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ORIGINAL ARTICLES

# Educational Technology: A Postdigital Social Tradition

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## Abstract

The dissolution of the campus during the early stages of the current pandemic provides a compelling case study of how Higher Education responds to emergencies. Initially, digital education was perceived as a lifeline and educators spoke of a 'pivot online'. What followed was an undignified stumble into remote teaching. Social theories of innovation suggest that rapid technological change is simply a matter of choice and organisations can make rapid and strategic changes when required. I argue that talk of pivots and innovation is misleading and deflects enquiries from an important reason for academic resilience: teaching as tradition. Drawing on early forays into the importance of imitation by Gabriel Tarde, I contribute to efforts to rediscover his microsociological approach and link this to modern evolutionary research. By using a sociocultural evolutionary lens to analyse 102 courses in a business school, I demonstrate the persistence and resilience of teaching traditions and the use of imitation, rather than top-down direction. Using a phylogenetic analysis, I show how flexible imitation of traditional practice created a resilient, but unplanned, response to crisis. I explain how these results can inform resilience-building in Higher Education, by supporting the flexible imitation of teaching traditions. The research also advocates the use of cultural evolution, drawing on the inspiration of Tarde, in postdigital educational research.

**Keywords** Postdigital · Teaching traditions · Cultural evolution · Imitation · Academic resilience · Innovation · Digital drift

## Introduction

Crises in Higher Education (HE) force academics to reconsider their teaching practice and their use of technology. Recent lockdowns, during a global pandemic, serve as a case in point although breakthroughs in generative AI threaten similar upheavals and, no doubt, other calamities loom on the educational horizon. I use the pandemic

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as a case study to consider the continuity of Higher Education emphasising how the Academy responds to threats. I will show how the persistence of tradition, so often regarded as an obstacle, is the basis of adaption and survival.

The shift to remote delivery highlighted the importance of educational technology in facilitating distance learning and maintaining educational continuity. However, the adoption of these remote teaching techniques was not simply a matter of technological implementation. Rather, it represented the transmission of a social tradition, as educators had to navigate the cultural and pedagogical nuances of remote teaching. I will examine the imitation of remote teaching techniques during the pandemic, exploring how educators have adapted to a new normal and how these adaptations were shaped by existing traditions. Rather than describe a deliberate and innovative response to a crisis, I will draw on cultural evolutionary frameworks to determine the extent to which changes were based on improvisation, imitation, and the prominence of tradition.

In March 2020, the full significance of the Covid-19 pandemic hit academia. Jandrić et al. (2020: 1069) described this as a 'unique time in human history' and called for testimonials to capture the event from an HE perspective. The pandemic is historically very significant but even as it continues (World Health Organization 2023), war, climate-change, natural disasters, and developments in AI threaten the familiar modus operandi of Higher Education.

Technological solutions are often sought but isolating the role of technology is a naïve and limiting view which ignores the complex entanglement of factors in education (Fawns 2022). The shift to remote teaching was framed as 'abnormal' (Boys 2022: 1) yet decades of digital drift had gradually substituted traditional teaching with educational technology (Tesar 2020). While this, no doubt, fuelled the optimism of the *pivot online*, the transition was anything but seamless. Not diminishing the genuine toil and anguish of the pandemic in HE, I posit that the crisis was simply a chapter in the cultural evolution of teaching traditions; traditions which are resistant to change and yet slowly creep away from so-called traditional practices and into postdigital realities.

This research was conducted in the business school of a research-focussed university in the UK. Business programmes deal with large student cohorts and course sizes of up to 600 students. Students experienced a campus-based and traditional learning environment.

Prior to 2020, fully online courses were rare with online educators very much in a marginal role (see Hodges et al. 2020). At the beginning of the crisis, the school developed an online framework which could be used as a self-study resource centre for academics to develop online skills (for a full description see Honeychurch and Offord 2021).

According to Bond et al. (2021), most HEIs adopted a system of synchronous videoconferencing. While active learning can be adopted via videoconferencing, there is a suspicion that this approach perpetuated the 'banking' style of education, i.e. passive learning (Freire 1993: 45). This was known to create inequalities in learning (Freire 1993; Boys 2022; Raaper and Brown 2020; Oliveira et al. 2021). The example set by the business school affords an opportunity to observe academics consciously trying to adopt an unfamiliar and difficult task under considerable time pressure. It is therefore a good test of the likely adaptions to new realities, under crisis conditions.

Early papers reflected anxiety and sense-making, followed by a period of normalisation and, finally, frustration and disappointment at the 'new normal' (Jandrić et al. 2021a). A longitudinal study of the early pandemic describes, in detail, testimonies collected a year apart (Jandrić et al. 2021b; see also Jandrić et al. 2020, 2021a, 2022). The impact of this chain of studies on research into the pandemic is already considerable (Jandrić et al. 2021a) so this research asks to what extent does the HE response to the pandemic reveal a generalised response to a range of crises? To achieve this, I turn to sociocultural evolution as a theoretical framework.

I will argue that cultural evolution provides an alternative and illuminating approach to more typical theoretical frameworks employed to understand innovation. This approach adopts a position that innovation is blind, based largely on imitation and the importance of tradition, a position also adopted by the prominent early sociologist, Gabriel Tarde. Cultural phylogenetic analysis was used to explore the evolution of 102 business courses at graduate and postgraduate level in a business school over 5 years (including the period of remote teaching).

I present the data in the form of different types of evolutionary trees. My research indicates that, indeed, the responses to the crisis took a limited number of forms. Evidently, a great deal of imitation is at the core of a highly resilient yet conservative range of adaptations. The crisis year punctuates an equilibrium of gentle digital drift and generated a great deal of change, although this was not a deliberate *pivot.* These findings are discussed in terms of likely strategies HEIs can use in future catastrophes. The data suggest that the inertia of teaching traditions may be the source of a deeply organic resilience and rich tradition of teaching.

## Social Theories of Innovation

The Cambridge Dictionary (2022) defines innovation as '(the use of) a new idea or method'. Innovation was an important topic discussed by founding sociological figures such as Marx, Durkheim, Spencer, and Weber (Blute 2022). Spencer and Durkheim were organicists and mechanists. They believed in a mechanistic cause-and-effect model of social forces which shape society, in much the same vein as the compelling scientific and positivist turn of the nineteenth century. But they also believed that social organisations could be compared with living organisms and had a 'life of their own'. These ideas remain in the twenty-first century and are especially influential in positivist sociology today (Blute 2022). Spencer's phrase, 'survival of the fittest', applying a pseudo-evolutionary approach to society (Paul 1988), became a rallying call for politicians and businesspeople, despite it being reductionist, overly simplistic, linear, and progressive (Mesoudi 2011: 37; Laland and Brown 2011: 29).

### Diffusion of Innovation Theory (DIT)

An example of a linear approach to ideation and propagation is Diffusion of Innovation Theory (DIT), made famous by Everett Rogers (2003). DIT posits a process-based model. Adopters of innovations go through five stages, beginning

with awareness and moving through appraisal and adoption (Frei-Landau et al. 2022). DIT also characterises the population of adopters as five separate categories: innovators, early adopters, early and late majority, and finally, the laggards. This adoptive trait is claimed to be normally distributed with the categories neatly dividing the curve such that innovators and early adopters take the first 16% while laggards occupy the final 16%. Early and late majorities are split evenly between these more extreme groups (Rogers 2003: 283). Figure 1 breaks down the key points.

A shortfall of this approach is the simplistic and linear predictions it makes (MacVaugh and Schiavone 2010). The overall approach is Spencerian as it relies on the selection of the fittest innovations. In reality, new technology does not always neatly replace old technology. The rather neat adoption distribution (Fig. 1) is not empirically supported and indeed, an adoption trait (if such a thing exists) would be a complex integration of psychological and external factors (MacVaugh and Schiavone 2010).

### Gabriel Tarde and Imitation

According to Blute (2022), the now neglected nineteenth century sociologist, Gabriel Tarde, may have articulated the most accurate picture of innovation diffusion via his theory of imitation. Unlike other early sociologists, such as Durkheim, Tarde espoused an interdisciplinary approach, drawing from natural sciences, psychology, and the humanities (Barry and Thrift 2007). Uniquely, Tarde included

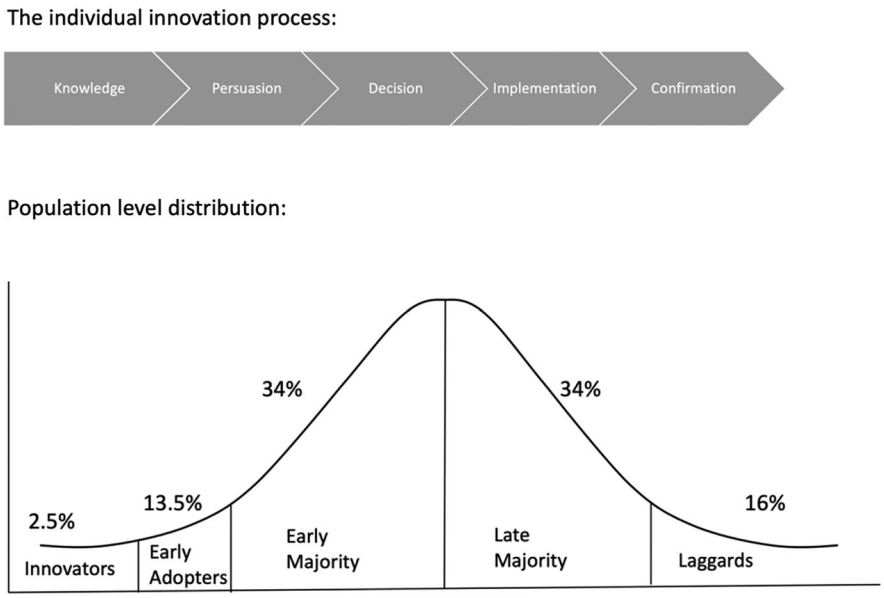


**Fig. 1** Rogers' (2003) diffusion of innovation theory

historicity in his theories and developed a theory of social learning and imitation which is comparable with Darwin's *descent with modification* (Blute 2022). His adoption of microsociology diverged from the popular grand theories of society but also gives Tarde's theories relevance to twenty-first century social phenomena (Barry and Thrift 2007). A good example is Tarde's promotion of media as channels for innovation and imitation (Barry and Thrift 2007).

Tarde also differed from Durkheim and Spencer in that he expressly disputed the idea of invention as deliberate, or prescient, that is he avoided the 'mechanist' approach of the others (Blute 2022). Invention, therefore, was not necessarily conscious but often unconscious, reactive, and not always optimal (Tarde 1903: xiv). In the next section, I will describe how similar this approach is to sociocultural evolution.

Durkheim sought to separate sociology from other disciplines (Barry and Thrift 2007); a position which isolates the field from progress elsewhere, for example using evolutionary frameworks to understand the diffusion of innovation. Consequently, sociology has missed the opportunity to develop microsociological theory (Blute 2022). Tarde advocated the study of relations, not general models of society, as Durkheim promoted. In fact, Bruno Latour suggests that Tarde was, in fact, the progenitor of Actor Network Theory (Latour 2012). Tarde's theories were full of promise but Durkheim's theories of 'social facts' proved to be more popular and Tarde's imitation theories slipped into obscurity (Blute 2022).

At the turn of this century, Tarde was 'rediscovered' in France (Barry and Thrift 2007), but his impact on the English-speaking world remains limited (Blute 2022). As a result, social theorists inherited progressive and deterministic theories which conveniently propped up cultural mores but failed to capture the complexity and nuance of social learning, innovation, and change (Mesoudi 2011: 38). Tarde conceived of innovation as a blind and iterative process percolated through society via imitation and improvisation, rather than grand and mechanistic projects delivering preconceived outcomes.

## Innovation in Higher Education

In Higher Education, criticism has been levelled at educators that they lack a culture of innovation (Kopcha et al. 2016). Non-adoption is closely associated with a cultural concept: *traditional* teaching (Kopcha et al. 2016). Traditional teaching is influenced by the imagined academic, an expert in her field who dispenses knowledge to students. Kopcha et al. (2016) place the traditional academic *persona* at the heart of non-adoption. This can be contrasted with the uncritical adoption of digital education as a delivery mechanism for learning content (Bayne et al. 2020: 22) and the separation of digital education from the semiotics of place (i.e., the campus) (Bayne et al. 2014).

The two views, one of staunch resistance to change, the other suggesting unresistant acceptance of change, is paradoxical. However, Westera's (2004) depiction of teaching as a craft resolves the paradox by explaining that core teaching techniques remain unchanged, while some elements are inevitably substituted using digital technology. This is echoed in a survey of over 1000 academics in the UK. The survey reveals a dominant narrative of threat and trauma from the acceleration into a neoliberal future

which makes teaching as a tradition precarious and vulnerable (Watermeyer et al. 2021). Teaching as tradition retains professional integrity, autonomy and identity while an irresistible tide of technology is perceived to erode it.

Elements of education have been replaced by convenient technologies with little critical thought and in a strategy vacuum (Westera 2004; Tesar 2020; Hamilton and Friesen 2013), resulting in unexpected consequences as the inevitable tension between instrumentalism and alienation has played out. However, Watermeyer et al. (2021) also point out that academics also took the opportunity to share and learn from each other during the crisis.

## Sociocultural Evolutionary Theories of Innovation

Darwinian sociocultural evolution is the theory that culture evolves in a similar (but not identical) manner to biological evolution (Mesoudi 2011: 25). Culture, as information, is therefore created, adapted, and spread. Since Darwin's *Origin of the Species* (1859/2011), there have been many attempts to apply an evolutionary framework to social theories. Many of these have been misguided or harmful, such as the so-called *progressive* theories of the nineteenth century or controversial such as socio-biology or memetics (Mesoudi 2011: 25). An example is the *survival of the fittest* argument applied to society by Spencer (although resisted by Darwin himself) and later used to prop up cultural stereotyping (Paul 1988).

The development of cultural evolution initially lacked theoretical integration (Mesoudi 2011), but towards the end of the twentieth century, a scientific and empirical framework emerged. I will refer to this framework as sociocultural evolution or cultural evolution for brevity (Mesoudi 2011; Blute 2010). Cultural evolution holds intriguing clues to many aspects of culture, including innovation. While cultural evolution differs in its treatment of innovation to modern sociology, it shares many insights with Tarde's formulation of innovation through imitation (Blute 2022).

### Innovation Is Blind

Unlike other social theories of innovation, cultural evolution emphasises the role of social learning and transmission. This process is not necessarily intentional or conscious, but can occur through various mechanisms such as imitation, teaching, and emulation. Caldwell et al. (2016: 8) assume innovation to be 'blind to the motivations and intentions of its creator' as a practical assumption in their review of cultural evolution experiments. This fits the evolutionary principles of VISTA (variation, inheritance, selection, time, and adaption) (see Mesoudi 2011). Therefore, variation becomes the first step in the innovation process and this step is unguided (Blute 2010: 34).

### Tradition Trumps Innovation

There are limits to innovation. These limits exist because of Darwin's law of *descent with modification.* Naturally, any innovation depends on existing knowledge or

technology and must be based largely on existing forms (Laland 2017: 102; Blute 2010: 53). Consequently, forms may vary within limits prescribed by their historicity, while selection of new forms is likely to be influenced by necessity (Blute 2010: 53). Because of the importance of historicity, some sociocultural researchers ground their research in traditions (e.g., Morin 2015; Jordan 2015). Traditions are carefully repeated but not immune to variation, indeed *flexible imitation* plays a key role (Morin 2015: 99). Flexible imitation is, therefore, a candidate for the genesis of ideas: new approaches that are based largely on previous ones.

### Good News Travels Fast

Sociocultural evolutionists believe that humans have evolved to learn a repertoire of actions which are selected according to context (Blute 2010: 141). Observed behaviour can be imitated, but is usually based on existing traditions and flexibly adapted to new conditions (Morin 2015: 122). Existing traditions have considerable inertia, so new ones must be attractive (Morin 2015: 124). Successful diffusion also requires that selective forces *match* available innovations (Blute 2010: 142). Finally, cultural practices can simply drift, that is experience change over time without any adaptive outcome (Blute 2010: 142).

Cultural evolution based on the diffusion of information is also considered in postdigital educational research. For example, Peters et al. (2022) liken information about Covid-19 as spreading like a virus itself. Their bioinformational paradigm has a great deal in common with sociocultural evolutionary theory which also draws on biological models of information percolation, originally used to track DNA data and increasingly for cultural phylogenetics (Peters et al. 2022; Blute 2010:142). Peters et al. (2022) note the rising tide of data from the mid-twentieth century as the conduit for informational contagion much as Tarde noted nineteenth-century media as an effective network for imitation (Barry and Thrift 2007).

### Slow, Slow, Quick

Any model of diffusion must consider the pace of change. While traditions researchers take a parsimonious view of evolutionary change (Morin 2015:124), bursts of rapid change are also possible. Alex Mesoudi compares this with the biological observations of *punctuated equilibrium* from the fossil record. Researchers noted that organisms remained largely unchanged for extensive periods but events such as the 'Cambrian Explosion' were characterised by fast change and rapid speciation with new animals exploiting new evolutionary niches (Mesoudi 2011: 117).

Cultural evolution could follow a similar trajectory. For example, Mesoudi (2011: 117–118) outlines recent research into the evolution of new languages which show evidence of rapid change. If traditions such as teaching can also experience rapid bursts of change, crises could feasibly become a speciation event for new teaching traditions. Like the Cambrian Explosion, change is unlikely to be deliberate, but random and unstructured.

### Can Cultural Evolution Really Work in a Similar Way to Biological Evolution?

Stephen Jay Gould, the evolutionary biologist most associated with punctuated equilibria (Gould and Eldredge 1972), disputed the similarity between cultural and biological evolution. His argument for this was based on the principle of *blending and particulate* evolution (Mesoudi 2011: 100). Biologists had long believed that biological evolution comprised distinct packages of information, hence the branches of the evolutionary tree diverged into new species. Reticulation or blending of branches was not originally considered a part of biological evolution, yet in culture, blending was far more common. This was held to be a defining factor which made biological and cultural evolution distinct.

More recently, biologists have noticed an increasing array of examples of blended evolution in animals, especially invertebrates (Mesoudi 2011: 101). Equally, cultural evolutionists have found that the horizontal transmission of ideas (ethnogenesis) is not as prevalent as originally thought (Tehrani and Collard 2002). The amount of branching in cultural examples of evolution puzzled researchers until Durham (1992) identified several Transmission Isolating Mechanisms or TRIMs which allow cultural and biological evolution to share pathways.

## Resilience in Higher Education: Digital Imaginaries and Postdigital Realities

### Case Study: Emergency Remote Education During Lockdowns

ERE is a field concerned with maintaining education in nations affected by war or natural disasters (Oliveira et al. 2021). The field is a part of the wider Educations in Emergencies (EiE) project, supported by UNESCO (Oliveira et al. 2021; UNESCO 2003). ERE researchers have investigated the impact of pandemics, for example, reporting a lack of preparedness for the H1-N1 virus in 2011 (Oliveira et al. 2021).

Reviews demonstrate a confused response to Covid-19. While many institutions thought they were 'pivoting online' they defaulted to a set of strategies reminiscent of ERE. The well-researched drift into digital (Tesar 2020; Rof et al. 2022) made this not only convenient but realistically, the only option.

Rof et al. (2022) describe the lockdown reaction as an extension of digital drift which resonates with evolutionary perspectives of continuous, modest, and random variation, punctuated by rapid unstructured change. Rapid change events leave the landscape irrevocably changed (Mesoudi 2011: 117) which supports the concept of a 'new normal'. However continual change (i.e. digital drift) also seems to be part of any normality, prior or after the pandemic.

### The Cost of Change

Collectively, the literature paints a picture of a degraded learning and teaching environment. Bond et al. (2021) find that academics relied heavily on formats they already knew well: synchronous lectures; converting these to videoconferencing as a channel. This fits the notion of flexible imitation and the persistence of existing tradition.

Students, on the other hand, did not have a tradition of online learning to fall back on. Consequently, Oliveira et al. (2021) report that student adaptation to the new reality was less adaptive than for educators.

Literature also describes a lack of support for staff adaption (Johnson et al. 2020; van Leeuwen et al. 2021; Oliveira et al. 2021), unequal access to digital technology (Raaper and Brown 2020; Meletiou-Mavrotheris et al. 2022; Czerniewicz et al. 2020), lack of student support (Raaper and Brown 2020; Meletiou-Mavrotheris et al. 2022; Oliveira et al. 2021), shock (Rof et al. 2022; Stewart 2021), lack of digital mindset (Rof et al. 2022), dataveillance (Usher et al. 2021), and issues with assessment (Oliveira et al. 2021).

## Research Questions

Sociocultural evolutionary approaches predict that teaching methods, as traditions, have inertia (Jordan 2015: 66) but comprised numerous cultural traits (68). Traditions evolve through the random variation of these traits which are either selected or not, while largely maintaining the original form; *descent with modification* (Blute 2010: 53). The evolution of new forms branches from previous ones following the process known as an evolutionary tree, a term popularised by Darwin in the *Origin of the Species* (Jordan 2015: 78). Cultural phylogenetics is the technique of analysing the evolutionary trees for cultural objects such as teaching traditions (Jordan 2015: 78).

The following research questions are adopted:

- Do HEI's adapt to crisis through improvisation and imitation as suggested by Tarde and sociocultural evolution?
- What sorts of pedagogical responses are likely to be adopted?
- How can HEIs support blind improvisation and imitation?

## Methodology

### Research Methods

In this section, the research methods are detailed and discussed including any ethical considerations. The project uses phylogenetic analysis to explore the trends in adapting teaching traditions to remote teaching.

Phylogenetic reconstruction is simply the creation of evolutionary trees, based on the concept of *descent with modification*, popularised by Darwin (Jordan 2015: 78). The branching of new teaching traditions away from ancestral forms is a novel but effective way to visualise change. Cultural evolution can be achieved through phylogenesis (newer forms inherit traits from earlier ones) or ethnogenesis (new forms inherit traits from contemporary traditions) (Jordan 2015: 78).

Phylogenetic trees are a visually impactful way to show the amount of evolutionary change in business courses (Huson et al. 2010: 52). Phylogenetic networks are a different form of graph which depict both vertical (phylogenesis) and horizontal (ethnogenesis) relationships (Huson et al. 2010:52).

Although phylogenetic methods are well established in computational biology, their introduction to social sciences is more recent and largely focused on anthropology (e.g. Tehrani et al. 2016) and archaeology (e.g. Jordan 2015). Tehrani and colleagues (2016) were able to use several cutting edge computational phylogenetic methods to determine the evolution of the Little Red Riding Hood fairy tale across the globe from oral to written versions by creating evolutionary trees exploring the likely sequence of different versions. I will use these methods to visualise the sequence of courses and their evolutionary changes.

## Dataset Building

In the business school, courses are approved using a documented change process. Any further changes are also approved and documented in the same way. Additionally, each year new instances of each course are hosted on the University Learning Management System (LMS). Each instance is a digital record of that version of the course (e.g. an LMS page for the course in academic years 2018/2019, 2019/2020, and so on).

Courses begin sharing a relatively small number of characteristics. For example, prior to 2020, almost all courses were based on face-to-face lectures since the school ran no digital programmes at that time. I confirmed this by exploring the LMS for any courses prior to 2020 for lecture timetables or teaching plans. However, as suggested by Tesar (2020), the courses were not immune to a degree of digital drift. I observed that some courses started to use electronic submission of assessments, while others retained physical essay scripts for marking. Those courses have the new characteristic of *electronic submission* which I can give a code. After 2020, several new developments become visible, for example asynchronous learning materials and so on.

By assigning a group of characters and listing each instance, I can derive a character matrix in the same manner as Tehrani et al. (2016) for fairy tales and Jordan (2015: 80) for hunter-gatherer technologies. An example of a character matrix is given in Table 1, based on a hypothetical course (numbered 3145) (Table 2).

The 102 courses captured using this process, took 50 h to collect and input into the character matrix, as each course required in-depth analysis. For each course, in

**Table 1** Example of character matrix for a hypothetical course. The matrix is based on a hypothetical course (code 3145). The code is randomly assigned to prevent identification of the school in question. There are five instances of the course from 2018 to 2022, over which period the course evolves. States for each character are recorded against the character number based on absence (0) or presence (1). The character code can be translated using Table 2

| Character | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3145_18 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3145_19 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 3145_20 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 |
| 3145_21 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3145_22 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |

**Table 2** Character codes

| | | |
|---|---|---|
| 1 | Asynchronous video | [0] absent [1] present |
| 2 | Synchronous video | [0] absent [1] present |
| 3 | Serious games | [0] absent [1] present |
| 4 | Online resources | [0] absent [1] present |
| 5 | Campus Lectures | [0] absent [1] present |
| 6 | Email | [0] alternative / chat [1] primarily email |
| 7 | Classroom Response Systems | [0] absent [1] present |
| 8 | Online quizzes | [0] absent [1] present |
| 9 | Online formative assessment | [0] absent [1] present |
| 10 | Online summative assessment | [0] absent [1] present |
| 11 | Lecture slides | [0] absent [1] present |
| 12 | Lecture recording | [0] absent [1] present |
| 13 | Course built online | [0] no [1] yes |
| 14 | Active learning | [0] no [1] yes |
| 15 | Blended online | [0] no [1] yes |
| 16 | Online social spaces | [0] no [1] yes |

each year, the LMS was interrogated to search for teaching plans, discussion fora, presentation slides, quizzes, etc. Additionally, data were processed to ensure they were arranged in a *tidy* format. This format is a specific data structure that R's package *tidyr* requires to deploy powerful data management tools (Wickham et al. 2023).

In addition to the time constraints of this hefty data management task, it was clear after around 10 courses, that a few patterns of change were repeating through the dataset. These patterns remained stable, with no new combinations emerging as the dataset grew to 102 courses. The dataset had achieved theoretical saturation (Low 2019), that is further data collection was considered unnecessary.

## Analysis

Each course comprised of up to five instances between 2018 and 2023. However, not all courses ran continuously over this period, so only courses with between 3 and 5 years of data were included. The dataset comprised of 435 observations, which is a very large dataset for phylogenetic analysis. For example, Jordan's network analysis of platform building in Northwest Siberia drew on traditions from 31 locations (Jordan 2015: 159) and the study of Little Red Riding Hood used 24 stories (Tehrani et al. 2016).

A distance table was created and used to generate phylogenetic trees using the statistical programming language R (R Core Team 2021) in conjunction with the appropriate phylogenetic packages: ape (Paradis and Schliep 2019); phangorn (Schliep 2011); phangorn for phylogenetic networks (Schliep et al. 2017); and ggtree (Guangchuang 2022). Finally, R Studio (RStudio Team 2015) was used as the programming environment.

### Phylogenetic Trees

Trees were generated by applying the UPGMA algorithm to the distance table explained above. UPGMA stands for *unweighted paired group method using arithmetic averages* (Huson et al. 2010: 52). The method works by merging the two closest clusters until only one cluster remains (a full mathematical model is at Huson et al. 2010: 53). An example from the hypothetical course 3145 is given in Fig. 2.

The tree in Fig. 2 shows the greatest evolutionary change between 2018 and 2019, despite the pandemic being a year later. This would suggest that the course was substantially reviewed prior to the pandemic and then changed further because of it. Evolutionary distances gradually decline over the 5-year period, demonstrating that the course was settling down over time with more modest changes taking place later. The last two instances (2021 and 2022) are very similar. Although the trees are easier to generate and tell a story, they lack the information regarding the hybridity and improvisation of this course, which is shown using the splits technique, shown in Fig. 3 (see next section).

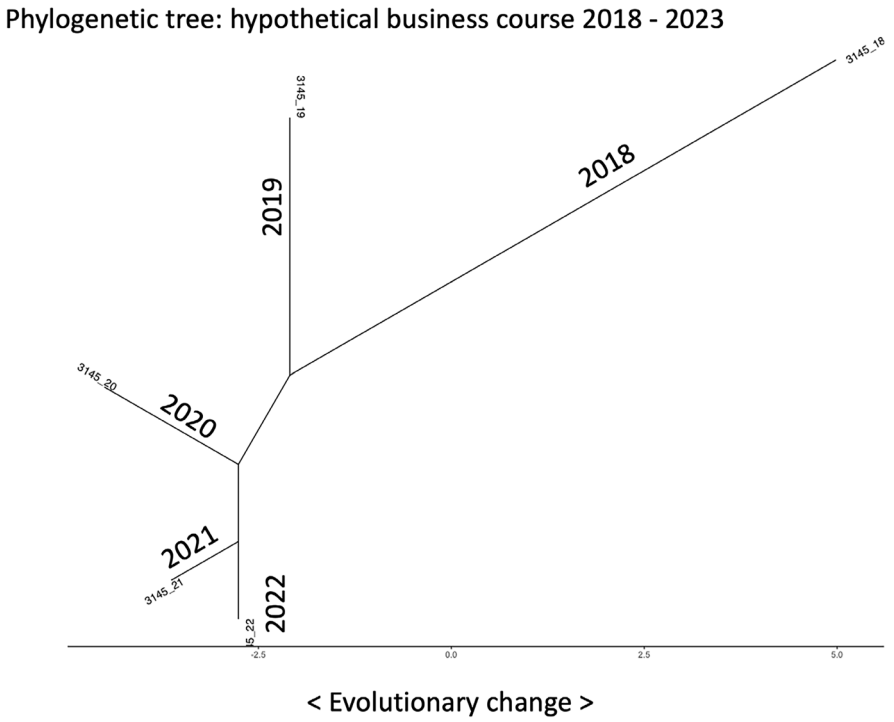


**Fig. 2** UPGMA Tree based on hypothetical course 3145. The tree is rendered as an unrooted tree using the layout 'equal angle' in the ggtrees package on R. The *x* axis is used to measure evolutionary distance

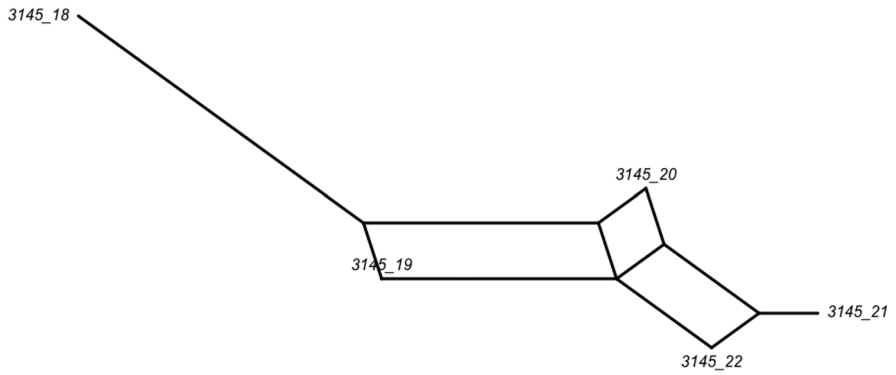


**Fig. 3** Phylogenetic Network for hypothetical course 3145. The length of lines between instances shows the evolutionary distance. Box shapes between instances show evidence of ethnogenesis or horizontal transmission

## Phylogenetic Networks

Instances of courses can be clustered into similar groups based on similarities in character states. These partitioned groups form 'splits'. The more characters are shared within a certain group, the stronger the split (Jordan 2015: 81) The method for determining the splits is known as the NeighborNet algorithm (Bryant and Moulton 2004; Huson et al. 2010: 254). An example based on the same data described previously as hypothetical course 3145, is given in Fig. 3.

The number of box shapes and connections between later courses shows a greater amount of horizontal transfer between courses. The shape of the network begins to resemble a mosaic in the later courses, suggesting that ideas were being trialled and shared between courses. It is important to note that all phylogenetic trees and networks are hypothetical. They serve as a method to visualise and explore the cultural development of traditions.

## Sample Size

The nature of this research is exploratory. The analysis of phylogenetic networks employs several statistical tests to ascertain the likelihood that certain characteristics are shared between taxa (see Huson et al. 2010). But, unlike the cultural and biological examples given earlier, the order of developments is already known with certainty.

Visualisation of the data is used to explore the nature of change, rather than conduct hypothesis testing. However, I do need to be certain that the results are valid, in that they represent the population.

The business school course catalogue contains 420 courses available in 2023. 46 courses are dissertations, which are not subject to teaching in the strictest sense. 16 courses ran over too few years (1 or 2 years) and 33 courses are copies of others or are online courses in the first place. In total 348 courses may be used in this study. However, the amount of data generated by this number of course is computationally prohibitive.

Therefore, I analysed data, observing the types of patterns emerging and noting when no new patterns were encountered. In practice, this occurred at around 10 courses, but 102 courses were collected in total, to generate a large and rich dataset.

Data collected was based entirely on course documentation and LMS representations of the course. Ethical approval and organisational access were secured, but no personal information was collected. The organisation and, therefore, the individuals creating courses are not disclosed.

## Results

### Summary of the Dataset

The dataset comprised 102 instances with each one listed in rows. Hamming distances (used to measure evolutionary change) were calculated generating a table with 93,961 entries, recording the number of substitutions required between courses. From the raw data, the number of substitutions per course per year was calculated to summarise the evolutionary change from 1 year to the next. As some courses were not run on all years, this task could only be conducted on 78 courses. An example of a substitution is replacing a face-to-face lecture with an online lecture. In this case, two substitutions are recorded. A minimal response to the lockdowns would be to swap these two teaching methods for the lockdown and then back again when a return to campus is feasible. This would result in two substitutions per course in 2020 and again in 2022, with zero substitutions on other years.

### Evolutionary Change

The mean number of substitutions was 2.16 over the period, indicating the average number of changes per course per year. Figure 4 shows the substitutions over the period. There are only four categories since substitutions can only be measured *between* years.

In most years, the amount of change experienced was conservative but changes are noted even when change is not strictly required. In the academic year 2020/2021, however, the amount of change was significant and could not be described as parsimonious. As Fig. 4 shows, the average was raised by a few courses which demonstrated remarkable levels of change (up to 11 out of a possible 16 substitutions).

The year the University returned to campus was subject to the most conservative change. Returning to traditional teaching would require the return of campus-based lectures and, additionally, the removal of asynchronous materials. Only a few courses went to these lengths, resulting in many blended courses as a result. This narrative could be more easily described as a ‘new normal’ than a ‘return to normal’.

### Phylogenetic Trees

A phylogenetic tree for academic years 2018/2019–2019/2020, 2018/2019–2020/2021, and so on was constructed (shown in Fig. 5).

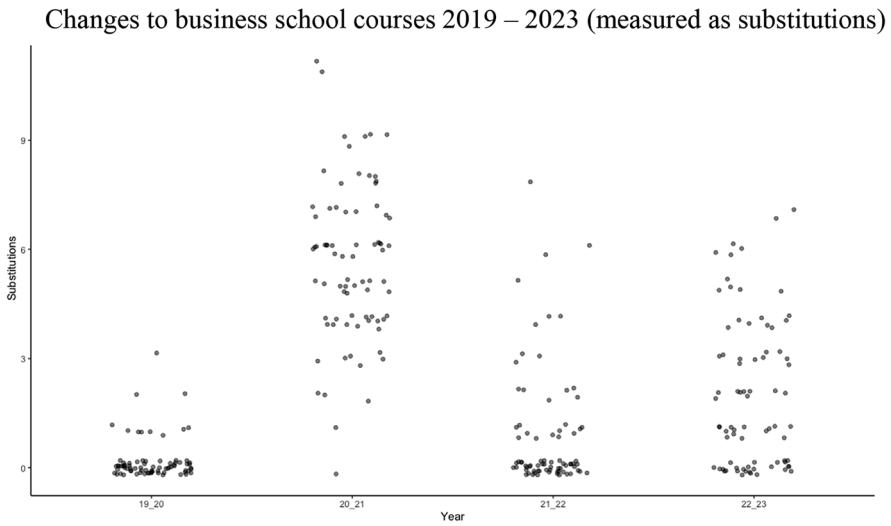


**Fig. 4** Course substitutions. The graph demonstrates the number of changes made to courses as the recorded substitutions according to the character matrix described in the 'Methodology' section. Each dot represents a single course in the academic years 2019/2020, 2020/2021, etc. Substitutions (on the *y* axis) are changes made since the previous year

Figure 5 shows that courses between 2020 and 2022 were online (mostly in the bottom left of the tree) but some were asynchronous, while others blended both synchronous and asynchronous material as well as active learning techniques to

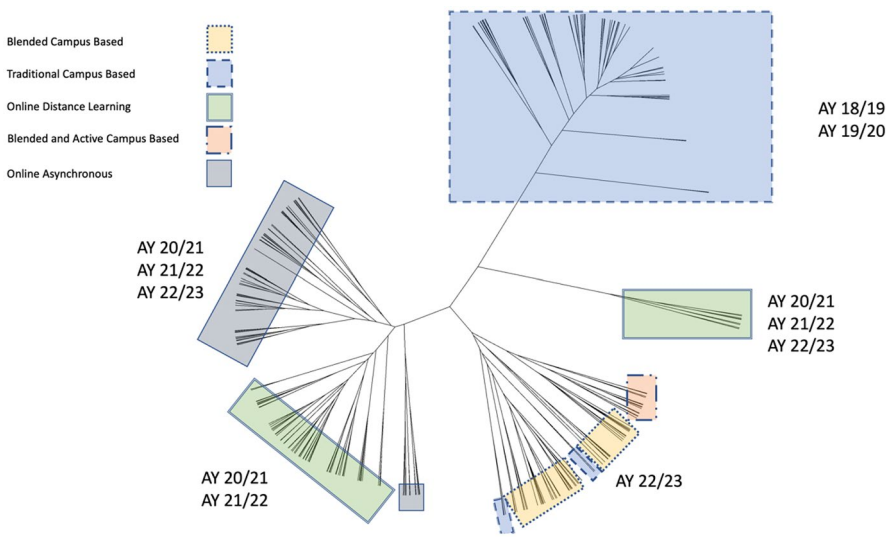


**Fig. 5** Detailed phylogenetic tree of business courses 2018–2023. This shows the tree with added detail from the original dataset which identifies the formats of the various clusters

create courses similar to online distance learning (ODL). Notably, some courses in these clusters remained online after the return to campus in 2022. The cluster in the bottom right part of the tree are an assortment of blended and active campus-based courses. Most courses in 2023 were characterised by campus-based lectures with legacy asynchronous materials, making them effectively blended courses. Some courses returned to a solely campus-based synchronous format.

## Phylogenetic Networks

Due to the computational complexity of the NeighbourNet algorithm, it is only possible to analyse small groups of courses, rather than 102 courses simultaneously.

The networks are used to analyse the degree to which courses had phylogenetic signals (linear evolutionary change) and ethnogenetic signals (imitation). All the networks show some degree of phylogenesis (see Fig. 6), which is indicated by the longer leaves seen emerging from the main body of the network. These leaves could indicate large and sudden change. However, all the networks are dominated by blocky or square connections, showing ethnogenesis or horizontal transfer. This shows the widespread sharing of ideas and techniques (hybridisation) which occurred through most of the period. This is indicative of widespread improvisation and imitation.

Figure 6 demonstrates that when groups of courses are compared, there is significant sharing of ideas (shown by the densely interconnected sections of the networks). This shows a high degree of imitation typical of the theories advocated by Gabriel Tarde and, later, sociocultural evolutionists.

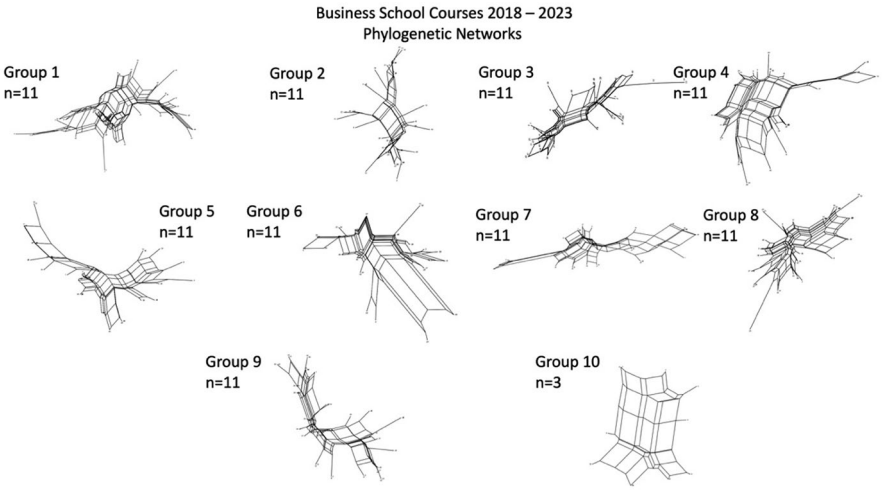


**Fig. 6** Phylogenetic networks of 9 sample business school courses. The networks are based on the NeighborNet algorithm and demonstrate the evolution of each course from 2018 to 2023 (from left to right)

## Discussion

This research shows that HEIs are more resilient than predicted by ERE researchers prior to the pandemic (e.g. Meyer and Wilson 2011). This resilience comes from the persistence of teaching traditions which both respond to change and retain their form. It would be an exaggeration to suggest that this is a *pivot online* since the response was unstructured, and more like improvisation and imitation. I posit that a similar response may result from future disruptions to Higher Education. It would also be an exaggeration to suggest that the response would be deliberately pedagogical, rather a haphazard selection of existing approaches and technology seems likely.

Business continuity plans generate structured responses to crises, but this relies on a strategic approach and close control of human resources. Neither is characteristic of HEIs. However, a framework of resources with guidance does appear to have worked well in the context of the business school. This supported the period of imitation by allowing some structure while retaining academic autonomy, and preserving teaching traditions. An example of a similar response might be to create a set of teaching resources to transform assessment in HE, in response to a threat from generative AI. Presently HEIs are focussing on a policy response (Rudolph et al. 2023), however a more flexible course of action would allow academics to improvise new assessment formats without impacting on the essential traditions underpinning their teaching.

The overall degree of change was large at the beginning of the lockdown period. This might suggest a 'huge leap forward' or a 'pivot online'. However, the change was unstructured. The framework of resources established by the school created a wealth of new teaching techniques, which were widely imitated. It appears that an array of responses occurred, a large and unstructured experimentation with novel online techniques. The choice of techniques was not uniform across the school, subjects, or programmes. This was followed by inertia as courses returned quickly to something quite close to pre-crisis random variation and changes made earlier were locked in. The analysis shows that a 'return to normal' did not occur and that teaching at the school was irreversibly changed, that is a new normal prevailed. This was also reported by Jandrić et al. (2021a, b) in their longitudinal study of the Covid-19 pandemic in HE.

### Imitation in Action

The networks in Fig. 6 demonstrate a great deal of horizontal transfer of ideas between randomly sampled groups of 11 courses. It is important to note that all the courses in my dataset evolved independently. Academics did not collaborate on specific courses to an extent that would affect the evolution of a group of courses together. There was no evidence of programmatic direction to course convenors to create similar courses over this specific period. However, all academics did share access to resources which could be copied into their courses.

This shared knowledge can be seen clearly in the horizontal transfer of ideas in the networks. The blocky areas of the network graphs show where courses shared similar patterns of teaching traditions. While there is no evidence that academics

collaborated directly, they are sharing a common resource and the evidence of this is clear in the networks. Since academics worked together to build framework (Honeychurch and Offord 2021), the ethnogenetic signals can be interpreted as intense collaborative improvisation and imitation.

Overall, the study suggests a common palette of teaching traditions, developed internally and used experimentally for a while before consolidation. This is also theoretically significant since cultural evolutionists assume that adoption of technology has a greater degree of ethnogenesis than other cultural practices, but this has not yet been confirmed by research (Mesoudi 2011: 102).

### Resilience

The business school, like so many HEI (and other organisations) was unprepared for the pandemic. Businesses often create business continuity plans for such events, but this was not the case in HE (Karlsson and Offord 2023). This lack of preparation was noted as a serious weakness in the wake of the H1N1 pandemic scare (Oliveira et al. 2021) but little remedial action took place. However, the business school did respond to the crisis by creating its own framework to guide the response. Although guiding principles were set out, much of the work to create the framework was a bottom-up 'bricolage' of techniques (Honeychurch and Offord 2021).

The impact of the framework, measured through this phylogenetic network analysis was an impressive response to the crisis through changes that were far greater in number than strictly required. The analysis also shows a wide array of reactions to the crisis. The extent and diversity of the remedial work to get teaching back on track, then, was impressive and shows intrinsic resilience at the school.

## Conclusion

This analysis has demonstrated several important modifications to thinking about crisis in HE and adds new understanding of evolutionary perspectives. This contribution is both theoretical and practical. Gabriel Tarde's notion that innovation is blind (Tarde 1903: xiv) and reliant on imitation diffused through media (Barry and Thrift 2007) can be seen through the large unstructured change observed in the early part of the crisis. This disputes the notion of deliberate and strategic responses to crisis in HE. Modern cultural evolution theory parallels Tarde's original ideas about innovation and imitation but adds to them by providing computational models and techniques such as cultural phylogenesis.

Research into the pandemic (e.g. Bond et al. 2021) shows that the *pivot* as a deliberate strategy failed. But Tarde, and cultural evolutionists, tell us *why* it failed. Tarde was concerned about historicity which is also a feature of Darwin's *descent with modification* arguments (although Tarde himself denied that he was influenced by Darwin) (Blute 2022). Historicity is preserved through the persistence of tradition but allows change through flexible imitation (Morin 2015: 99), an addition to Tarde's original ideas about innovation and imitation (Tarde 1903). Flexible imitation can be seen in

the widespread sharing of ideas, demonstrated by the phylogenetic networks in this research. Peters et al. (2022) also discuss the viral spread of ideas in modernity which highlights the way imitation spread through the network.

The school generated blended approaches to its courses almost by accident. There was no evidence of pedagogical decision making in the course documentation. But by retaining digital elements (perhaps removing them would require more effort), many courses evolved to have both synchronous and asynchronous elements. Many courses adopted active learning techniques in response to the crisis. These novel approaches were widely shared and imitated, suggesting that a framework of resources to 'borrow' from may be effective in other types of challenge.

Practically speaking, the school clearly avoided the more common contingency of trading lectures for Zoom. It did so at minimal financial expense (although with considerable individual effort). This offers a new insight to the sometimes-pessimistic view that, under duress, educational establishments will simply adopt videoconferencing. It is recommended that the use of internally created frameworks is researched to build more resilience in Higher Education. It should be added that frameworks differ from business continuity plans, risk management plans and the like, which would presumably encourage a more structured response. A framework supports academic autonomy and resilience.

The concept that the Covid-19 pandemic was simply another chapter in the ongoing story of digital drift (Tesar 2020) is broadly supported since there is clear evidence of digital drift prior to and after the early response. The scale of change clearly accelerated but the types of change did not alter over the 5-year period, hence there is an argument that the pandemic did not radically alter HE's long-standing trajectory of inertia, resistance to change, conservatism and slow substitution. However, this analysis takes an extra step of comparing the sociocultural approach and pointing out that although change is slow and traditions are highly influential, they are also subject to periods of intense change through punctuated equilibria (Mesoudi 2011: 151). This has impact on postdigital approaches to education, supporting the narratives of digital drift and substitution which is not drastically impacted by crisis (e.g. Tesar 2020).

Sociocultural theories of inertia and innovation as blind variation are supported, but this research also supports the theory of punctuated equilibria where change can escalate. This is an important contribution as examples of punctuated equilibrium are rarer in cultural studies than in biology (Mesoudi 2011: 100). Additionally, Tarde's emphasis on the importance of imitation (Blute 2022) is fully supported by this research. Imitation is equally important in cultural evolution studies (Mesoudi 2011: 190). Re-discovering the works of Gabriel Tarde might, therefore, provide a useful theoretical synthesis of social theories of innovation and a counterbalance to positivistic, Durkheimian approaches that remain so influential.

This study also supports policy planning in HE by demonstrating the effect of self-created frameworks as a possible alternative to more business-like risk management techniques. Although such frameworks are unlikely to exert control over an institution's response, they clearly support improvisation, imitation, and resilience. These may be a far better bet than hubristic attempts to make strategic pivots. Broadly, the array of possible crisis responses is limited to existing institutional

knowledge and technologies. The school did not create or adapt any novel techniques or traditions during this time. Rather, it exploited well-known methods to improvise a response. In future crises, similar reactions are highly likely and policies can be written around this pragmatic idea, rather than ambitious 'moon shots'.

The findings of this research have important implications for crises such as the breakthrough of generative pre-trained artificial intelligence (such as GPT-3 and GPT-4). An ongoing and heated debate is dominating HE (Rudolph et al. 2023) as to the impact of generative AI on assessment in HE. The range of suggested responses from banning chat bots to incorporating them (Rudolph et al. 2023) are another example of the kind of unstructured response catalogued from my dataset on remote teaching. My findings suggest that, if the AI crisis develops to the point of making traditional assessment obsolete, we will likely see a wide range of improvisations based on imitation, rather than a structured management plan, or strategy. Indeed, this already appears to have started (Rudolph et al. 2023). A promising development of this research is to use simulation techniques to model HE responses to other crises, using the findings of this research. Simulations belong to the family of techniques used by computational social scientists (Cioffi-Revilla 2017, p. 2). They are a powerful, yet simple way to model complex systems (Wilensky and Rand 2015, p.10) which allow researchers and policy makers to explore the options in new crises.

Finally, this research demonstrates that the inertia commonly reported in Higher Education as a blight or shortcoming, is the source of considerable resilience. The persistence of teaching traditions, coupled with an ability to rapidly improvise, is at the heart of the fortitude shown by the business school, although this came at a cost like many other HEIs (Oliveira et al. 2021). There is a protective culture which is undoubtedly highly important to the future of HE. It also demonstrates that this protection does not mean that HE cannot or will not respond to threats. However, the nature of the HE response cannot necessarily be planned or controlled and can lead to unexpected results, such as irreversible changes and new normals.

## Limitations

This research is not directly generalisable to other HE contexts. The business school in question clearly responded to the Covid-19 crisis in a way which is not typical of that reported in ERE research thus far (e.g. Bond et al. 2021). It could be viewed as a case study where its specificities offer insights (into the evolution of teaching traditions) but not predictions of how HE institutions respond to a specific crisis. Further research should be conducted into the use of internal frameworks for peer collaboration versus top-down contingency planning to discover whether such fallbacks are effective in HE.

The research is deductive, it uses a priori theories of cultural evolution, such as imitation, parsimony, modification with descent and punctuated equilibrium. While these theories explain the data, the results are nuanced and likely specific to the business school. The visualisations of the data as trees and networks are descriptive but allowed me to deduce a range of case-specific responses to the crisis. The theoretical framework (sociocultural evolution) offers no specific predictions, just

guidelines, suggesting that teaching traditions have inertia but can experience sudden change. Cultural complexity means that universal truths and predictions are extremely unlikely. Future research should incorporate multiple contexts to discover what, if any, patterns are repeated from this analysis.

**Data Availability Statement** The data that support the findings of this study are openly available in the Open Science Framework at [osf.io/28b7g]. 

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