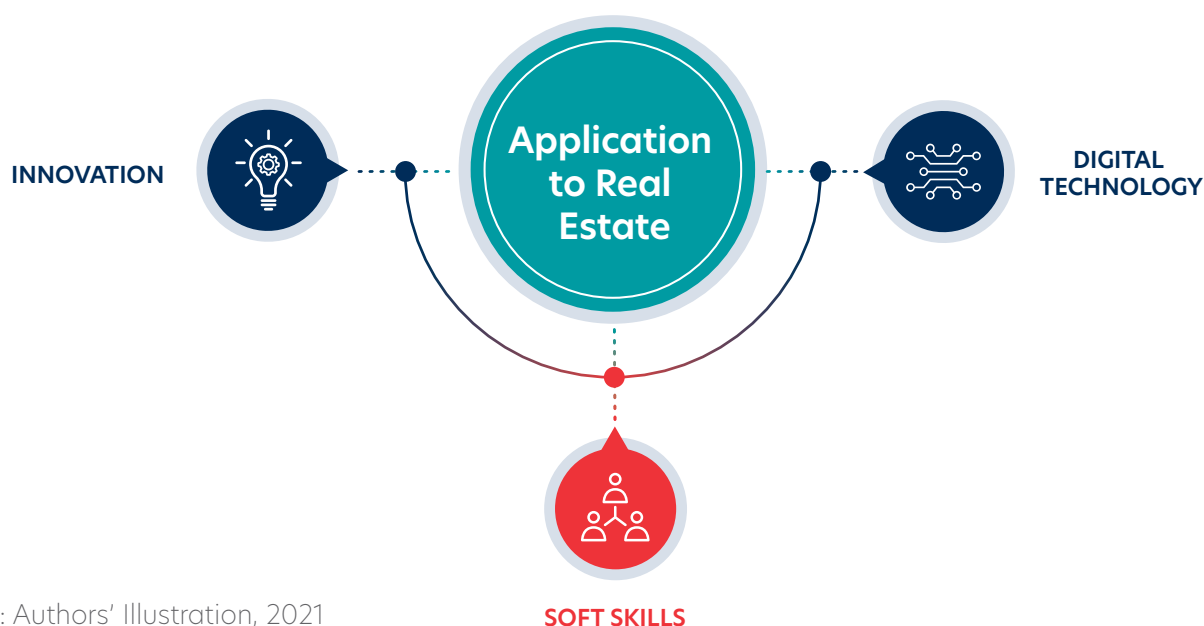

Source: Authors' Illustration, 2021

innovations. Data and analytics have been identified as a PropTech fundamental; thus, this module should emphasise data and analytics and how these can enhance economic, social, environmental and physical efficiency and effectiveness of real estate.

The concentrated module may incorporate a general introduction to IT and digital technology such as data, analytics, computing, internet, cloud, IoT, blockchain, AI, drones etc at basic levels. Innovation and other soft skills such as creativity, communication, strategic thinking, ethics, entrepreneurship and problem-solving should accompany the hard skills. Problem identification is particularly an important professional capability; it therefore should be a point of emphasis in the module construction. It is important that the core elements of this module

are linked to their applications to real estate operations and practice, particularly identifying how technology and innovation can solve real estate problems relating to planning, land management, development, construction, finance, investment, valuation, appraisal, portfolio management, asset and property management, agency and brokerage and other areas of operations and practice. This introductory module can also go on to discuss the chronology and evolution of PropTech, mapping out the growth and development of digital applications to real estate as well as major landmarks at local and global levels.

The primary integration approaches (dispersal and concentrated) have their merits and demerits, and these are summarised below in Table 1.

Table 1: Merits and Demerits of Dispersal and Concentrated Approaches to Integration
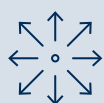
Dispersal Approach

Concentrated Approach

PANEL A: Merits of the Dispersal Approach - relative to Concentrated Approach

Dispersal Approach	Concentrated Approach
Students are introduced to a wider range of technologies which can expand their knowledge and understanding of various practical applications of innovation and digital IT tools. This can enable them to further develop broader scope of application of innovation and digital technologies to the different components of real estate.	A module-based approach, though covering several IT-related topics may have a limited scope of application. Students may thus be confined to a few technological tools which can limit the application to different components of real estate.
The dispersal approach may be easier to adapt as it is less likely to require major changes to the current course structures. Furthermore, it is more subtle and less disruptive, particularly when compared to introducing a new module/suite of modules (see section 5.1.2). Heads of Schools/departments and Course Directors may encounter less bureaucratic hurdles if this approach is adopted.	The concentrated approach may be more complex in implementation and may require several bureaucratic and procedural challenges (e.g., approval from the RICS and relevant University committees and boards).
With the right level of interest and support from various module leaders, the dispersal approach can be implemented in a much shorter time, in comparison to introducing a new module/suite of modules (see section 5.1.2).	Developing a module may require long bureaucratic and administrative procedures which may take a lengthy time. Planning and implementing the integration using the concentrated approach may therefore be time consuming.
The dispersal approach eliminates the need to create a new module. Thus, there is lesser knowledge/skills trade-off (in terms of getting rid of already existing content and assessments which are embedded in the current course structures) which would be the case if an existing module is to be replaced with a PropTech and innovation module.	Having a new module may be practically challenging for programmes and courses with short duration or special structures (such as postgraduate courses). A major problem is the trade-off between currently existing modules and a new PropTech and innovation module- i.e., which module will be discontinued to accommodate the new module?

PANEL B: De-merits of the Dispersal Approach - relative to Concentrated Approach

| Dispersal Approach	Concentrated Approach
Considering that the integration (dispersal) will be implemented within several modules, it may be more challenging for the heads/leaders of the programmes/courses to coordinate the activities of all the module leaders and appraise the progress and development of the integration.	With the concentrated module, the progress and appraisal of the module (after initial set up and approvals) can be coordinated more effectively by the heads/leaders of the programme. This can further improve the review and re-development of the module and the PropTech education integration in general.
With the dispersal approach, it will be more challenging to monitor students' performance and engagement with PropTech and innovation; this can further make it more challenging to appraise and monitor the progress of the integration plan.	A module-based approach improves the monitoring of students' performance, interest and engagement on PropTech and innovation, thus enhancing the general integration appraisal.
Students without prior knowledge and exposure to PropTech may struggle to appreciate the need and relevance for PropTech and innovation as emergent paradigms if this is dispersed across the different modules.	The concentrated approach offers an opportunity for students to gain foundational knowledge and understanding of the context of PropTech and innovation and their importance to real estate operations and practice in general.

Source: Authors, 2021

5.1.3 Hybrid/Blended approach

The dispersal and concentrated approaches may be implemented independently. However, considering the merits and demerits discussed in Table 1, a secondary approach- hybrid/blended (illustrated in figure 11) is considered a more effective approach for the integration of PropTech in the real estate higher education system. This will involve the development of a module to introduce property technology and innovation (concentrated approach), while simultaneously incorporating technology and innovation in the already existing real estate modules (dispersal approach). This approach can provide a balance in integration, ensure that the weaknesses of both dispersal and concentrated approaches are mitigated and the potential benefits are maximised, and also enhance integration planning and execution flexibility.

Figure 11: A Blended Approach to PropTech Education Integration
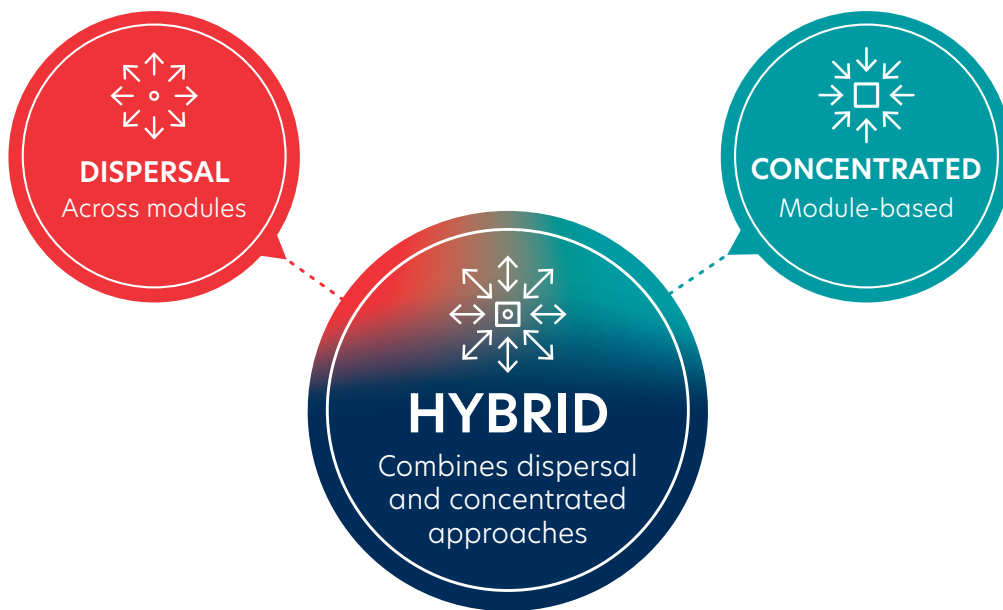
Source: Authors' illustration, 2021

5.2   Curriculum and Pedagogical Considerations

5.2.1 Course Content, Learning Aims and Outcomes

Depending on the approach of integration adopted, real estate programmes that aim to integrate innovation and digital/IT applications in their current real estate curricula will require different levels of pedagogical modifications. The key areas where modification may be required are highlighted in this sub-section; they will be discussed in the context of the three approaches discussed in section 5.1.

5.2.1.1 Dispersal: the learning aim and outcomes of the existing modules in real estate courses and programmes should be modified to incorporate some of the components discussed in section 5.1. Emphases should be on the practical applications of technology to the various real estate operations and practice areas within the modules.

5.2.1.2 Concentrated: tthe PropTech and innovation module should aim to enable the students to develop foundational knowledge and understanding of the theory and application of data and analytics, how these can be applied to a variety of real estate operations and practice areas, and how digital/ IT tools can be used to solve real estate problems. The module should ultimately aim to support students to think critically about real estate problems and develop possible solutions using innovative and digital tools. The learning outcomes can be developed along the lines of:

a. Data and analytics

b. Various digital tools and their applications to real estate operations and practice

c. Innovation and digital technologies as tools for enhancing economic, social, environmental and physical efficiency

d. Other soft skills (such as critical thinking, problem-solving, entrepreneurship etc) and their relationship with real estate operations and practice

5.2.1.3: Hybrid: To combine both elements discussed in 5.2.1.1 and 5.2.1.2

5.2.2 Pedagogical Alignment to the UK Professional Standards Framework (UKPSF)

The UKPSF is a comprehensive set of professional standards and guidelines for everyone involved in teaching and supporting learning in higher education in the UK and it can be applied to personal development programmes at an induvial, institutional or national level to improve teaching quality. This sub-section outlines the five key areas of activity of the UKPSF and their alignment to the PropTech education integration framework.

A1: Design and plan learning activities and or programmes of study

In designing and planning the learning activities around innovation and digital applications to real estate, the teacher should consider that PropTech and its associated elements are currently emerging and still unfamiliar to many students, thus, learners' needs, and knowledge will vary significantly. Further consideration should be given to the fact that real estate students typically come from a variety of backgrounds and disciplines and are thus likely to hold distinctive perspectives on digital and IT systems. It will therefore be useful to integrate PropTech through practical mediums that can improve students' knowledge, understanding and experience. The teacher's ultimate aim should be to support students' transition from different scales of the Bloom's taxonomy (reviewed in Section 2) to the pinnacle of the scale where they become more creative and innovative. Educators can plan case studies, scenario-based discussions, tasks, group discussions, videos and other materials that will make the subject matter interesting, stimulating, and practical. Deep learning should be encouraged to ensure that students take ownership of the learning process with educators providing a diverse range of materials and processes to support it. For instance, students can be encouraged to attend lecture sessions with process workbooks and learning diaries. Furthermore, process workshops can also be

organised to support positive group functioning. It is recommended that no more than one-third of the contact time should be facilitated by the teacher; the rest of the time should be based on learner-centred activities with a high level of engagement. For instance, a 3 hour-weekly contact session could comprise of 1 hour workshop/lecture and two hours of case study, discussion and group tasks. Guest speakers from industry can also be invited to facilitate some of the sessions.

A2: Teach and/or support learning

Teaching and supporting learning in PropTech education will require a blend of various methods and approaches to support learners with different learning needs and styles. For instance, visual learners will benefit from lecture content with graphical tools while aural learners will learn more with verbalisation; the read/write learners will benefit from written text and reading exercises, while the kinaesthetic learners will benefit more from demonstrations and activities. Regardless of the class settings, the educator can explore a variety of content and delivery methods to ensure that various learners are actively involved. These could include visual scaffolding (show and tell), small groups/teams, and support bubbles, particularly with the module-based/concentrated approach. Team collaborations are particularly useful for building team working skills which are essential for collaboration and innovation. Case studies are also effective approaches to fostering student engagement and critical reasoning. Students may be assigned to focus on PropTech tools or innovations that have transformed a particular segment of the market, while mapping out the evolution and landmarks of the tools or platforms. This can provide the students with insight inot idea development and impact. An equally important area that students can focus on is the factors that led to the failure or low impact of some PropTech solutions. This will provide the students with an understanding and appreciation of some of the challenges associated with innovation and digital technologies.

The educator's priority in learning support and teaching PropTech and real estate innovations should be support students to gain adequate knowledge and understanding of the underpinning theories, while also developing soft skills. Areas of focus could be improving the awareness of the growth and expansion of PropTech and the identification of opportunities and gaps that can be explored in real estate operations and practice. Lecture session should enable leaners to identify the inefficiencies in specific real estate operations and practice areas and support them to develop creative ways through which these inefficiencies can be minimised.

The level of study, the academic structure and the integration approach will determine the appropriateness of the teaching and learning support provided. For instance, in a module-based/concentred approach, one week can be used for discussion and case studies, while another week can be used for industry visits or guest lectures. In the dispersal approach however where it may be a single week dedicated to the application of IT and digital systems to a particular area of real estate, the delivery may combine several methods and approaches.

A3: Assess and give feedback to learners

Assessment is an integral element of learning and should thus be carefully considered in PropTech education integration. Considering the practical nature of PropTech, traditional examination-style assessment is considered unsuitable and may be an ineffective method of testing learners' understanding of PropTech and other real estate innovations. In line with the ultimate objective of leading the students to the top of scale of Bloom's Taxonomy (creativity and innovation), more practical assessment styles relating to mental stimulation, critical reasoning, creativity, soft skills development could be explored to assess learners' ability to apply theory, analyse and synthesise information and data, and combine all these to think about creative and innovative approaches to real estate operations and practice.

Essays may be effective in increasing students' knowledge and awareness of general underpinnings for real estate innovations, while course work and case studies may be useful in providing students with more in-depth knowledge and understanding

of specific innovative tools and platforms, and the solutions they provide. Group projects may also be explored to provide a platform to students to collaborate to develop innovative solutions to real estate problems. These approaches can more effectively be combined in the concentrated or blended approaches. In a 20-credit concentrated module, for instance, 40% of the assessment may be a 1500 worded essay which may instruct the students to write about the evolution of PropTech, its importance and the major factors that have led to its growth, and the other 60% may be a final project or coursework which can focus on a specific real estate problem and the innovative solutions that have been developed to solve these problems. There is the need to ensure that formative feedback strategy is put in place from the onset of the module so that the module leaders can assess their progress and re-strategise (where necessary). In the dispersal approach however, the application of PropTech may be limited to a single topic, hence the PropTech assessment could be embedded in the module assessment plan in line with the module aim and learning outcomes. In this case, the module leader may consider incorporating some elements of digitisation or innovation in the coursework or essay element of assessment.

A4: Develop effective learning environments and approaches to student support and guidance

The learning and teaching of innovations and digital/IT applications (particularly as they relate to real estate) will require effective and stimulating physical and psychological learning environment and approaches. The learning environment should ultimately stimulate real estate students to reason, analyse and develop their creative capabilities; thus, the environment should be conducive enough for them to participate and engage. In terms of the physical environment, different seating arrangements can be explored to facilitate brainstorming and self-directed learning. Students' engagement and collaboration can be enhanced through collaborative group project work, hence the use of smaller groups (or break out rooms) during lecture session could make students collaboration and knowledge sharing more effective and thus boost teamwork which they can build in group

projects. The psychological environment can also be further stimulated with some sessions delivered by PropTech professionals, as the students are able to further understand and appreciate real estate innovation and digital technologies. Multi-media and audio-visuals (for instance, short videos and documentaries) can also be incorporated in the delivery sessions to further stimulate critical thinking and learning.

A5: Engage in continuing professional development in subjects/disciplines and their pedagogy, incorporating research, scholarship and the evaluation of professional practice

In addition to planning and executing the integration of PropTech in real estate programmes, educators need to constantly monitor the fast-changing industry. PropTech is a rapidly changing area and failure to keep up with the changing trends may make integration plans and other activities outdated and ineffective. Continued professional development, research and scholarship should therefore be essential priorities for real estate educators and course/programme leaders involved in curriculum development, teaching and learning support. Real estate educators should attend seminars, conferences, webinars and other events where real estate innovations and PropTech are being discussed. Integration plans should be evidence-based and constant review of current practices should form the basis for future re-development. Educators and programme/course leaders should therefore document their integration experiences and use these as basis for knowledge sharing and discussions. In addition to these, real estate educators should actively engage with professional bodies and associations such as the UK PropTech Association, the RICS and BPF, particularly in implementing and reviewing their integration plans. Furthermore, educators are encouraged to further explore research areas relating to innovation and technological applications to real estate in order to expand their scope of knowledge and understanding of PropTech and real estate innovation. These approaches can enhance the flexibility and adaptability of the integration framework in line with changes in innovation in real estate operations and practice.

5.3 Cyclical Approach to PropTech Education Integration and Review

As discussed in sub-sections 5.1 and 5.2, a "one-size fits all" approach is impractical and real estate courses/programmes need to be flexible in their integration plans and approaches. Regardless of the integration approach, there is the need to develop an integration plan which should culminate in an integration review. A three-yearly APPIR cyclical model (Assess, Prioritise, Plan, Implement, Review) has been developed to address this (illustrated Figure 12).

Stage 1 - Assessment: The process should begin with an assessment of the current course/programme structure, areas of needs and challenges. This will also entail the assessment of current trends in the real estate field and employability requirements.

Stage 2 - Prioritise: The next stage of integration is the identification of course/programme priorities. For instance, some real estate courses are domicile in the business school while some others are in the planning, environmental departments; thus, priorities and course administration approaches may differ.

The course/programme priorities should therefore be examined vis-à-vis the need identified in stage 1 to develop a feasible and viable integration plan.

Stage 3 - Plan: Developing and documenting an integration plan is essential for implementation and review. The integration plan should account for institutional and course needs and priorities, and also specify the integration objectives (what), actions/process (how), and the timeline of execution and review (when), as well as the pedagogical strategy to be adopted. A SWOT analysis will be useful for identifying areas of strengths of the proposed plan and the associated opportunities. The SWOT analysis will also make it possible to strategically manage areas of weaknesses and mitigate potential threats.

Stage 4 - Implement: Following the plan that has been developed, the integration can be executed with monitoring, feedback and record mechanism. The feedback and observation from this stage will form the basis for further review.

Figure 12: The APPIR Cyclical Model for the PropTech Education Integration

Source: Authors' illustration, 2021

Stage 5 - Review/Reflect: This stage ends the first cycle of integration. It focuses on a reflection on the first integration cycle, identifying areas of optimal performance and areas that require improvement. According to Kolb (1984), we learn and create knowledge by critically reflecting upon past experiences and actions; educators can therefore create their own knowledge and understanding of their experiences, and this can serve as a way of improving the current practice and advancing knowledge. It is important that the students' feedback be incorporated in the review process; the review should be objective and fair and should form the basis for the next cycle of integration.

The review element of this model is particularly important because PropTech education integration plans must take account of several changing parts which include the fast-paced changes in the realm of PropTech, changes in programme and course priorities and structures, changes to staff areas of expertise and research interest, and changes in technology and pedagogy for them to remain effective. Although a three-year APPIR cycle is suggested, institutions should adopt a cycle period that they find most suitable and feasible.

6.0 Data Analysis of Survey Responses

In line with one of the key objectives of testing the feasibility and practicality of the PEIF, and getting feedback from real stakeholders and stakewatchers, an online survey was administered. The online survey contained a link to the third version of the framework (PEIFv3) and participants were advised to study the PEIFv3 before completing the survey.

The survey was a structured questionnaire, albeit an extra open-ended question was included at the end to enable respondents suggest ways of improving the framework. The results are analysed below, and specific questions asked in the survey are included in the appendices section (Appendix 2).

6.1 Respondents' Information

The survey was promoted on various social media platforms, conferences and other personal-professional networks. After three months, a total of 70 participants had completed the survey. As shown in Chart 1, 68% of respondents were real stakeholders (students and educators/researchers) while 28% were stakewatchers (real estate and PropTech professionals and practioners), while the "other" category (4%) included respondents who did not identify with the four categories mentioned. Those within the "other" group identified as facilities manager, software company employee and real estate alumnus (unemployed); while the fourth respondent did not specify his/her profession.

The respondents were drawn from several parts of the world. Although the majority of respondents were based in the UK (60%), 10% were based in Europe, while the other 30% were drawn from other parts of the world (Chart 2a), suggesting that the responses and views from the survey go beyond the UK and Europe. To further understand the location of respondents, the real stakeholders and stakewatchers have been grouped by location (Chart 2b) and the results show that majority of the students

(86%), educators (57%) and PropTech professionals (75%) were based in the UK, while the majority of real estate professionals in the survey (55%) were based in other parts of the world (outside Europe). Chart 2b further shows that all the European respondents in the survey were educators.
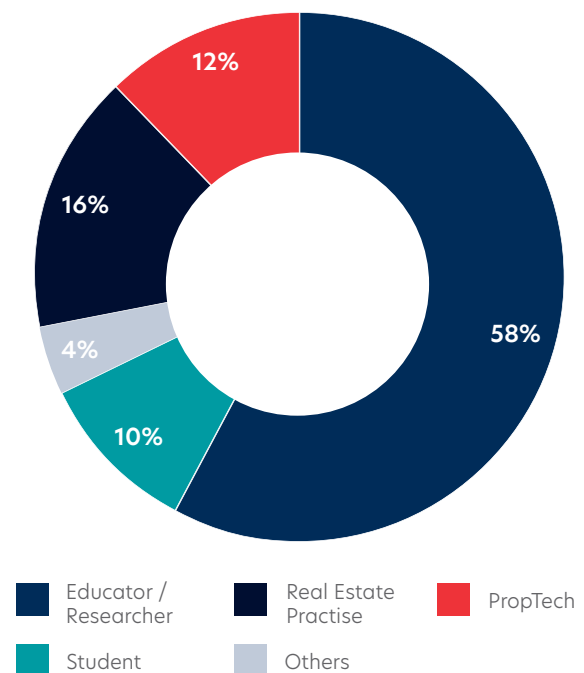
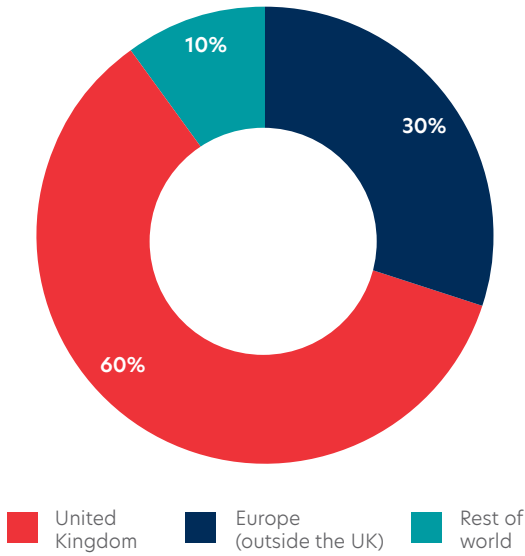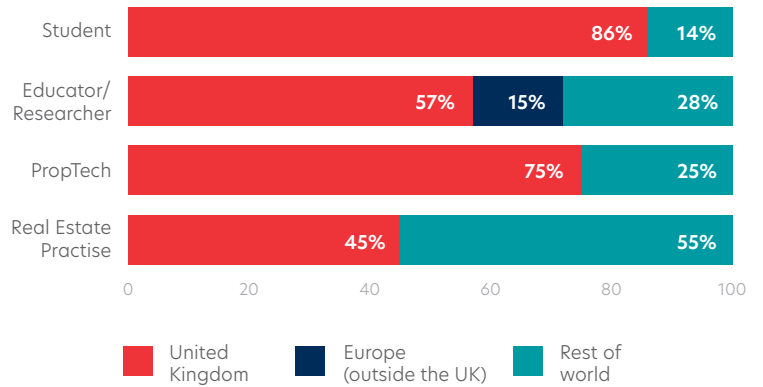Chart 1: Roles and Professions of Respondents

- Educator / Researcher
- Real Estate Practise
- PropTech
- Student
- Others

Chart 2a: Location of Respondents

- 30%
- 10%
- 60%

United Kingdom

Europe (outside the UK)

Rest of world

Chart 2b: Location of Respondents (by respondents' roles/profession)

Student	86%	14%
Educator/Researcher	57%	15%	28%
PropTech	75%	25%
Real Estate Practise	45%	55%

United Kingdom

Europe (outside the UK)

Rest of world

6.2 The Future of PropTech

The responses also provide some insight on respondents' expectations regarding PropTech and its future relevance. Chart 3a shows a high level of optimism on the growth of PropTech, with 86% of respondents indicating that PropTech will become more relevant and 14% believing it will remain relevant over the next decade. Interestingly, none of the respondents expects PropTech to diminish in the near future. Further results (Chart 3b) reveal that a lower level of expectation (i.e., PropTech to remain relevant) was recorded by educators and participants in the more traditional real estate practice. Conversely, PropTech professionals and students recorded a 100% optimism that PropTech will become more relevant.

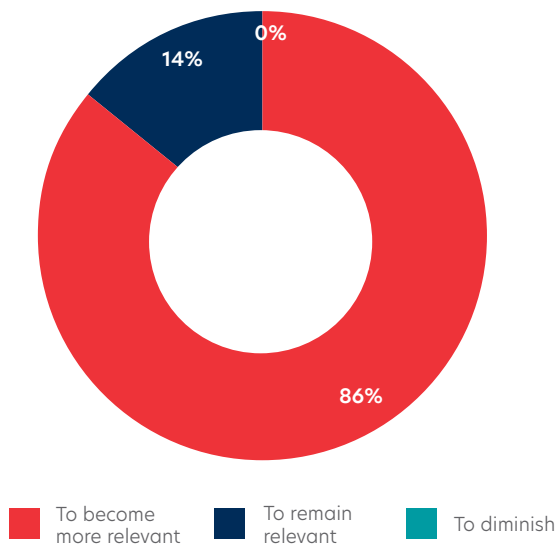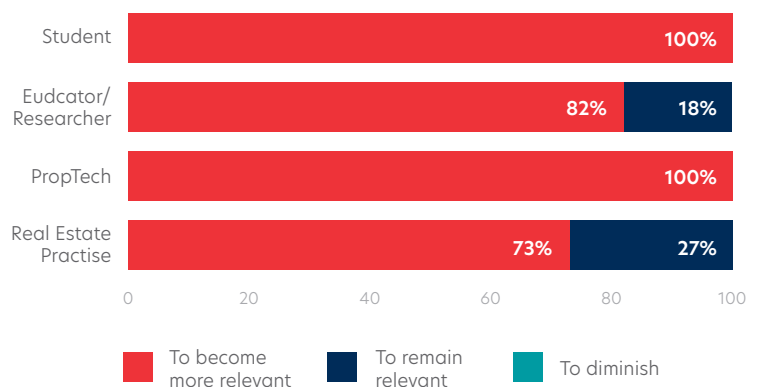**Chart 3a:** General Expectations of PropTech in the Next Decade

- 0%
- 14%
- 86%

To become more relevant

To remain relevant

To diminish

Chart 3b: Expectations of PropTech in the Next Decade (by respondents' roles/profession)

Student	100%	
Eudcator/Researcher	82%	18%
PropTech	100%	
Real Estate Practise	73%	27%

To become more relevant

To remain relevant

To diminish

6.3 Skills

The survey also sought to gain participants' opinion on aspects of skills requirements for PropTech and other future employability considerations. First, respondents were asked if soft skills such as innovation, creativity, entrepreneurship etc should be integrated in the real estate higher education curriculum (along with the PropTech integration). Chart 4a reveals that 99% of the respondents support the inclusion of soft skills in the PropTech education integration plan and Chart 4b further reveals that interestingly, the only group where the soft skill integration did not receive 100% support is the educator/researcher group, although only a small fraction (3%) of this group do not believe that soft skills should be incorporated in real estate higher education.

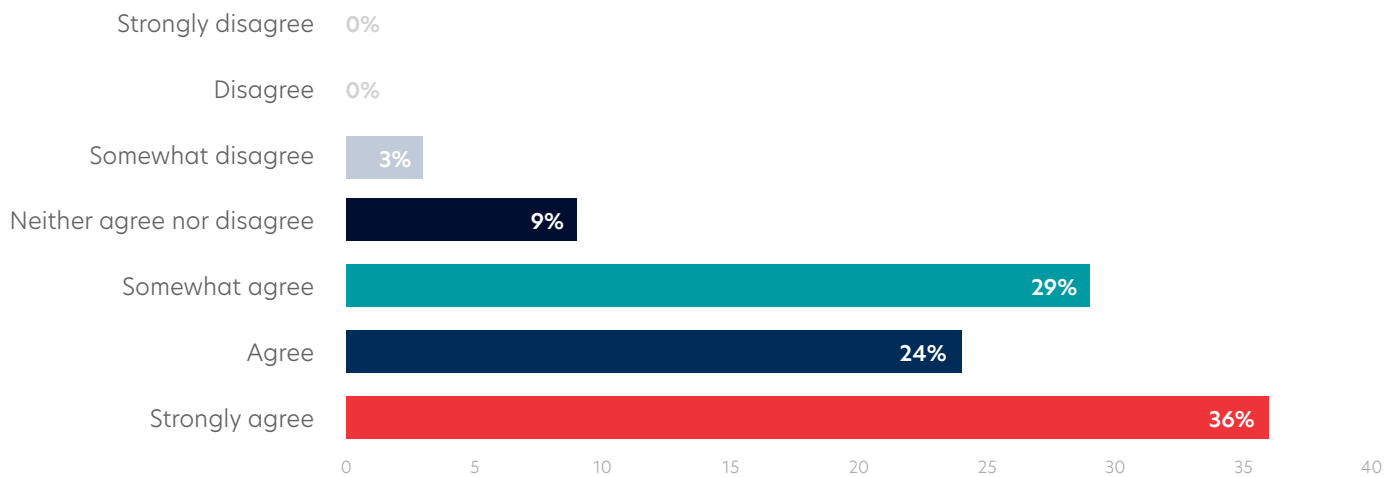Chart 4a: Should Soft skills be incorporated in Real Estate Higher Education?
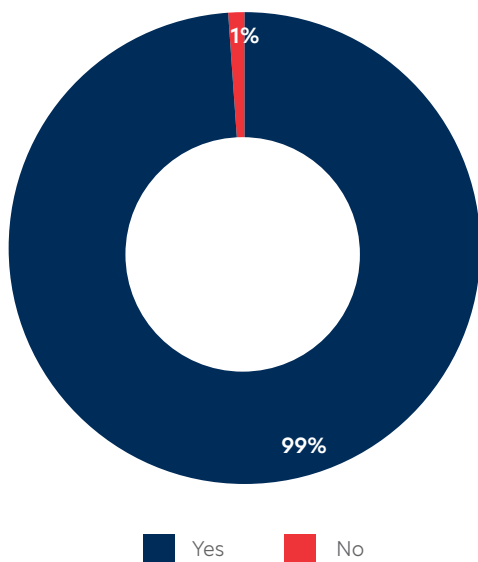
Chart 4b: Should Soft skills be incorporated in Real Estate Higher Education? (by respondents' roles/ profession)
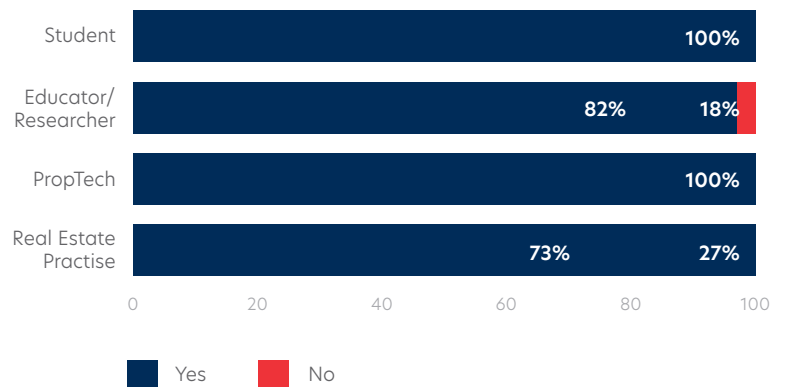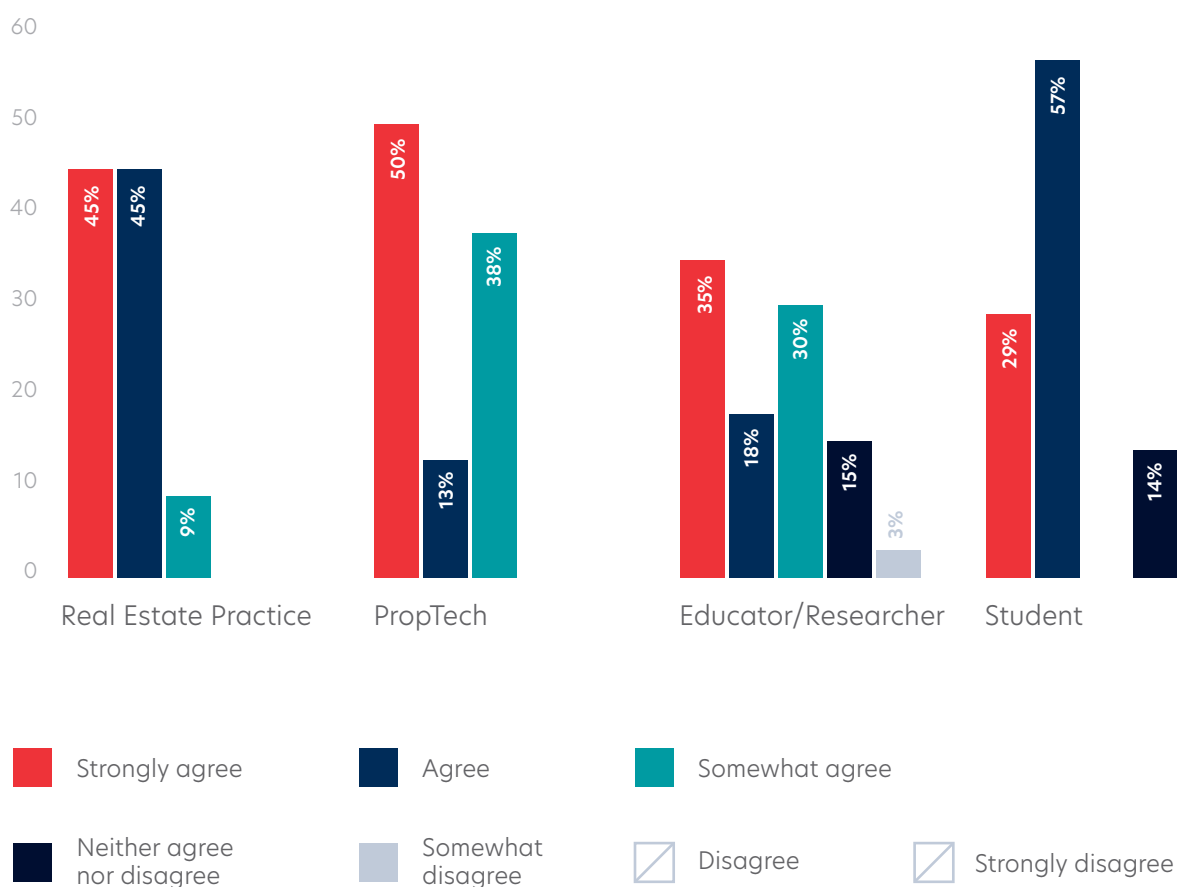

To further gain further insight into the perception of real stakeholders and stakewatchers on the role of data and analytics skills in future real estate operations and practice, a 7-point likert scale question was asked to measure how respondents agree/disagree that real estate students who do not have the basic skills for data and analytics are likely to struggle in professional practice. Chart 5a shows that the vast majority of respondents (89%) agree with this assertion, with 9% remaining neutral and 3% disagreeing. Chart 5b further shows that 100% of stakewatchers (real estate and PropTech professionals) agreed at different levels. Although, a vast majority of the real stakeholders also agreed at different levels, some real stakeholders remained neutral (15% of educators), while 3% of educators and 14% of students disagreed. This suggests a level of disconnect between stakewatchers' (industry) expectations and the expectations of real stakeholders (academics and students). This further indicates that educators and students may not fully appreciate the role of PropTech and other soft skills in enhancing students' employability and future professional practice in the near future.

Chart 5a: How much do you agree/disagree that real estate students who do not have the basic skills and appreciation for data and analytics are likely to struggle in professional practice?

Strongly disagree	0%
Disagree	0%
Somewhat disagree	3%
Neither agree nor disagree	9%
Somewhat agree	29%
Agree	24%
Strongly agree	36%

Chart 5b: How much do you agree/disagree that real estate students who do not have the basic skills and appreciation for data and analytics are likely to struggle in professional practice? (by respondents' roles/ profession)

Legend:
- Strongly agree
- Agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Disagree
- Strongly disagree

6.4 PropTech Education and Integration

The survey further sought to assess the relevance of the PropTech integration in real estate higher education and respondents' preferred integration approach. The results (in Chart 6a) indicate that 97% of respondents agreed that PropTech education integration is important, with a vast majority (78%) believing that it is very important. A few educators/ researchers (3% of all respondents and 5% of educators/researchers) however indicated that PropTech education integration is unimportant (as shown in Chart 6b). It is also noteworthy that 100% of students believe that the integrating PropTech in real estate higher education is relevant.

Chart 6a: Rating the Importance of PropTech Education in Real Estate Higher Education
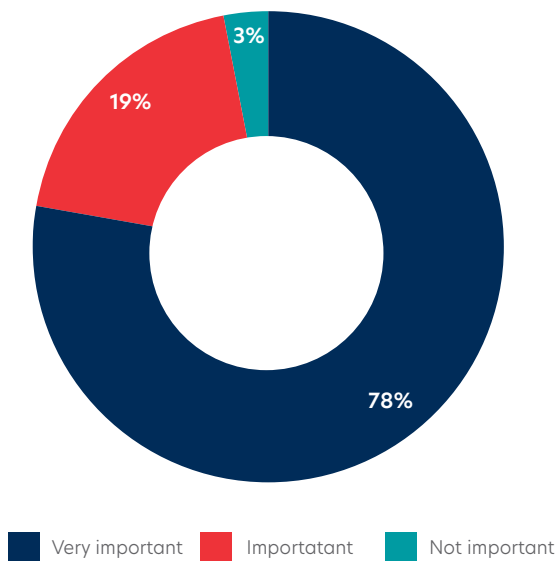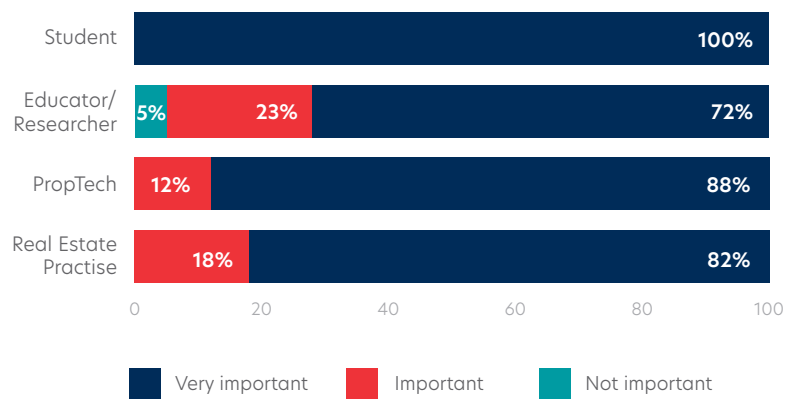

Very important · Importatant · Not important

Chart 6b: Importance of PropTech Education in Real Estate Higher Education (by respondents' roles/ profession)


Very important · Important · Not important

The general lower level of optimism and interest in PropTech education integration observed in the educators/researchers should be considered when integration plans are being developed or reviewed.

Finally, the three proposed integration approaches were presented to the respondents and each respondent was requested to rank the three integration approaches as first choice, second choice and third choice integration preferences. This question aimed to identify the integration approach that respondents found most effective and practical. Chart 7a shows that more than half (52%) of respondents selected the blended/hybrid integration approach as first choice, while there was an almost even split between the concentrated approach (second choice-

25%) and dispersal approach (third choice- 23%). This is further explored through the overall rating of each of the approaches using the ranking mechanism. The ranking mechanism used in this survey ensured that if one of the approaches was consistently preferred (for instance, placed first and second in the ranking scales of the respondents), it would have a higher score, while the approach that is consistently ranked lower will have a lower score. As shown in Chart 7b, the hybrid approach still remained the most preferred integration approach (with a ranking score of 2.36 out of 6 points), while the concentrated approach and dispersal approaches were almost evenly preferred, although the concentrated approach appears to be slightly more preferred than dispersal approach (1.88 and 1.75 points respectively).

Chart 7a: Most Preferred (first choice selection) Integration Approaches by Respondents
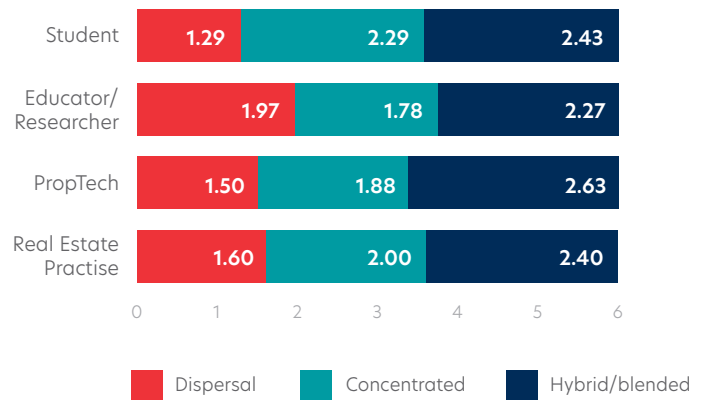

- Dispersal
- Concentrated
- Hybrid/blended

23%
52%
25%
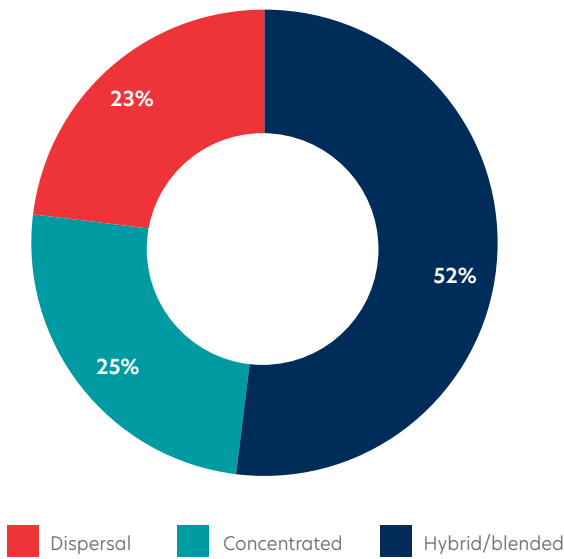
Further analysis of the various respondent groups (Chart 7c) shows that the hybrid approach was preferred across the real stakeholders and stakewatcher groups, while the concentrated approach was the next preferred approach for all the groups, apart from the educators who had a second preference for the dispersal approach. In general, the responses support the adoption of a more blended integration approach to PropTech education integration.

Chart 7b: Ranking Scores of the three PropTech Education Integration Approaches

1.88
2.36
1.75

- Dispersal
- Concentrated
- Hybrid/blended
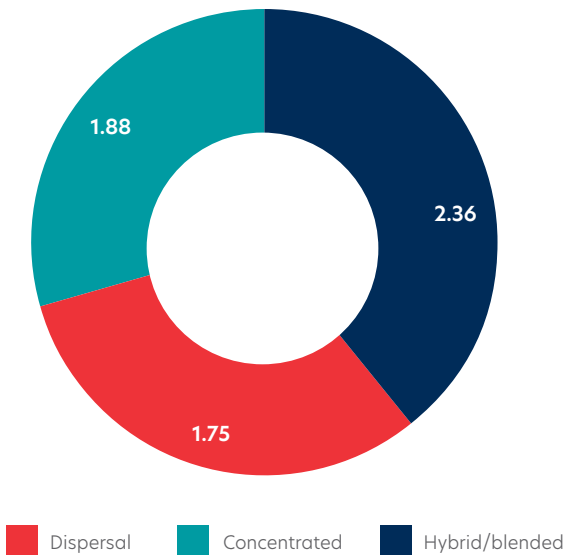
Chart 7c: Ranking Scores of the three PropTech Education Integration Approaches (by respondents' roles/profession)

	Dispersal	Concentrated	Hybrid/blended
Student	1.29	2.29	2.43
Educator/Researcher	1.97	1.78	2.27
PropTech	1.50	1.88	2.63
Real Estate Practise	1.60	2.00	2.40

- Dispersal
- Concentrated
- Hybrid/blended

The key insight from the data analysis can be summarised below:

- 86% of respondents believe that PropTech will become more relevant over the next decade

- 97% of respondents confirm that integrating PropTech in the real estate higher education curriculum is important

- 99% of respondents believe that soft skill integration should accompany the integration of PropTech in real estate higher education

- 89% of respondents agree that real estate students who do not have the basic skills and appreciation for data and analytics are likely to struggle in professional practice

- 52% of respondents have a preference for the hybrid/blended PropTech education integration approach in comparison to the dispersal and concentrated integration approaches

7.0   Conclusions and Recommendations

7.1   Potential Challenges and Limitations

The following areas have been identified as the potential challenges and limitations to the integration framework:

1. The concentrated and hybrid approaches may require new module(s) to be developed which may further create the need for substantial changes to be made to existing real estate courses and programmes. This may further require a substitution with an already existing module in the real estate course structure. Students still need to have a full grasp of core fundamentals of real estate theory and application, thus creating the challenge of determining what the best trade-off will be in terms of core knowledge areas and skills.

2. Some real estate departments may not have academic staff with skills and teaching/research interest in PropTech. This can be a draw-back for all three approaches, although it may be more of a problem in institutions where a concentrated approach is contemplated. Head of departments, course leaders and programme directors who are contemplating the adoption of the concentrated approach should ensure that the module

leaders have the interest, skills, knowledge and appreciation of the contemporary real estate innovative trends and digital technologies.

3. There are not many academic articles and textbooks that can be used by staff to develop the module content in the case of the concentrated approach; this can also adversely affect the development of lecture content and learning exercises in the case of the dispersal approach.

4. Real estate innovation and PropTech are fluid and changing rapidly. This suggests that some current systems and "innovations" may become obsolete within a few years. This calls for real estate educators to be open to new ideas and to keep track of changing trends in real estate operations and practice. A close link to industry and professional bodies may mitigate this potential challenge.

5. PropTech has a very broad scope of knowledge and application; this can make the integration complicated and complex in many cases.

7.2   Recommendations

1. Guest speakers (PropTech professionals/ entrepreneurs) should be part of the delivery in the concentrated module and the various core modules of integration (in the dispersal approach).

2. The concentrated module can be delivered with the support of other IT/Computing academic staff

within the university. Real estate lecturers can therefore build their experience with the support of lecturers with more experience in teaching IT/ digital technology.

3. Internships/placements in PropTech firms will help to increase students' interest in real estate digital technological systems and other innovations;

real estate departments may therefore wish to consider incorporating internships/placements in their programmes for students with interest in PropTech.

4. PropTech firms and professional bodies (such as RICS, UK PropTech Association and BPF) need to collaborate more with higher institutions to enhance the real estate digital/innovation integration drive for the benefit of the real estate profession. This can also minimise the potential challenges which the educators may face in a rapidly changing PropTech landscape.

5. Secondary/evasive versions to the concentrated approach can be explored. For instance, course induction sessions for new students or weekly/ fortnightly industry seminars and events can focus on various aspects of PropTech and innovation. This can complement the integration plan using a dispersal approach in the case that it becomes difficult or impossible to create or operate a new PropTech and innovation module.

6. Learning outcomes and modules course structures should be modified to incorporate technology and innovation on a much more elaborate scale than is currently being done. This modification should be grounded by scholarly and market-based pedagogical considerations.

7. Innovation, particularly in the field of real estate has been driven by flexibility. Furthermore, pedagogical flexibility has been shown to be an essential element of curriculum development. Institutions should therefore be flexible in both adoption and adaptation of the integration to align to their realities and dynamic environments.

8. PropTech is developing at different paces around the world. It may therefore become useful to introduce some of the PropTech elements through various levels of competencies such as introductory, intermediate and advanced modules/content. For instance, in areas where PropTech is advancing at a very high pace, there could be advance PropTech modules to complement the introductory-level concentrated module. Alternatively, an elective PropTech module may be developed to consolidate on either the concentrated or dispersal effort so that students with special interest in PropTech can further explore PropTech and innovation.

9. The expectation is that different integration approaches will be adopted and tested across different higher institutions. It would therefore be useful to document these integration implementations, possibly within the APPIR cyclical framework; case studies can then be used to further analyse the effectiveness and practicality of the various PropTech education integration approaches.

Education is an "inseparable" service, and the service value is created through the quality of the engagement activity. Contemporary real estate education therefore needs to be able to facilitate student engagement in line with the current growth in real estate digitisation. This research has provided an evidence-based integration plan for the integration of PropTech and innovation in real estate higher education and the report has provided a practical guide to curriculum development and further pedagogical aspects of the integration plan. Higher institutions are advised to approach PropTech education integration with flexibility and an effective review mechanism to meet the constantly changing real estate operations and practice. The implementation of this framework can increase the scope of innovation and digitisation among real estate students, and further expand the PropTech and real estate innovative space with economic, physical/spatial, environmental and social benefits. Further research can be conducted develop more effective PropTech enhancement approaches and tools to further expand the scope and impact of PropTech.

Appendices

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Appendix 2: Survey Questions

PropTech Education Integration Framework

Developing an Integration Framework for PropTech Education in Real Estate Higher Education

Summary
In the last decade, IT and digital systems have become pervasive in traditional real estate markets, creating a contemporary branch of real estate typically referred to as "PropTech". Despite the advancement of PropTech over the last few decades, there is no evidence-based approach to developing a PropTech education framework for higher institutions.

Following several interviews and focus group discussions with senior managers and CEOs of leading real estate and PropTech firms, and further discussion with Heads of real estate departments and programme directors, we have developed a PropTech Education Integration Framework. It is our expectation that the framework will be adaptable to the different real estate programmes in UK universities and around the world; it will thus be valuable to get your general opinion and feedback on the feasibility and practicality of the proposed framework. The data from this survey will be analysed to improve the framework further.

What would I be asked to do if I took part?
We request that you read the summary of the framework (links to both versions are provided below) after which you will be requested to answer the survey question below to the best of your knowledge and understanding. Reading the summary version and completing the survey question should take no more than 10-15 minutes of your time (although reading the comprehensive version will take longer). There is no compensation for taking part. The research outcome will be publicly available upon publication in reports and academic journals.

What happens if I do not want to take part or if I change my mind?
It is up to you to decide whether or not to take part. By completing the survey, you are providing your consent. If you decide to take part, you are still free to withdraw at any time without giving a reason and without detriment to yourself. However, since we are not collecting any personal identifiable information (e.g., name, contact details etc), it will not be possible to remove your data from the project once it has been submitted as we will not be able to identify your specific data. This does not affect your data protection rights.

What information will you collect about me?
No personal identifiable information is required in the survey. We only request information on the country of residence/operation which is optional.

Who is conducting the research?
· Dr Olayiwola Oladiran (Lead Investigator)- Department of Urban Studies and Planning, University of Sheffield, UK; o.o.oladiran@sheffield.ac.uk
· Professor Anupam Nanda (Co Investigator)- Department of Planning and Environmental Management, SEED, the University of Manchester, UK; anupam.nanda@manchester.ac.uk

What if I have a complaint or concern?
If you have a complaint that you wish to direct to members of the research team, please contact Dr Olayiwola Oladiran- email: o.o.oladiran@sheffield.ac.uk

Before you begin this survey, please read the **SUMMARY OF THE FRAMEWORK**

1. Submission to the survey will be interpreted as your implied consent to participate. Please confirm your consent by ticking the box below

○ Yes

2. Where are you currently located?

○ United Kingdom
○ Outside the UK (Europe)
○ Outside the UK (rest of the World)

3. How would you classify your current role/operation?

○ Real estate practice
○ PropTech
○ Educator/Researcher
○ Student
○ Other (please specify)

4. How would you describe your general expectations of PropTech over the next decade?

○ To diminish over time
○ To remain relevant
○ To become more relevant

5. How would you rate the importance of PropTech integration in real estate higher education?

○ Not important
○ Important
○ Very important

6. Will it be valuable for other soft skills such as innovation, entrepreneurship, creativity etc to also be actively incorporated in real estate higher education along with digital technology (PropTech)?

○ Yes
○ No

7. "Real estate students who do not have the basic skills for data and analytics and who also lack the appreciation for digital technology are likely to struggle in real estate professional practice in the near future". Do you agree/disagree with this sentiment?

○ Strongly agree
○ Agree
○ Somewhat agree
○ Neither agree nor disagree
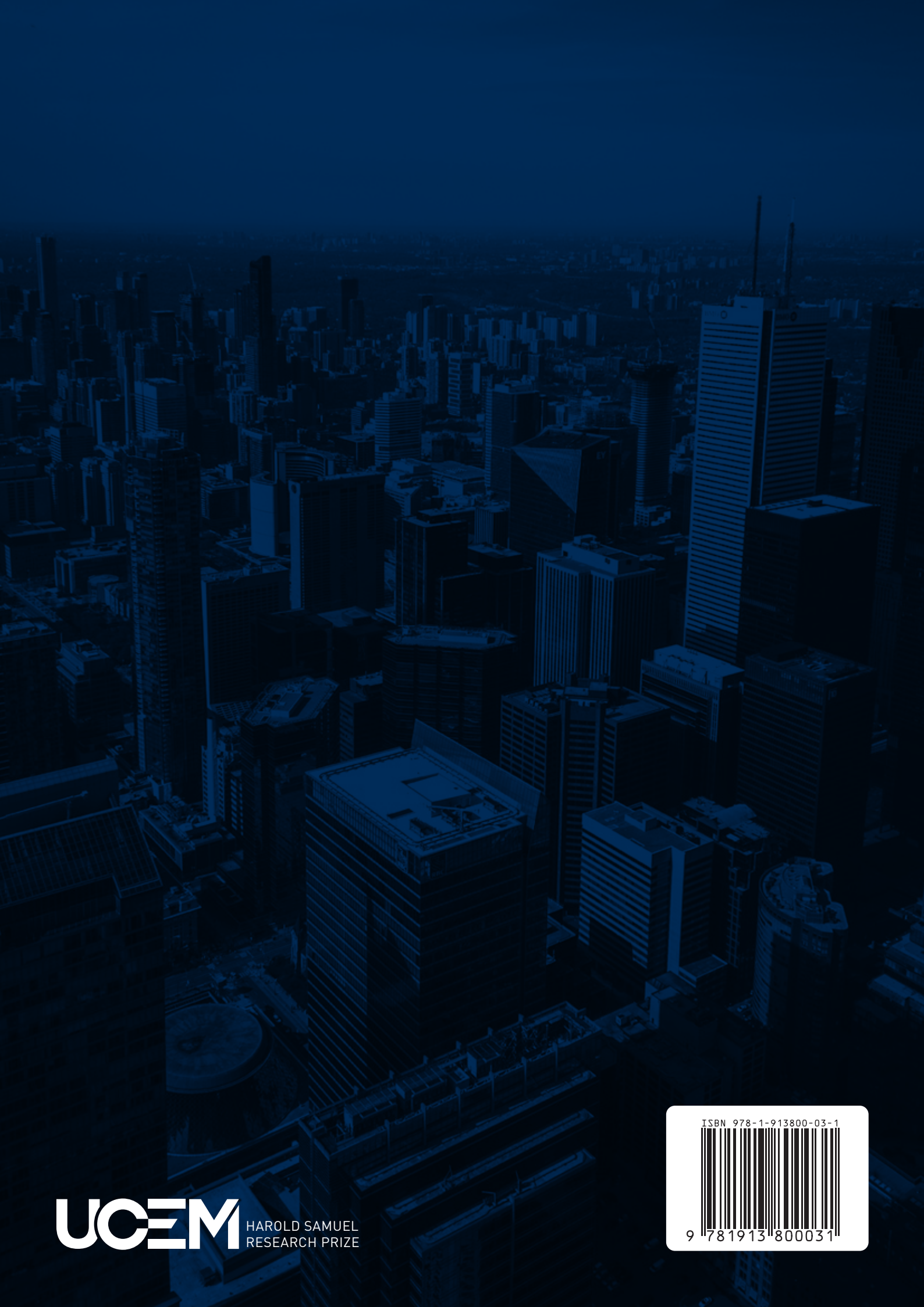○ Somewhat disagree
○ Disagree
○ Strongly disagree

8. Having reviewed the summary of the framework, how would you rank the three approaches to PropTech education integration in order of preference?

☰	↕	Dispersal approach (DA)
☰	↕	Concentrated/module-based approach
☰	↕	Blended/hybrid approach

9. What are your suggestions for further improvement of the framework
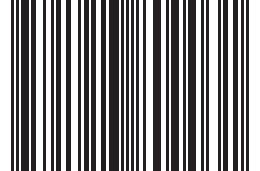
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