



Use of Focus Groups and Reflexive Thematic Analysis to Uncover the Essential Conditions for UK Built Environment Degree Apprenticeships

Susan Dawson, Jack Goulding & Barry Gledson

To cite this article: Susan Dawson, Jack Goulding & Barry Gledson (2024) Use of Focus Groups and Reflexive Thematic Analysis to Uncover the Essential Conditions for UK Built Environment Degree Apprenticeships, International Journal of Construction Education and Research, 20:4, 562-580, DOI: [10.1080/15578771.2024.2404966](https://doi.org/10.1080/15578771.2024.2404966)

To link to this article: <https://doi.org/10.1080/15578771.2024.2404966>



© 2024 The Author(s). Published with license by Taylor & Francis Group, LLC.



[View supplementary material](#)



Published online: 02 Oct 2024.



[Submit your article to this journal](#)



Article views: 170




[View related articles](#)



[View Crossmark data](#)



Use of Focus Groups and Reflexive Thematic Analysis to Uncover the Essential Conditions for UK Built Environment Degree Apprenticeships

Susan Dawson ^a, Jack Goulding ^b, and Barry Gledson ^a

^aFaculty of Engineering and Environment, Northumbria University, Newcastle, UK; ^bUnisearch UK Ltd, Glasgow, UK

ABSTRACT

Degree Apprenticeships within UK Architecture, Engineering and Construction (AEC) organizations present a raft of unprecedented opportunities. However, little is understood on precisely how AEC Employer Organizations (EO's) truly engage with Higher Education Institutions (HEI's) in order to create "meaningful" Built Environment Degree Apprenticeships. Understanding this challenge and minutia of this engagement forms the starting trajectory of this work. To do this, and informed by Boundary Object Theory, an interpretivist approach was used to capture qualitative data from transdisciplinary focus groups – representing domain experts from AEC/HEI sector bodies. Primary data was evaluated using reflexive thematic analysis. An integrated inductive/deductive approach was used to examine nuance, subjectivity, understanding and meaning. Research findings culminate in the form of a thematic map, highlighting four essential conditions to support the delivery of UK AEC DA's; specifically, the need for: (i) Onboarding, (ii) Structure (iii) Cooperation, and, (iv) Infrastructure. These findings identified that the knowledge needed to support engagement goes beyond existing acknowledged boundaries – ergo, that the corollary impact of these essential conditions require much deeper understanding than first thought. These findings form part of a wider study, the results of which will be reported in later works.

KEYWORDS


Degree apprenticeships; education; industry engagement; focus groups; reflexive thematic analysis, skills, collaboration

Introduction

The Architecture, Engineering, and Construction (AEC) industries significantly help drive global economic activity, contributing 6–10% of a country's GDP. Several countries have growth plans engaging AEC in their infrastructure programs, acting as catalysts for wider economic activities (CLC, 2021; PWC, 2023). However, this places significant demands on the availability of appropriately skilled resources (CIOB, 2021; McKinsey, 2019). From a skills perspective, AEC is at a pivotal juncture, needing to meet current and future demands. Skill gaps within AEC organizations remain traditionally complex and (arguably)

CONTACT Susan Dawson  susan.dawson@northumbria.ac.uk  Faculty of Engineering and Environment, Northumbria University, Ellison Place, Newcastle NE1 8ST, UK

This article was originally published with errors, which have now been corrected in the online version. Please see Correction (<http://dx.doi.org/10.1080/15578771.2024.2417466>)

 Supplemental data for this article can be accessed online at <https://doi.org/10.1080/15578771.2024.2404966>.

© 2024 The Author(s). Published with license by Taylor & Francis Group, LLC.

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

this position has not really changed significantly over several centuries (de Matos Camarinha et al., 2023). Presently, the US construction sector requires an additional 0.5 million skilled workers annually to meet demand (NCCER, 2024), while the UK similarly needs an extra 225,000 workers by 2027 (Construction News, 2023). Many countries acknowledge AEC's skills problem, but there are no clear plans or frameworks to address these challenges at local, regional, national, or international levels. Given the focus here on understanding the need and impact of skills through UK Built Environment Degree Apprenticeships, it's crucial to reflect on underlying challenges. Industry leaders, government bodies, professional institutions, and Higher Education Institutions (HEIs) have voiced concerns, advocating for a collective approach to ensure skills are sector-appropriate, up-to-date, and relevant. The Richard Review (2012) introduced apprenticeships as a potential solution. While apprenticeship schemes in the UK AEC industry are not new, Degree Apprenticeships (DAs) are. Between 2015 and 2020, the UK Government launched several flagship Degree Apprenticeships in Architecture, Surveying, and Construction, along with quality standards (Institute for Apprenticeships, 2015). This opened a new provision for the unification of academic and vocational learning via an industry-defined curriculum across both undergraduate and postgraduate service provisions. This approach supports embedding "meaningful work experience" across professional disciplines like architecture, construction management, engineering, and surveying. This initiative is gaining momentum, and it is now suggested that "Closer ties between educational institutions – at every level – and construction businesses will also help to ensure that new candidates have the skills most needed for the industry" (Keen, 2023). Moreover, DA's can be used to "... improve apprenticeship starts and enhance training pathways to support continuation ..." (Construction News, 2023). In many respects, discussions have not centered on needs, but more on the engagement mechanisms throughout which DAs are managed, actuated, and delivered.

The challenge stems from differing perspectives, particularly polarized thinking between Employer Organisations (EOs) and HEIs. These positions are influenced by the complexities of inter- and intra-organizational dynamics, culture, and risk, leading to a lack of trust and shared understanding. This highlights the need for further work to identify the essential conditions for successful collaboration in DAs. Further, there is a need to ensure the unique characteristics of DAs are identified, understood, accepted, and embedded from the outset. This is challenging, especially in managing the partnership and engagement process (Huddleston & Branch-Haddow, 2022). However, many still argue that EOs and HEIs are far too entrenched in their respective silos; given that they invariably position themselves in their socially constructed different worlds (education and industry), and by default therefore tend to pursue different objectives and agenda (Rybnicek & Königsgruber, 2019). Whilst accepting this situation, better understanding these challenges (and different perspectives) could help all parties achieve their own priorities through mutual dependency. This resonates with the need to fully understand the unique stakeholder boundaries in play, where the complexity of combining different perspectives can be reshaped against a common purpose (Fominykh et al., 2015), placing cooperation as the central tenet (Etzkowitz, 2008).

The complex relationships and interactions underpinning DAs are significant and palpable. This work asks: (i) Do we understand these issues well enough to grasp their pervasiveness and impact? (ii) Can we sufficiently identify the essential conditions of

a DA to ensure effective cooperation between HEIs and EOs? In addressing these concerns, this work also presents and discusses the methodological approach in this transdisciplinary AEC sector and education research. The next section explores these issues further, culminating in a research point of departure structured to the concepts of Boundary Object Theory, and the mechanisms needed to establish the essential conditions for successful DAs. This paper also discusses how interpretivism aids in understanding the contemporary social world, followed by a discussion on the methodological process, focus group engagement, and reflexive thematic analysis, which informed the development of the resultant thematic map.

Literature review

This synthesis provides the theoretical background of knowledge and theory following three guiding lines of enquiry; i) Interrelationships and interdependencies of AEC and HEI, ii) Apprenticeships, DA's and blockers and enablers, and iii) Theoretical underpinnings and concepts of Boundary Object Theory. Line of enquiry i) was discussed in the introduction. Here, the first two waves of apprenticeships are discussed through a historical narrative while the third wave, the DA, is addressed through a systematic literature review. Boundary Object Theory is presented as the predominant theoretical lens to explain the real-world challenge and the theoretical concepts are mapped to the DA to confirm its applicability.

UK apprenticeship – the first two waves – statutory and voluntary apprenticeship

Schon (1991) describes apprenticeship as active learning in an educational setting where learning is applied, while Pratt (1997) sees it as a way to teach and develop master practitioners through education and physical integration into relevant practices. Key characteristics of apprenticeship include learning in various contexts, involving multiple stakeholders, and diverse learning methods. The Statute of Artificers formed the first UK national apprenticeship system in 1563 which exerted control over artisan production for almost two centuries. This first wave of the Statutory Apprenticeship was never solely about training, historians have stressed the wider contexts of work, residence, industrial, and socializing relations (Heather, 1988). These views support that the apprenticeship, from its very early days, was a state-enacted programme (long before 1563), a matter of moral, familial, social, and political control as well as a means of skill production. The 1814 repeal of the Statute led to reduced state involvement, aiming for industry responsiveness, but faced opposition from trade societies, nearly collapsing the system (Henson, 1970). Between 1814 and 2015, apprenticeships were redefined, leading to the second wave of Voluntary Apprenticeships, which adapted to industrial changes and large-scale manufacturing. This period saw increased flexibility, movement between apprenticeships, and the abandonment of indentures, though still emphasizing manual skill, knowledge, and training (More, 1980). Employers valued apprenticeships for training and worker commitment, and the UK's Industrial Training Act led to a resurgence in high-tech occupations, such as nuclear, oil and gas, and automotive to avoid skill shortages (More, 1980). In 1964, the UK Government accepted a growing responsibility for training and stated an intention to make apprenticeship a mainstream part of the UK education system. Significantly, the foundation was laid

for the British Educational System thereby formalizing a dichotomy between education and training (Howell, 1972).

A third wave – the degree apprenticeship (DA)

Connections between earlier apprenticeship systems are evident in the new DA; however, there are significant variances that mark this as a step change (Higgs, 2022). DAs cover professional-level occupations and are principally delivered by HEIs, which is a new kind of education provision for them. Curriculum content is determined by employer-led trailblazer groups, and there is considerable external regulation and governance, particularly in connection with quality and inspection. Across the UK there are variations in funding, but in most cases, they are funded via an Apprenticeship Levy, providing fee-free education for apprentices and up to 100% contribution for EOs. This radical reform maintains the dual system of vocational and academic learning with both employer and education involvement, and, with explicit aim of addressing industry skill shortages.

A systematic review was conducted to explore the existing knowledge base on DAs in the UK. Library Search, Web of Science, and Google Scholar were used to find peer-reviewed academic papers published between 2015 (when DAs were introduced) and 2023. The search terms were “degree” “apprentice” and “apprenticeship” and the truncated term “degree apprentice*.” This specific emphasis was to condense the search specifically to DAs and establish a boundary between the well-established fields of research in related educational research areas such as traditional apprenticeships and work-based learning. The search yielded 87 peer-reviewed papers, with 51 containing relevant content and context. Notably, 74% of these papers were published post-2019, indicating the recent growth of interest in the field. However, only 4% of the papers were directly related to DAs in the Built Environment (BE), highlighting a knowledge gap. This gap is significant as AEC DAs represent 10% of all apprentices starting between 2021/22 (HM Government, 2022). Due to the under-researched nature of this subject, generic DA research was also evaluated and synthesized in this study. Pre-2019 research predominantly discusses the positioning of DAs as a new educational pathway for HEIs, EOs, apprentices and government policy, identifying challenges related to stakeholder identity and DA awareness (Antcliff et al., 2016; Crawford-Lee, 2016; Mulkeen et al., 2019). Post-2019 research expands to include curriculum development, work-based learning, and apprenticeship-specific pedagogy (Lillis & Bravenboer, 2020; Lingard et al., 2022). This appears to respond to the recognition of the challenge of the development of professional competence and the subsequent varying levels of employer engagement (Carter & Tubbs, 2019; Lillis & Bravenboer, 2020). Recent research emphasizes the need for additional integration between diverse stakeholder groups, particularly HEIs and EOs, to ensure successful DA delivery outcomes (Fabian et al., 2023; Jones, Nawaz et al., 2022). Although the shared responsibility for holistic apprenticeship fulfillment is well researched, there remains a noticeable gap in literature addressing attributes of the DA in sufficient detail to ensure more effective cooperation between HEIs and EOs.

Boundary object theory

Boundary Object Theory provides the predominant theoretical lens in this study. It is the work of Susan Leigh Star, an American sociologist, and James Griesemer, a philosopher of

science. Their seminal work defined a Boundary Object as an “object that lives in several social worlds with different identities in each” (Star & Griesemer, 1989). A Boundary Object is an artifact i.e. information, model or project, used in different ways by disparate stakeholders to enable cooperation and collaborative work. Boundary Objects were posited as analytical concepts to assist interaction and translation so that stakeholders could work together even when consensus was not fully possible (Star, 2010). Fominkyh et al. (2016) state that typically, divergent viewpoints and diversity amongst stakeholders create a central tension, and, favorably Boundary Object theory presents a model to manage this tension. Star and Griesemer (1989) suggest that the Boundary Object improves cooperation and learning in shared spaces amongst stakeholders. Trompette and Vinck (2009) go further to suggest Boundary Objects support stakeholders to maintain coherence between interacting social worlds and provide a space for negotiation of differences to establish cooperation. This presents an interesting parallel with challenges previously identified in the DA.

Star described the architecture of the Boundary Object as having three distinguishing features. Firstly, “Interpretive flexibility” which indicates that an object has a different meaning and interpretations for each stakeholder involved (Cozzens et al., 1989). The two other aspects appear to be less frequently cited: “Structure,” to address activity or the flow of an information need, and, “Movement,” which is tacking back and forth between participants and tailored applications (Star, 2010). While this study does not fully subscribe to the notion that Boundary Object theory alone can explain the mechanisms of DAs, recent work suggests that the DA as a Boundary Object needs to be better understood.

Applicability of boundary object theory to the AEC DA

It is appropriate to build from and apply, the Boundary Object theoretical concepts to establish a set of regimes, or essential conditions, to ensure more effective cooperation between HEIs and EOs exist in the AEC DA. Figure 1 shows the alignment of the three theoretical concepts with the unique characteristics of the AEC DA to show the DA as a Boundary Object. The DA exists within a broad external ecosystem of regulation and governance (hatched line), while the circular shaded fields represent the internal stakeholders (Lester, 2020). The stakeholders

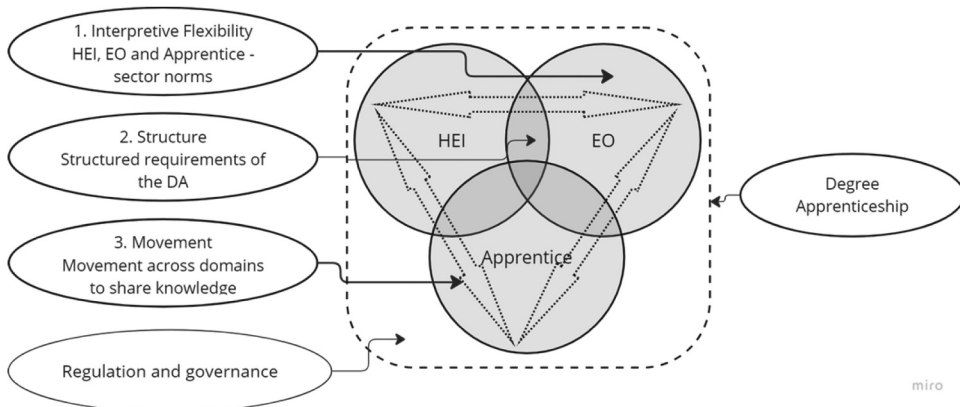


Figure 1. DA as a Boundary object.

occupy separate domains with individual professional and social spheres, and with localized sector norms and cultures. Each stakeholder resides predominantly, in their own unique professional realm or learning environment yet they overlap and transcend into less familiar domains. Here, knowledge is acquired, processed, and applied across various settings like universities, workplaces, or broader professional networks (Bechky, 2003). Various spaces overlap and intersect across domains or institutional boundaries representing a space for cooperation and collaboration, created by the structured requirements of the DA. Under the UKs' Institute of Apprenticeships and Further Education (IfAtE') regulation, HEIs coordinate both "off the job" and "on the job" learning, requiring HEIs and EOs to temporarily reside in each other's domain directing work-based and institutional learning. Boundary crossing activities such as tri-partite contractual obligations and progress review meetings take place in the shared spaces and the central overlapping area, where rules and regulations are mandated, and apprentice progress is reviewed and mapped. Double-ended arrows signify movement between the domains where a process of translation is required to ensure relevance and accessibility of information and learning, deep into the specialized domains.

The literature review examined the interrelationships and interdependencies of HEIs and AEC EOs, followed by a historical account of the UK's national apprenticeship system and analysis of the third wave, the DA. It established the principal enablers of apprenticeship provision as the continuing demand for skills within the professional disciplines of UK AEC. However, the complexities of stakeholder priorities, sector norms, strict external governance, and cooperation complexities hinder sustained activity. The applicability of Boundary Object Theory to develop the essential conditions of a DA is worthy of exploration. As a Boundary Object, the DA has the potential to "satisfy the needs of users from different social worlds while facilitating cooperation between them" (Steger et al. 2018), thereby offering the capability of effective communication and knowledge translation between HEIs and EOs working within the DA. The central analytical question raised by this synthesis is: Can Boundary Object Theory provide a new perspective to identify the essential conditions of a DA in sufficient detail to ensure more effective cooperation between HEIs and EOs?

Research methodology

Studying social situations of AEC, UK HEI, and stakeholder interactions is rooted in social science research, examining contexts rather than isolated instances (Koch et al., 2019). This research captures user experiences to understand the AEC DA context at the boundaries of UK HEI and AEC EOs. Eliaeson (2016) and Chowdhury (2014) note that interpretivism views reality as a social construct, offering a rich and complex view. It focuses on the uniqueness of situations, providing depth (Myers, 1997). This approach, linked to Max Weber's concept of "verstehen" or understanding in context, rejects the positivist, quantitative approach for recognizing context, nuance, and humanity (Hordern & Brooks, 2023). Qualitative survey was chosen for this research, adopting an interpretivist epistemological stance and constructivist ontological perspective. Focus groups were used to offer an authentic construct of the shared AEC DA domain, connecting AEC and HEI. Ethical approval was obtained from the

Table 1. Advantages and disadvantages of focus groups: adapted from Braun (2013).

Advantages	Disadvantages
Flexibility in exploring unanticipated issues	Do not allow in depth follow up of individual views and experiences
Good for gathering new knowledge where little is known	Can be difficult to manage
Access to everyday ways of talking about topics	Can easily get off topic
Access to interaction and meaning-making processes	Logistically difficult to recruit and organise
Can facilitate disclosure	Not good for busy people
Can lead to some level of empowerment and social change	Generally time needed is longer than interviews and may need careful management
Reduce the power and control of the researcher and data potentially less influenced by the moderator	Transcriptions can be time consuming
Flexibility in exploring unanticipated issues	Do not allow in depth follow up of individual views and experiences
Good for gathering new knowledge where little is known	Can be difficult to manage

university ethics committee and participants were briefed and confirmed their consent.

Focus groups

Focus groups have been used in qualitative research since Borgardus's work in 1926, and they have formally become known as "group interviews" (Morgan, 1997). Initially used in the 1940s for market research, their popularity grew in research during the 1980s and 1990s, when they were used in over 100 published journals per year (Morgan, 1997). Merton and Kendall (1946) used groups to examine how people together interpret topics. This is where similarities can be drawn with this study to specifically collect the HEIs and AEC EOs participant responses to the new AEC DA and where participants are selected to provide an expert 'user' perspective. Table 1 shows the advantages and disadvantages of focus groups. Focus group data is rich and relevant due to the synergistic and collaborative nature of the discussions between different participant disciplines/perspectives. Interaction among group members distinguishes this method from one-to-one interviews or surveys, as participants engage in multi-dimensional conversations and reflect, guided by a moderator to align with the research objectives (Morgan, 1997). While opinions on user-based research vary, it is recognized that users can provide valuable insights beyond functional and practical aspects, grounded in reality and ambition (Bruseberg & McDonagh-Philp, 2002). Morgan (1997) argues focus groups collect data not accessible from individual interviews. Braun & Clarke (2006) recognize the value of focus groups where "change" is part of the research intent as participation has a conscious raising effect and the experience is often empowering for the participants.

Data analysis and reflexive thematic analysis

Focus groups generate high volumes of high-quality data that need to be analyzed with a systematic approach, particularly in social science, which is inherently laden with bias and where reflexivity is often part of the solution, not the problem (Bourdieu & Wacquant, 1992; Bryman, 2016). Braun & Clarke (2006) advocate for a reflexive approach in thematic analysis (TA) to interpret meaningful patterns and relevant themes. Although several versions of TA have been introduced, for example Attride Stirling (2001); Joffe (2012),

the work of Braun & Clarke's (2006) contemporary "Six-Phase Guide" approach to Reflexive Thematic Analysis (RTA) provided a theoretically robust and structured process to minimize bias and ensure consistency in the findings (Braun & Clarke, 2006).

Bias can significantly impact how research is viewed, conducted, analyzed, and interpreted. If not managed properly, it can compromise the validity and reliability of findings. Understanding the types and causes of bias should be ingrained in the research methodology, from the formulation of the research lens to the selection of bias mitigation strategies. This research acknowledged the potential impact of several biases, including researcher bias, which can be individual or collective; confirmation bias, where contradictory evidence is ignored; selection bias, which involves choosing participant profiles that align with the researchers' hypothesis; observer bias, characterized by a tendency to favor certain aspects over others; and recall bias, where memory saturation can mislead interpretation. These issues were recognized as likely to influence the outcomes of the research. The principal concerns included researcher bias, sampling bias, question bias, interviewer/interviewee bias, and social desirability bias. To address these challenges, the research team employed stratified triangulation and reflective journaling to document biases and to challenge themselves through critical reflection. This approach, conducted through "scene setting exercises" and peer debriefing, enhanced the reliability and validity of findings, improved methodological transparency, and strengthened the impact of subjective interpretation.

Thematic map development

An overview of the thematic map development process is shown in [Figure 2](#). An exploratory systematic literature review provided the theoretical background and followed the three lines of enquiry. This initial work identified phenomena to deepen understanding of AEC, HEI, and DA contexts. Boundary Object Theory was chosen to address real-world challenges, mapping theoretical concepts to the DA. Qualitative methods were used to explore complex DA processes and participant behaviors.

Focus groups involved a purposive sample of 78 DA experts from HEIs and AEC EOs. Participants were selected to ensure representation from roles experienced in AEC DA from onboarding, delivery, to end point assessment, resulting in a multi-dimensional sample. Participant consent was obtained. Overall, 13 different HEIs and 22 EOs were represented (see [Table 2](#)).

The focus group themes aligned with the three lines of inquiry (see [Figure 2](#)) and loosely formed three waves of data collection. They were guided by a semi-structured agenda that presented a single parent theme to each group, supported by no more than two discussion areas. For example, Focus Group 1 had the parent theme of "Interrelationships and Interdependencies of HEIs and EOs," supported by two broad discussion areas: i) Sector challenges for HEIs and AEC EOs, and ii) Success criteria for HEI and EO engagement. Open questions such as "I am especially interested in your experiences of working across HE and industry, what can you tell me about that?" and "What does success look like when HEIs and EOs work together?" facilitated the free flow of discussion. An iterative approach was followed across the series of focus groups, allowing the data from one group to inform the next and enabling the researcher to "check back" to ensure consistency in understanding and meaning. Despite the primary focus, the conversations were allowed to naturally overlap and recap as the lines of

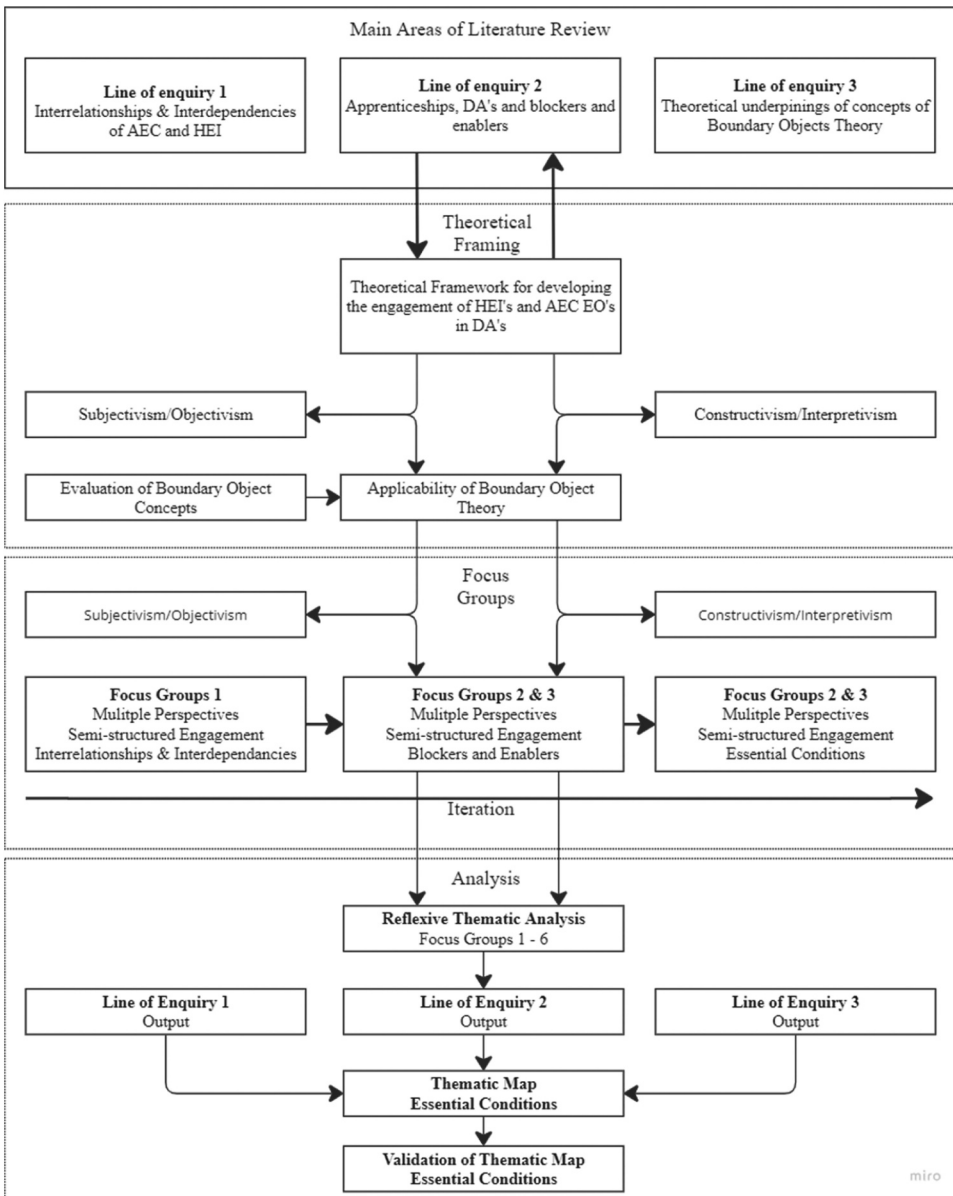


Figure 2. Research methodology.

enquiry became blurred during the discussion. This stimulated participation using familiar language with minimal moderator involvement. Follow-up questions like “I am especially interested in,” and “Tell me more” facilitated deep probing and encouraged participation. Focus groups averaged 3 h in length and adhered to ground rules on confidentiality, respect, and project aims. Data recording involved participant-generated visual artifacts in the form of flip charts, where the use of coloring pens and paper brought a level of familiarity to participants accustomed to using drawings as an accepted form of communication in AEC. This qualitative research was what Braun

Table 2. Participant sample (R1)

Sector	AEC DA Involvement						
	Total	Job Role (Participants were permitted to select more than one)			Job Rank (Participants were permitted to select more than one)		
		Onboarding	Delivery	End Point Assessment	Support	Operational	Strategic
HEI	44	20	29	22	6	24	25
EO	34	16	22	20	3	17	18

(2013) describe as rich, exciting, and challenging, yet it captured the mess and contradiction that characterize the real world and the AEC DAs.

Braun & Clarke's 2006 "Six Phase" recursive thematic analysis was undertaken to analyze the raw data. During Phase 1, the researcher conducted a process of familiarization where preliminary notes, field notes, reflections, artifacts, and transcripts were stored, accessed, and analyzed using NVivo Pro12 software. An initial inductive analysis was conducted to identify emerging trends and patterns. These trends were developed during Phase 2 into a "long list" of keywords from the raw data. Coding reflected both the semantic and latent meanings of discussions and experiences, and they were consolidated and merged where similarities occurred through a dynamic process of "to-ing and fro-ing." While some codes were absorbed by others, some were renamed, and new ones emerged. Phase Three formed candidate themes with an overarching narrative and common meaning. Four discrete global themes were supported by an initial 17 organizing themes and 24 sub-themes to represent the conceptual detail. The global themes were specific enough to represent a single idea "yet broad enough to capture different incarnations in different texts" (Attride Stirling, 2001). During Phase Four, the potential themes were reviewed via a "top down," deductive analysis to categorize and reconcile the "bottom up," data-driven initial coding (Proudfoot, 2022). Phase Five was the last data reduction exercise and generated the final names for the themes. The concluding phase, Phase Six, resulted in the production of the final thematic map. Here, a recursive process of stepping back to the original coding in Phases 1 and 2 took place. The four global themes were confirmed, supported by 12 sub-themes, all of which together represent the underlying set of data.

Findings

Initial inductive analysis generated keywords or "inductive codes." Deductive reconciliation and theorization of these codes aligned them with concepts from Boundary Object theory, ultimately informing the Essential Conditions (see Table 3). For example, a principal concept of Boundary Object theory, "Interpretive Flexibility," acknowledges the different needs and interpretations of stakeholders. The findings revealed divergent interests between HEI and AEC sectors regarding their motivations for engaging in DA delivery. Nevertheless, they also highlighted a shared strategic need for the DA, with increased common awareness. Codes such as "alignment," "awareness," and "contractual obligations" were captured to represent the necessity for shared conventions of practice and membership within the DA community. As a further example, "Movement," is necessary through the Boundary Object into local domains. For the DA, the apprentice must acquire knowledge in

Table 3. Inductive Codes.

Inductive Codes	Theorisation	BoT Constructs	BoT Concepts
Alignment (Academic and practice requirements) Awareness Commercial Contractual obligations Cost DA roles and responsibilities Quality	The analysis of codes indicates that there are different needs and “interpretations” amongst stakeholders yet the need for a common identity (Star & Griesemer, 1989)	Stakeholder conventions Local need Shared need Learned as part of membership	Interpretive Flexibility
Accessibility Communication Contractual complexities Retention and lifelong learning Stability of contacts Support Systems and processes	The analysis of codes indicates “structure” related to informatic and work process and needs and arrangements (Star, 2010)	Multiple stakeholders Common identity (ill structured) Local identity (firm structured) Trans-disciplinary work Inter-disciplinary work	Structure
Agility Alignment – academic/practice Collaboration Curriculum Delivery model Diversity Staff capacity and capability Work based learning	The analysis of codes indicates that “work” is required beyond and across local sites (Star & Griesemer, 1989)	Reach beyond a local site Local expertise Tacking “to-and-fro”	Movement
Alignment (Strategic) Awareness (Industry) Contractual complexities Diversify Income Funding Skills gaps	The analysis of codes indicates a broader macro environment and that “external” interrelated systems are essential to enable co-operation (Star, 2010)	Visible on brake down and fixed in increments Embodiment of standards Embedded within stakeholders and built on installed base Transparency	Infrastructure

the HEI and test and apply this knowledge in the EO workplace. Codes such as “agility,” “collaboration,” and “delivery model” were established to reflect different perspectives on moving beyond familiar sector boundaries to less familiar domains. These initial codes were categorized under the Boundary Object concept of “Movement.” A similar process occurred when establishing the essential condition of “Structure,” where inductive coding relates to “accessibility,” “contractual complexity,” and “support systems” were captured, recognizing the need for a centralized and formalized structure. This recursive review of themes and the combined inductive and deductive analysis generated hybridized themes with enhanced meaning (Braun & Clarke, 2006).

Table 3 also highlights the emergence of a fourth category, “Infrastructure,” recognizing the discussions around external systems essential for supporting DA delivery. Inductive codes related to “strategic alignment,” “external governance,” “contractual complexities,” and the broader challenges of skills gaps and expanding recruitment pools were captured

within this category. These findings informed the essential conditions for AEC DA, where: i) *Onboarding* recognizes the need to acknowledge the interpretive flexibility of stakeholders; ii) *Structure* identifies the structure and work process requirements; iii) *Cooperation* categorizes the movement required through the DA; and iv) “Infrastructure,” recognizes the broader contextual environment in which HEIs and EOs are positioned, and the DA is governed. The naming of these conditions is aligned with Boundary Object theoretical concepts and uses familiar language for HEIs and AEC users. These are illustrated in the thematic map.

Thematic map

Figure 3 illustrates a thematic map representing the four essential conditions for AEC DAs introducing a new cognitive paradigm. It highlights the interrelationships and interdependencies between HEIs and AEC EOs, along with the blockers and enablers experienced by DAs. The four conditions necessary for DA delivery are; On-boarding, Structure, Cooperation, and Infrastructure. Each condition is interdependent and supported by three variable action points. When applied holistically, these conditions enhance communication effectiveness, with engagement levels depending on the capability and capacity of the involved EOs and HEI stakeholders.

Onboarding is the process through which stakeholders acquire the necessary knowledge, skills, and behaviors to be effective DA participants, integrating them into the DA context. This selection process is designed to promote meaningful membership among stakeholders. Structure provides formalized arrangements that establish identity and connectivity with stakeholders and external governance, improving accessibility to the

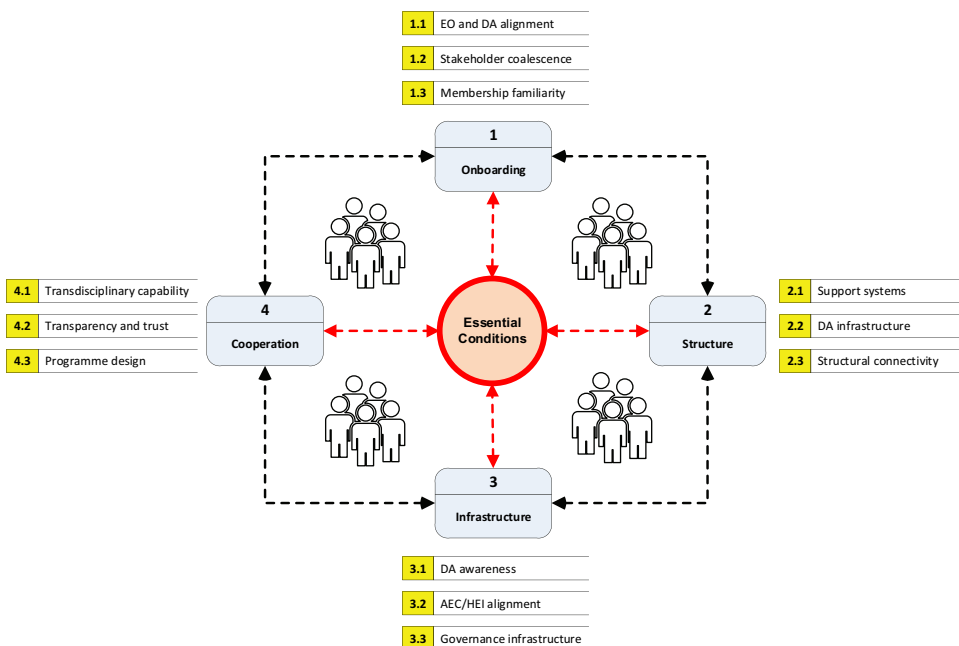


Figure 3. Thematic map: 4 essential conditions.

DA and ensuring compliance. Cooperation involves interactive, transdisciplinary movement across sectors and disciplines, enabling knowledge acquisition in the institution and testing in the workplace. This is facilitated through effective program design and alignment with sector priorities and goals. The remaining essential condition is Infrastructure, which refers to the broader system or contextual macro-environment supporting the DA and recognizing the need for wider awareness, enhanced strategic alignment between AEC and HEIs, and simplified external governance. These essential conditions penetrate deeply into the specialist domains of higher education and AEC, allowing for meaningful stakeholder contributions and participation. They accommodate local needs and priorities while maintaining a common identity centered on the core purpose of the DA. Identifying and implementing these essential conditions is crucial for developing and maintaining coherence across intersecting participants and ensuring the co-delivery of the AEC DA.

Thematic map validation

A systematic process was adopted to ensure rigor throughout, considering the “human” element (Smith & McGannon, 2018). Following Smith and McGannon (2018), new expert participants were asked to reflect on the findings in a “Validation and testing” focus group. Lincoln and Guba’s (1985) evaluation criteria – credibility, dependability, confirmability, and transferability – provided a set of trustworthiness criteria. The validation exercise results indicated a convincing level of approval, and the essential conditions were deemed suitable for ensuring more effective cooperation between HEIs and EOs in delivering DAs for AEC. Accuracy was commended, and one minor recommendation regarding the visual representation was taken forward.

Discussion

The study found that the AEC sector aims to address skills shortages, while HEIs seek to diversify from traditional markets and connect with AEC partners to deliver new DAs. Anticipated growth in DAs requires deeper connections and increased cooperation across sectors. Results highlight problematic boundaries between HEIs and the UK AEC sector, with DAs as potential areas of misunderstanding due to differing competencies and priorities (Lynn-Matern, 2020). AEC DAs lack the structure to integrate practice and education, compromising full stakeholder participation. Focus groups revealed strong feelings that EOs struggle to fully support apprentices (Forster et al., 2017; Lester, 2022). Both HEIs and EOs recognize the value of sector diversity but desire a mutual *modus operandi*. Simple co-existence or a *laissez-faire* approach presents tension (Rybnicek & Königsgruber, 2019). Despite diverging priorities, achieving alignment and informed membership is essential for parallel working (Lester, 2022). Embedded structures within DAs address language and cultural differences (Akkerman & Bakker, 2011) and support work across sectoral boundaries, producing a knowledgeable workforce (Fuller & Unwin, 2005, 2009). This work identifies four essential conditions – Onboarding, Structure, Cooperation, and Infrastructure – to foster a mutual *modus operandi* and enhance cooperation between HEIs and EOs in delivering AEC DAs. These conditions enable sustained access to education and industry domains and serve as a reference for strategic stakeholder

investment in apprenticeships. They also help maximize participation, identify capability and capacity shortfalls, and determine where investment is needed. The essential conditions assist AEC EOs and HEIs in decision-making regarding partner selection, investment, and recruitment.

- Partner selection: A robust onboarding process helps identify informed, committed, and capable stakeholder partners from the start.
- Investment: The thematic map highlights where investment is needed across HEIs and EOs. Targeted investment in recruitment, training, and business processes builds capability, capacity, and efficiency in DA resources.
- Recruitment: Implementing the essential conditions helps develop the DA as a robust, sustainable solution to skill shortages in AEC disciplines, ensuring apprentices achieve high academic and industry-required skills

Increased strategic alignment between higher education and AEC can benefit AEC by enhancing access to HEI specialisms in research and innovation (Pilcher et al., 2017). This study expands the existing DA research by deepening the understanding of AEC DAs in the UK and exploring how more effective cooperation can be achieved between HEIs and EOs in the DA.

Focus groups and reflexive thematic analysis

This social science research employed an interpretivist methodology, using focus groups as the primary data capture tool to explore expert user experiences. Given that the DA is a relatively new phenomenon, this approach allowed participants to engage through interactions, reflection, and challenge (Morgan, 1997). The groups offered a relaxed and safe environment, enabling the researcher to probe deeply into new themes. They provided a quick way to gather feedback and were high-energy, often fun, and engaging, bringing together participants eager for change (Braun & Clarke, 2006). This setting facilitated cross-sector questioning and understanding, helping to develop a common language often missing in education and industry collaborations. Despite the challenge of managing large data volumes, participant-generated flip charts and NVivo Pro12 software aided in data reduction and maintained focus aligned with the research aim.

Focus groups, while time-efficient for researchers, can be demanding for participants, affecting recruitment and attendance (Krueger, 2015). The study's purposive and convenience sampling strategy mitigated this issue, achieving 92% attendance. Conversations were open, with no significant confidentiality concerns. Although balancing participant involvement is a common criticism (Morgan, 1997), participants in this study were confident, with moderators managing dominant voices and encouraging quieter ones. Langford and McDonagh (2003) noted that focus groups are not the ultimate method, but they were chosen here to foster transdisciplinary discussions and address the complexities of the DA. Using a reflexive approach to thematic analysis allowed the researcher to discern meaning from the data and reconcile it with Boundary Object Theory. The integrated inductive and deductive approach applied theoretical concepts to DAs, enhancing understanding of real-world phenomena and forming the DAs essential conditions. Criticisms of thematic analysis include time-consuming coding iterations, difficulties in assessing rigor, and

reduced subjectivity due to a priori knowledge (Braun, 2013). However, the well-structured “Six-Phase” tool mitigated these concerns, enabling rigorous qualitative analysis. A strength of reflexive TA was its constructivist approach, using latent meanings to explore deep issues, facilitating the development of theory-based themes for the essential conditions.

Conclusion

There is a skill shortage amongst AEC professionals and DAs have been advocated as a way to partially address this. Prior to this study, little was understood about how AEC EOs and HEIs can engage effectively to deliver “meaningful” DAs. Thus, the objective of this study was to establish those essential conditions necessary to enable the co-delivery of AEC DAs. Three lines of enquiry led a review into the existing literature and the boundaries between Higher Education and AEC within the DA were identified as being problematic with principle blockers of diverging sector strategic priorities, lack of a common understanding and awareness and the lack of a committed and capable resource. Whilst, principal enablers stem from the sustained and growing need for appropriate talent. Data were collected through a series of transdisciplinary focus groups which provided a multi-user perspective and this was qualitatively analyzed using Reflexive Thematic Analysis. The integrated inductive and deductive process of analysis allowed Boundary Object Theory to provide a new way of considering the DA. This reconciliation with Boundary Object Theory provided an increased awareness and new understanding of how the DA as a Boundary Object could facilitate and encourage active and full participation, whilst delivering on sector-specific objectives and strategic priorities.

The results revealed four essential conditions of i) Onboarding, ii) Structure, iii) Cooperation and iv) Infrastructure. Future research can build upon this study by, a) Developing a supporting framework of action by HEI and EO stakeholders and, b) Further recognizing the third stakeholder perspective, the apprentice. Such future studies may provide further novel ideas about how to improve engagement through the DA and further embed it as a strategic solution. Historically, cross-sector collaboration has proved difficult to maintain; however, the application of the essential conditions can: increase structural alignment between HEI’s and EO’s; help facilitate transdisciplinary co-operative working; and provide a recommended set of regimes to be used by HEI’s and AEC EO’s to support the delivery of the AEC DA.

This study offers some key findings to the current body of knowledge and builds on the work of others (Fabian et al., 2023; Lester, 2020; Lillis & Bravenboer, 2020). However, like many other studies, it contains several limitations that need to be acknowledged. This research was conducted with a relatively small sample size (78) as DA’s can still be considered “new,” and as a result, the numbers of experienced user participants were low. It is recognized that there is a unique set of circumstances associated with AEC and EO demographics which present unique challenges; therefore, the findings are generalizable to broader AEC context but not wholly to other subject areas. An additional limitation relates to the apprentice DA stakeholder perspective. This study primarily recognizes the experience of the principle delivery

partners, HEI's and AEC EO's, and only in a more peripheral way acknowledges the apprentices.

Disclosure statement

No potential conflict of interest was reported by the author(s).

ORCID

Susan Dawson  <http://orcid.org/0000-0003-3670-7000>

Jack Goulding  <http://orcid.org/0000-0002-9039-7464>

Barry Gledson  <http://orcid.org/0000-0002-4273-0832>

References

- Akkerman, S. F., & Bakker, A. (2011). Boundary crossing and boundary objects. *Review of Educational Research*, 81(2), 132–169. <https://doi.org/10.3102/0034654311404435>
- Antcliff, V., Baines, S., & Gorb, E. (2016). Developing your own graduate employees: Employer perspectives on the value of a degree apprenticeship. *Higher Education, Skills & Work-Based Learning*, 6(4), 378–383. <https://doi.org/10.1108/HESWBL-05-2016-0032>
- Attride Stirling, J. (2001). Thematic networks: An analytic tool for qualitative research. *Qualitative Research QR*, 1(3), 385–405. <https://doi.org/10.1177/146879410100100307>
- Bechky, B. A. (2003). Sharing meaning across occupational communities: The transformation of understanding on a production floor. *Organization Science*, 14(3), 312–330. <https://doi.org/10.1287/orsc.14.3.312.15162>
- Bourdieu, P., & Wacquant, L. J. (1992). *An invitation to reflexive sociology*. University of Chicago Press.
- Braun, V. (2013). *Successful qualitative research: A practical guide for beginners*. Sage Publications.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp0630a>
- Bruseberg, A., & McDonagh-Philp, D. (2002). Focus groups to support the industrial/product designer: A review based on current literature and designers' feedback. *Applied Ergonomics*, 33(1), 27–38. [https://doi.org/10.1016/S0003-6870\(01\)00053-9](https://doi.org/10.1016/S0003-6870(01)00053-9)
- Bryman, A. (2016). *Social research methods* (5th ed.). Oxford University Press.
- Carter, J., & Tubbs, N. (2019). Degree apprenticeships, the 'joy of learning' excellence framework, and the common good. *Journal of Further and Higher Education*, 43(1), 127–137. <https://doi.org/10.1080/0309877X.2017.1356917>
- Chowdhury, M. F. (2014). Interpretivism in aiding our understanding of the contemporary social world. *Open Journal of Philosophy*, 04(3), 7. <https://doi.org/10.4236/ojpp.2014.43047>
- CIOB. (2021). *Upskilling and educating the workforce*. <https://www.ciob.org/industry/policy-research/policy-positions/upskilling-educating-workforce>
- CLC. (2021). *Industry skills plan for the UK construction sector 2021 – 2025, construction leadership council*. https://www.constructionleadershipcouncil.co.uk/wp-content/uploads/2021/03/B06322_CLC_SkillsPlan_v27.pdf
- Construction News. (2023). *Our plan to fill the skills gap needs your collaboration, Nick Roberts*. Retrieved 21 July, 2023, from <https://www.constructionnews.co.uk/sections/news/our-plan-to-fill-the-skills-gap-needs-your-collaboration-21-07-2023/>,
- Cozzens, S. E., Bijker, W. E., Hughes, T. P., & Pinch, T. (1989). 'Wiebe E. Bijker, Thomas P. Hughes, and Trevor Pinch, eds. the social construction of technological systems: New directions in the sociology and history of technology (book review)'. *Technology and Culture*, 30(3), 705. <https://doi.org/10.2307/3105993>

- Crawford-Lee, M. S. (2016). Towards a sustainable apprenticeship system. *Higher Education, Skills & Work-Based Learning*, 6(4), 324–328. <https://doi.org/10.1108/HESWBL-09-2016-0068>
- de Matos Camarinha, R., Goulding, J., & Peter, C. (2023). Construction sector transformation: Developing a new learning paradigm. In A. Gomes Correia, M. Azenha, P. J. S. Cruz, P. Novais, & P. Pereira (Eds.), *Trends on construction in the digital era. ISIC 2022. Lecture notes in civil engineering* (Vol. 306). Cham: Springer. https://doi.org/10.1007/978-3-031-20241-4_25
- Eliaeson, S. (2016). Max Weber's methodology and the comparative sociology of religion. *Revue internationale de philosophie*, 276(2), 253–272. <https://doi.org/10.3917/rip.276.0253>
- Etzkowitz, H. (2008). *The triple helix: University-industry-government innovation in action*. Routledge ISBN: 9780415964500.
- Fabian, K., Taylor-Smith, E., Smith, S., & Bratton, A. (2023). Signalling new opportunities? An analysis of UK job adverts for degree apprenticeships. *Higher Education, Skills & Work-Based Learning*, ahead-of-print (ahead-of-print). 13(2), 299–314. <https://doi.org/10.1108/HESWBL-02-2022-0037>
- Fominkyh, M., Prasolova-Forland, E., Divitini, M., & Petersen, S. A. (2016). Boundary objects in collaborative work and learning. *Information Systems Frontiers*, 18, 85–102.
- Fominkyh, M., Prasolova-Førland, E., Divitini, M., & Petersen, S. (2015). Boundary objects in collaborative work and learning. *Information Systems Frontiers*, 18(1), 1–18. <https://doi.org/10.1007/s10796-015-9579-9>
- Forster, A., Pilcher, N., Tennant, S., Murray, M., Craig, N., & Copping, A. (2017). The fall and rise of experiential construction and engineering education: Decoupling and recoupling practice and theory. *Higher Education Pedagogies*, 2(1), 79–100. <https://doi.org/10.1080/23752696.2017.1338530>
- Fuller, A., & Unwin, L. (2005). Older and wiser?. *International Journal of Lifelong Education*, 24(1), 21–39.
- Fuller, A., & Unwin, L. (2009). Change and continuity in apprenticeship: The resilience of a model of learning'. *Journal of Education & Work*, 22(5), 405–416.
- Heather, S. (1988). The illusion of economic structure: Craft guilds in late medieval English towns. *Oxford University Press*, 121(1), 29–48. <https://doi.org/10.1093/past/121.1.29>
- Henson, G. (1970). *Henson's history of the framework knitters*. Augustus M. Kelley.
- Higgs, A. (2022). The England degree apprenticeship: A lens to consider the national and international context of social work education. *Social Work Education*, 41(4), 660–674. <https://doi.org/10.1080/02615479.2021.1873935>
- HM Government. (2022). *The construction playbook: Government guidance*. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1102386/14.116_CO_Construction_Playbook_Web.pdf
- Hordern, J., & Brooks, C. (2023). The core content framework and the 'new science' of educational research. *Oxford Review of Education*, 49(6), 800–818. <https://doi.org/10.1080/03054985.2023.2182768>
- Howell, G. (1972). *A history of the working men's association from 1836 to 1850*. Frank Graham.
- Huddleston, P., & Branch-Haddow, S. (2022). Employers at the heart of the system: Whose system is it anyway? *London Review of Education*, 20(1), 28. <https://doi.org/10.14324/LRE.20.1.28>
- Institute for Apprenticeships. (2015). *Institute for apprenticeships statement: Quality apprenticeships*. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/662192/Institute_for_Apprenticeships_Statement_-_Quality_Apprenticeships.pdf
- Joffe, H. (2012). Thematic analysis. Qualitative research methods in mental health and psychotherapy. *A Guide for Students and Practitioners*, 1, 210–223. <https://doi.org/10.1002/9781119973249.ch15>
- Keen, M. (2023). *Construction industry must address the skills crisis now in order to increase output*. *New civil engineer*. EMAP Publishing Ltd, Retrieved 15 March 2023, from <https://www.newcivilengineer.com/latest/construction-industry-must-address-the-skills-crisis-now-in-order-to-increase-output-15-03-2023/>

- Koch, C., Paavola, S., & Buhl, H. (2019). Social science and construction – an uneasy and underused relation. *Construction Management & Economics*, 37(6), 309–316. <https://doi.org/10.1080/01446193.2019.1599160>
- Krueger, R. A. (2015). *Focus groups: A practical guide for applied research*. Sage Publications.
- Langford, J. D., & McDonagh, D. (2003). *Focus groups : Supporting effective product development*. London Taylor & Francis.
- Lester, S. (2020). Creating conditions for sustainable degree apprenticeships in England. *Higher Education, Skills & Work-Based Learning*, 10(5), 701–714. <https://doi.org/10.1108/HESWBL-04-2020-0062>
- Lester, S. (2022). Architecture in the UK: A study in professional entry-routes and entry-gates. *Higher Education, Skills & Work-Based Learning*, 12(1), 1–12. <https://doi.org/10.1108/HESWBL-02-2021-0034>
- Lillis, F., & Bravenboer, D. (2020). The best practice in work-integrated pedagogy for degree apprenticeships in a post-viral future. *Higher Education, Skills & Work-Based Learning*, 10(5), 727–739. <https://doi.org/10.1108/HESWBL-04-2020-0071>
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Sage Publications.
- Lingard, H., Zhang, R. P., Labond, C., Clarke, J., & Doan, T. (2022). Situated learning: How interactions with supervisors shape construction apprentices’ safety learning and practice. *Journal of Construction Engineering and Management*, 148(10). [https://doi.org/10.1061/\(ASCE\)CO.1943-7862.0002371](https://doi.org/10.1061/(ASCE)CO.1943-7862.0002371)
- Lynn-Matern, J. (2020). *Mass collaboration between employers and universities is the future of higher education: Emerge edtech insights*. <https://medium.com/emerge-edtech-insights/mass-collaboration-between-employers-and-universities-is-the-future-of-higher-education-part-1-ed840467bfd5>
- McKinsey. (2019). *Voices on infrastructure workforce of the future, global infrastructure initiative, McKinsey & company*. <https://www.mckinsey.com/~media/mckinsey/business%20functions/operations/our%20insights/voices%20on%20infrastructure%20workforce%20of%20the%20future/gii-voice-dec-2019.pdf>
- Merton, R. K., & Kendall, P. L. (1946). The focused interview. *The American Journal of Sociology*, 51(6), 541–557. <https://doi.org/10.1086/219886>
- More, C. (1980). *Skill and the English working class, 1870–1914*. Croom Helm.
- Morgan, D. L. (1997). *Focus groups as qualitative research* (2nd ed.). London :SAGE.
- Mulkeen, J., Abdou, H. A., Leigh, J., & Ward, P. (2019). Degree and higher level apprenticeships: An empirical investigation of stakeholder perceptions of challenges and opportunities. *Studies in Higher Education*, 44(2), 333–346. <https://doi.org/10.1080/03075079.2017.1365357>
- Myers, M. D. (1997). Qualitative research in information systems. *MIS Quarterly*, 21(2), 241–242. <https://doi.org/10.2307/249422>
- Nawaz, R., Edifor, E. E., Holland, S. R., Cao, Q., & Liu, L. S. (2022). The impact of degree apprenticeships: Analysis, insights and policy recommendations. *Transforming Government: People, Process and Policy*, ahead-of-print (ahead-of-print). 17(3), 372–386. <https://doi.org/10.1108/TG-07-2022-0105>
- NCCER. (2024). *Construction employment outlook: Research fact sheet January 2000 – January 2024*. National Center for Construction Education and Research. <https://www.nccer.org/media/2024/05/2024-Construction-Employment-Outlook.pdf>
- Pilcher, N., Forster, A., Tennant, S., Murray, M., & Craig, N. (2017). Problematising the ‘Career Academic’ in UK construction and engineering education: Does the system want what the system gets?. *European Journal of Engineering Education*, 42(6), 1477–1495.
- Pratt, D. D. (1997). *Five perspectives on teaching in adult and higher education*. Krieger Publishing Company.
- Proudfoot, K. (2022). Inductive/Deductive hybrid thematic analysis in mixed methods research. *Journal of Mixed Methods Research*, 17(3), 308–326. <https://doi.org/10.1177/15586898221126816>
- PWC. (2023). *PwC’s global workforce hopes and fears survey 2023, price waterhouse Cooper global*, <https://www.pwc.com/gx/en/issues/workforce/hopes-and-fears.html>

- Richard Review. (2012). *The Richard review of apprenticeships, Doug Richard, school for startups*. <https://assets.publishing.service.gov.uk/media/5a79cfb1ed915d042206b345/richard-review-full.pdf>
- Rybnicek, R., & Königsgruber, R. (2019). What makes industry–university collaboration succeed? A systematic review of the literature. *Journal of Business Economics*, 89(2), 221–250. <https://doi.org/10.1007/s11573-018-0916-6>
- Schon, D. A. (1991). *The reflective practitioner*. Ashgate Publishing.
- Smith, B., & McGannon, K. R. (2018). Developing rigour in qualitative research problems and opportunities within sport and exercise psychology. *International Review of Sport & Exercise Psychology*, 11(1), 101–121. <https://doi.org/10.1080/1750984X.2017.1317357>
- Star, S. L. (2010). *This is not a boundary object: Reflections on the origin of a concept*. Science Technology and Human Values.
- Star, S. L., & Griesemer, J. R. (1989). Institutional ecology, translations and boundary objects: Amateurs and professionals in Berkeley’s museum of vertebrate zoology, 1907–39’. *Social Studies of Science*, 19(3), 387–420. <https://doi.org/10.1177/030631289019003001>
- Steger, C., Hirsch, S., Evers, C., Branoff, B., Petrova, M., Nielson-Pincus, M., Wardropper, C., & Van Riper, C. J. (2018). Ecosystem services as boundary objects for transdisciplinary collaboration. *Ecological Economics*, 143, 153–160.
- Trompette, P., & Vinck, D. (2009). Revisiting the notion of boundary object. *Revue d’anthropologie des connaissances*, 3, 3–25. <https://doi.org/10.3917/rac.006.0003>