

The temporal properties of e-learning: an exploratory study of academics' conceptions

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Abstract

Purpose – The purpose of this paper is to present the results of an exploratory study that investigates Portuguese academics' conceptions concerning the temporal properties of e-learning, in the context of traditional Higher Education Institutions.

Design/methodology/approach – Grounded Theory methodology was used to systematically analyse data collected in semi-structured interviews with 62 academics. Data analysis followed the constant comparative method and its three-staged coding approach: open, axial and selective coding. Data collection and analysis developed until theoretical saturation was reached.

Findings – Emergent academics' conceptions concerning the temporal properties of e-learning indicate the existence of unregulated and unaccounted for dynamics, which are a direct consequence of transitioning from campus-based lecturing to teaching online using the affordances of virtual learning environments. This transition produces disruptions to established workload metrics and work patterns, as well as conflicts with dominant modes of instructional delivery that are not synchronised with the demands of online interaction and immediacy.

Originality/value – This paper is valuable to e-learning strategists and administrators. An understanding of the temporal properties of e-learning as perceived by academics provides actionable knowledge that is directly applicable to the design of suitable work arrangements, normative frameworks and e-learning practices that address perceived time-related barriers. To mitigate the time-related conflicts and disruptions identified in the study the authors suggest the establishment of university-wide norms of virtual presence and the implementation of temporal protocols to sustain the productive engagement between instructors and learners.

Keywords Grounded theory, Higher education institutions, E-learning, Adoption, Academics, Conceptions, Temporal properties

Paper type Research paper

1. Introduction

Previous research into social systems has established the complexity of theorising time (Adam, 1990; Giddens, 1994; Moore, 1963; Zerubavel, 1981) and temporality, understood here as the collective experience of time (Ballard and Seibold, 2003; Gómez, 2009). In considering the specific relationship between time and change, social systems theorist Luhmann (1995, p. 41) goes as far as proposing that “for some systems time exists as an aggregate designation for all change”.

Indeed despite its centrality to all spheres of human action, time is a difficult concept to grasp, notably the organisational perspectives on temporality (Ancona *et al.*, 2001; Gómez, 2009; Zaheer *et al.*, 1999), in both perceptual and behavioural senses (Massey *et al.*, 2003;



Orlikowski and Yates, 2002). Nevertheless, it is not difficult to agree with the relevance of understanding specific systems' temporal attributes as ascribed by their participants.

The problem, however, lies with the historical polarisation of perspectives on temporality between an objectivist stance that views time as absolute, linear and mechanistic (Thompson, 1967); and a subjectivist stance that reduces time to the norms, beliefs and customs produced by individuals (Orlikowski and Yates, 2002).

Contemporary social theory suggests an alternative to this duality and proposes the existence of interlacing forms of temporality: the day-to-day experience that is constituted in repetition (*durée*), the life-span of individuals in a biological sense and the time of institutions (*longue durée*) (Giddens, 1987). Drawing on Giddens and taking a practice-based perspective, Orlikowski and Yates (2002) focus on how time is enacted in organisations. Throughout this paper it is this practice-based perspective that will allow us to examine temporality from the perspective of academics doing their work and their interactions with the temporal features of e-learning.

When reviewing organisational research, it becomes apparent that an established stream has investigated time and its relationship with the management, planning, co-operation and synchronisation of work-related activities in specific socio-cultural contexts, such as medical work (Reddy *et al.*, 2006; Johnson *et al.*, 2014), interpersonal collaboration (e.g. Huang and Trauth, 2006; Nandhakumar and Jones, 2001; Saunders *et al.*, 2004; Spillers and Loewus-Deitch, 2003), and project management (Gersick, 1989; Nandhakumar, 2002; Baker *et al.*, 2013; Langley *et al.*, 2013; Costas and Grey, 2014). These studies share a common concern with understanding temporality as "the experience of time and the temporal organisation of activities around us" (Reddy *et al.*, 2006, p. 33), yet the corpus of knowledge available that relates the management and administration of e-learning to time is limited and eminently focused on the experience of e-learners (Allan, 2007; Land and Bayne, 2008).

This paper seeks to bring the rather fragmented discourses on temporality and on e-learning management and administration into conversation by focusing on how academics use their knowledge of the temporal features of e-learning to plan, organise and coordinate their professional activities. This implies a deep understanding of "organisational actors' ongoing active production and reproduction of their social context" (Nandhakumar and Jones, 2001, p. 191), as time is a pervasive category in any organisational context. This very idea is vividly purported by Strauss *et al.* (1985): "anyone who works in organisations thinks – has to think – of his or her work, and of the organisation itself, in temporal terms" (Strauss *et al.*, 1985).

More specifically, this paper aims to explore Portuguese academics' conceptions of the temporal properties of e-learning through analysing the self-disclosed impact of e-learning systems in the different stages of academic practice, namely the operation and control of virtual learning environments (VLEs), and the sequences of planning, scheduling, developing, managing and assessing online instructional activities.

This research endeavour is motivated by the need to understand potential time-related barriers to adoption, in order to achieve improved performance, seamless interaction, manageable workload and safeguard against e-learning dissatisfaction. Since negative conceptions concerning the temporal properties of e-learning will predictably affect use behaviour or intention to adopt e-learning systems, it is important in a first instance to map and reconstruct the time-based arrangements requested by the multi-directionality and sense of continuous engagement introduced by e-learning processes (Allan, 2007, p. 561).

By mapping and theorising the variety academics' conceptions of temporal properties of e-learning, we hope to contribute with actionable knowledge that can be

applied in the design of favourable e-learning arrangements. This endeavour is also a response to Orlikowski and Yates (2002) call for the implementation of “temporal structuring” processes, which act as frames of reference for time-aware planning, alignment and synchronisation of activities in organisations.

The remainder of the paper develops as follows: the next section provides an overview of methodology and research design. Section 3 looks in detail at the emergent grounded theory of academics’ polychronicity. Following the typical inductive research design, Section 4 presents a discussion of findings, integrating them with the relevant literature. The paper closes with a call for the institutionalisation of a time-sensitive normative framework to regulate academics’ online teaching presence.

2. Methodology

Grounded Theory was selected as the methodology in this study for its capacity to integrate theory and method as a whole. We followed Clarke’s (2005, 2006) postulate that symbolic interactionism and Grounded Theory constitute a theory/methods package (Charmaz, 2008, p. 52), suitable to move scientific enquiry further from mechanistic models of causation through centring the focus of research on meaning “as established in the conjoint adjustable responses of interacting and communicating individuals” (Mead, 1934, p. 78).

Accordingly, the interactionist nature of this study is concerned with understanding how the symbolism of practice – more specifically e-learning practice as expressed through academics’ sensemaking processes – “influences the process of implementation and related areas of organisation-level action” (Prasad, 1993, p. 1405).

Stressing the authenticity of academics’ lived experience and recognising the adoption of e-learning as an intersubjectively generated human-activity system, the study addressed the fundamental contributions of symbolic interactionism and focused on the instances in which academics enact, envision and adjust their activities in meaningful terms towards e-learning and its temporal properties.

Data collection efforts developed in two stages: a first interview round comprised 14 interviews; and a second interview round comprised 51 interviews. During the latter stage, three informants interviewed during the first interview round have been revisited to ensure the validity of ongoing coding and analysis. Interviews followed a semi-structured interviewed guide.

Purposive sampling efforts focused initially on the identification and recruitment of a relevant social arena of action, composed of academics in Portuguese public Higher Education Institutions, teaching at BA/BSc level, and affiliated with faculties where e-learning appropriation manifested itself in considerable depth. As the study developed into the second round of interviews, the selection of informants was driven by analysis, following the principle of theoretical sampling. Figure 1 provides detail on the disciplinary affiliation of informants.

Data collection and analysis coexisted until no new open codes emerged from the data analysis. This indicated that theoretical saturation had been achieved, as can be observed in Figure 2, where the graphic details the emergence of new codes after each interview.

In terms of data analysis, this study operated through constant comparison, following the steps described by Glaser and Strauss (1967, p. 105): “(1) comparing incidents applicable to each category; (2) integrating categories and their properties; (3) delimiting the theory; and (4) writing the theory”. The process has led to the unearthing of conceptual categories and their properties from data, following the principle that the progressive abstraction of empirical data (sequential stages of

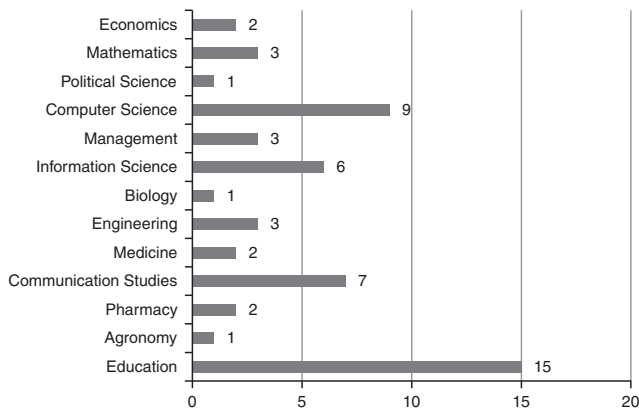


Figure 1.
Disciplinary affiliation of academics

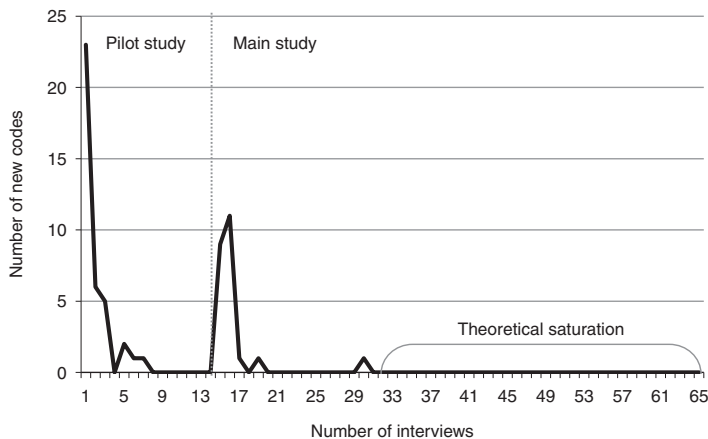


Figure 2.
Coding and theoretical saturation

open, axial and selective coding), combined with the comparison of incidents, allows the systematic generation of theory. Ultimately, this has led us to the development of “a set of relational statements that can be used to explain, in a general sense, what is going on” (Strauss and Corbin, 1998, p. 145) in the field.

3. Towards a grounded theory of polychronicity

As mentioned previously in the methodology section, Grounded Theory is concerned with the generation of a parsimonious “set of well-developed categories (e.g. themes, concepts) that are systematically interrelated through statements of relationship to form a theoretical framework” (Strauss and Corbin, 1998, p. 22). In the course of this study, intensive interviewing permitted the in-depth exploration of academics’ cognitions and situated realities, with informants being asked to describe and reflect upon their experiences.

What follows next is the narrative explanation of academics’ conceptions of e-learning temporal properties. The introduction of theoretical propositions is aided by diagrams that illustrate the hierarchy in the coding process, and by connected extracts of interviews that give voice to the participants in this study.

In the course of interviews, academics’ experiences of e-learning adoption converged into a perception of reshuffling of temporal dimensions. This perceived reshuffling

pertained greatly to duration or in other words to the amount of time that academics dedicated to designing and bringing to life educational contents and learning activities. The space and time nexus was also affected, since academics globally perceived that teaching and learning activities were growingly taking place over extended continuums of time, dilating temporal frames and transposing fixed locations. Another manifestation of changes in temporal patterns occurred at the level of sequence, with academics perceiving an uncontrolled emergence of simultaneous and competing tasks spanning across different points in time, yet all demanding attention. Finally, traditional conceptions of the work cycle's periodic regularity – with the alternation between high- and low-demand periods across the teaching semester – was reportedly transformed by a transition to cycles of limited rhythmic alternation, with the prevalence of intensively busy periods.

These emergent conceptions of e-learning temporal properties were categorised as pertaining to the levels of organisational structures, the processes involved in teaching online and the intensification of linkages that occur via online interaction. Figure 3 illustrates the progression in analytical abstraction that culminated in the identification of this set of categories – a process described by Strauss and Corbin (1998) as axial coding – and ultimately in the discovery of a central category that represents the product of all the analysis and that indicates “what the research is about” (Strauss and Corbin, 1998, p. 146).

Considering academics' conceptions concerning the temporal properties of e-learning, it is proposed that the concept of “polychronicity” holds the ability to condense all other categories under an explanatory whole able to explain variations within them. Indeed academics' narratives revealed the subjective, complex, multi-dimensional nature of the experience and conceptualisation of time when adopting e-learning. Their experiences do not reflect the linear, monochronic conceptualisation of time that is clearly embedded in traditional face-to-face delivery.

In its most basic definition, “polychronicity” is the doing of two or more things at the same time (Bluedorn *et al.*, 1992; Hall, 1983). In consonance with this definition and to avoid ambiguity in the terminology, the core category of “Polychronicity” is advanced

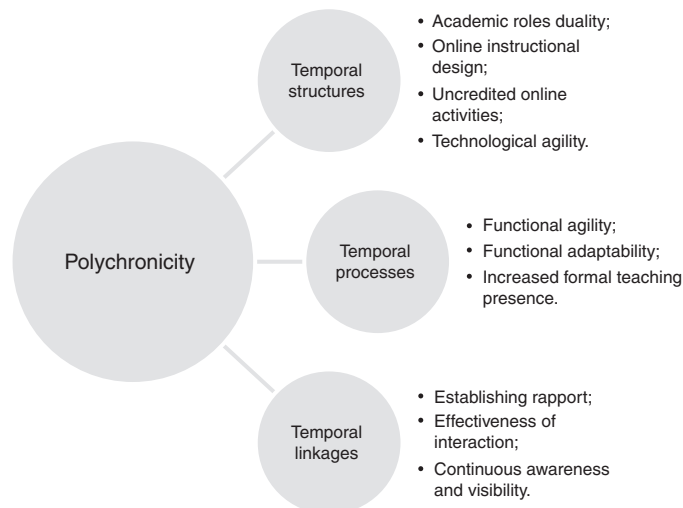


Figure 3.
Set of higher
level categories

Note: From left to right: core category, near core categories and categories

here to signify academics' strategies to manage work constraints and cope with work overload introduced by e-learning. It reflects the high demands of being able to adjust to simultaneous teaching and social negotiation rhythms, synchronise tasks for adaptive course generation, and swiftly decide which contents, resources, tools and interaction strategies best fit to students' needs at different moments.

The subsequent subsections contain an explanation of these findings in detail, supported by an elaboration on categories and subcategories, and accompanied by extracts of the interview transcripts which bring to life the issues experienced by academics.

3.1 Temporal structures

The category of "temporal structures" translates the self-disclosed conflicts between dominant institutional arrangements and their incompatibility with the demands of e-learning as an innovation in traditional Higher Education Institutions. Figure 4 captures its constituent dimensions: the duality in academic careers with emphasis and reward on research outputs but effective workload attribution oriented towards teaching times; the unsupported development of online instructional design which typically involves timely, steep and lonely learning curves; the inexistence of negotiated norms to regulate, credit and reward academics' virtual presence; and the technology proficiency required to manage and make the online encounter of learners and instructors meaningful.

In the course of the data collection interviews, informants expressed the belief that e-learning introduces a reshuffling of temporal dimensions: duration (amount of time dedicated to design learning activities and educational contents); location (activities and tasks take place over extended continuums of time, dilating temporal frames of fixed particular points); sequence (concurrent detachment of activities from temporal restraints and reification of uncontrolled restraints resulting from being tied up to

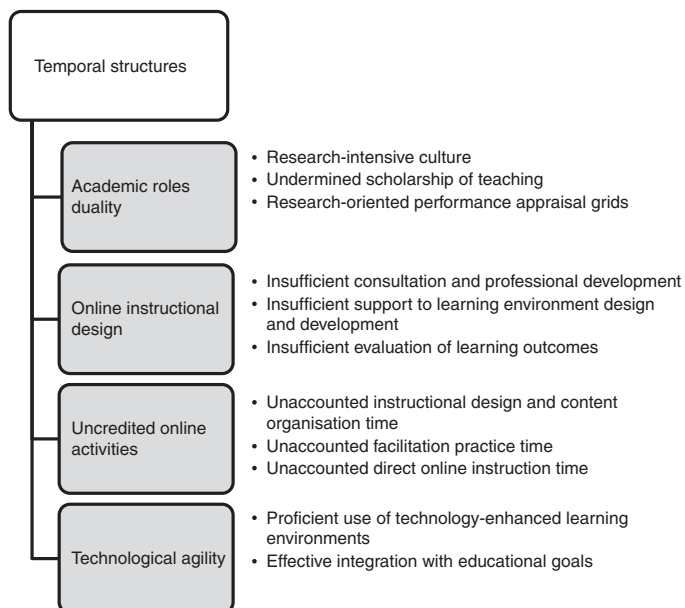


Figure 4.
Illustration of the
emerging category
of "Temporal
structures" from
axial coding

activities spanning across unspecified points of time); and cycle (reappraisal of work completion periodic regularity and transition to cycles of limited rhythmic alternation, with the prevalence of being intensively busy):

Any engagement with virtual environments is extremely absorbing and time-consuming. Just like the relationship we keep with social networks. It's terrible to be on Facebook because you actually perceive how much time it takes from your other commitments. The same happens with online learning environments [...] (Q11:43:79).

Academics readily acknowledge the practical challenges of simultaneously developing and maintaining critical aspects of time in e-learning. Because of time concerns and time constraints, many academics are making a restricted use of e-learning systems:

For self-protection reasons I can say that I have only used 10 to 20% of e-learning's full potential. I could have done a lot more, but the management denied my sabbatical leave, which I had programmed to dedicate entirely to the redesign of my course. [...] Without time there is no mental availability, there is no awareness. It takes time to elaborate a strategy (Q10:14:104).

Emergent temporal trajectories of academics indicate unregulated and unaccounted for dynamics, mainly deriving from changes in the approach to teaching, resulting in difficulties to synchronise their temporal behaviour with other actors with whom they interact; and time-related consequences cascading across the system, such as disruptions to internal workload patterns and conflicts with dominant modes of delivery, reinforced by entrenched organisational practices or deeper institutional processes:

The academic who migrates a campus-based course into integral online delivery will be the protagonist of a radical time experiment. Their schedule will be nightly, and concentrated on the period of after work hours because that is when students will prefer or be available to access the e-learning platform. This means that the teacher is stuck from 10 p.m. to 2 a.m. And this is unaccounted work time, which will not be rewarded or compensated for. The university could not care less. This time is not taken into consideration for payment purposes, the same happening with the time spent mediating students' interaction or developing instructional contents (Q19:10:14).

Academics are confronted with the need to speedily accomplish educational tasks and to adapt and reconfigure the teaching and learning process to changing delivery conditions by coping with existent career and performance expectancies, which reward research over teaching and overvalue a metric approach to hours of teaching:

E-learning implementation is extremely time-consuming. In my personal context I felt that it would not be possible to harmonise e-learning development with the full range of my professional duties, such as research, administration and being the programme coordinator for a master degree (Q34:1:2).

There are also pressures to rapidly adjust to new working methodologies that defy traditional temporal expectations by the overcoming of communicative barriers and the production of interaction amongst the members of the e-learning community of enquiry:

There is an extension of our teaching activities with e-learning. For example, in campus based teaching, regulations establish fixed time slots for tutorial sessions, which students can book individually with their teachers. There is a weekly limit for the total duration of these sessions. In an online environment these time frames don't apply because the expectation of digital presence exceeds it greatly. [...] Online I am expected to be constantly available, chatting or answering emails, and fundamentally using personal time without compensation (Q38:16:47).

Finally, another common perspective advanced across interviews was the lack of specialised support in the design of engaging online instructional activities. It was commonly perceived that the embedding of a range of learning technologies in academics’ professional practice requires support in designing resources and opportunities based on solid pedagogic principles. It also requires a strong emphasis in practical knowledge, which differs substantially from an abstract or loose understanding of e-learning:

Expecting that all academics become experts in pedagogy and educational technology is not reasonable. There is not time for that. You cannot expect that academics stop their scientific development and disciplinary growth to dedicate themselves to the study of teaching and learning strategies, unless we ask all our academics to take a degree in Education (Q15:36:63).

3.2 Temporal processes

The perception that e-learning overcomes the predominant conventional transmissive pedagogy in Higher Education and that this is not without time costs to instructors was quite common across interviews. As illustrated by Figure 5, the emphasis was placed on the growing demands of being an agile module administrator, on being responsive to a continuous stream of intervention requests, and on an increased teaching presence.

Many of the informants acknowledged the need to tailor the teaching and learning settings online to adequately accommodate the flows of content and interaction, and to regulate students’ behaviour against the variety of information conveyed through VLEs:

We are busy day and night, all the time, even during weekends. Working rhythms and patterns are intensified and very distinct to traditional teaching. In campus-based teaching I can afford the luxury of not preparing a lecture in much detail beforehand. With e-learning every teaching activity needs to be anticipated, prepared, scripted and preferably rehearsed. The planning and execution efforts are incomparably higher. [...] E-learning requires an acute awareness to operational control and performance. Even in the simplest aspects (Q3:35:70).

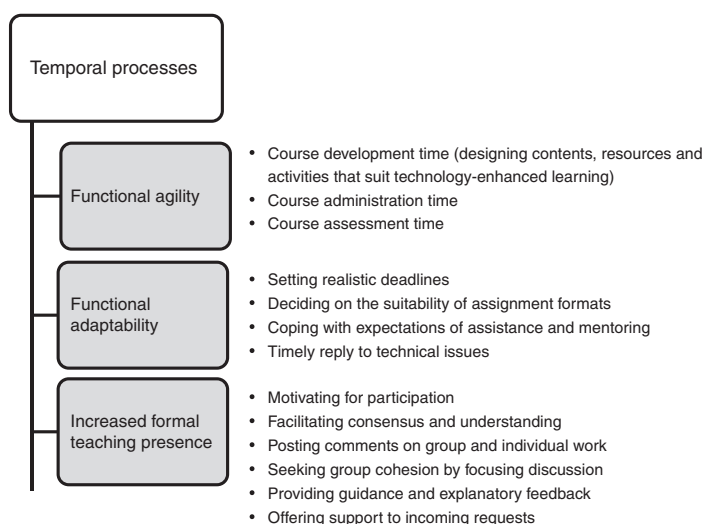


Figure 5. Illustration of the emerging category of “Temporal processes” from axial coding

The range of difficulties that academics reportedly face more frequently relate to dealing with the negotiation of activities that best meet students' learning needs, dealing with the flow of content questions and answers from students – which can easily become overwhelming – and improving closeness and cognitive learning through mechanisms of instructor immediacy:

Technology-enhanced teaching and learning imprints different routines to the teacher-student relationship, because there is greater proximity and regular feedback. Virtual presence is a de facto addition to physical presence, which makes academics' workload excessive (Q22:3:5).

Naturally, academics cannot be permanently available online. However, the pressuring demands to promote online learning effectiveness push them into an array of very demanding activities such as: increasing the intelligibility of materials by designing easily navigable contents; offering guidelines on how to use resources; being emphatic about turn-around times for response; establishing expectations of tutor feed-back and availability patterns; being explicit about participation rules in asynchronous discussions, etc.:

[...] teachers find themselves trapped in continuous streams of demanding tasks. I had to make this point clear to prevent the completely false idea that often circulates about academics having more free time or being less professionally engaged when they teach online (Q24:8:17).

Another important issue is that the process related to adjusting to the online environment is bidirectional and valid both for students and instructors, despite students' over expectations concerning the affordances of e-learning and the availability of instructors:

They live permanently online and expect the instructor to be the same: always available. They are shocked when confronted with the fact that such permanent presence online is not possible. Also, they tend to postpone their activities to weekends or for the night period and only realise that instructors are not remotely present when they don't find them online (Q:9:18).

Wrong expectations about the pace of activities can also be the consequence of academics' misjudgement about how teaching and learning develops online:

If as a teacher I am unable to give my students timely individual or collective feedback because there are too many tasks or too many assignments, I am clearly being misled by a product strategy. Instead I should be pursuing a quality contents strategy (Q31:26:45).

However, the most critical factor raised across interviews was the set of academics' technical and educational expertise, which implies the ability to set collaborative learning agendas; moderate conferencing behaviour; provide leadership and guidance to individual learning needs; and organise delivery in such a way that learning objectives are aligned with methods, assessment and expected outcomes. These new dimensions of the scholarly activity go well beyond traditional disciplinary knowledge and require a substantial investment of time, as indicated by a lecturer:

I have to be intellectually honest with you: it took me a huge personal time investment to feed contents into e-learning platforms. Contents are the core problem of e-learning. I cannot re-use them in the following year because they are not static and reality is changing. Updating is extremely time-consuming. For the first three years I spent most of the time, including weekends, answering queries, mentoring and monitoring students (Q:1:10).

3.3 Temporal linkages

The linking of learners and instructors in meaningful interaction was also identified as simultaneously a critical success factor of e-learning and a major consumer of academics' time. Figure 6 illustrates the range of perceived time-intensive and time-consuming activities, namely the abilities to establish rapport and explore the social functions of the learners' community, and the increased visibility of instructors who are expected to monitor students progress, offer directive posting and provide pastoral support.

According to the perceptions collected in interviews, one of the keys to successful interaction is the ability to ensure continuous relevant presence of both instructor and learners. In the absence of physical situatedness, academics need to adopt strategies to minimise possible feelings of uncertainty and suspicion, and to filter the noise created by activities that are not relevant for knowledge sharing. In practical terms this develops through ensuring enhanced visibility with regulatory and motivational input:

If I create a discussion forum and if I want to be consistent in my extraction of the pedagogical and instructional benefits of the tool, I need to dedicate a huge amount of time to making it dynamic and to invite students' participation. Similarly, if I want my Moodle page to be kept tidy and up to date, I will need to revisit it daily. Also because there is always something to be done: a comment to add, a discussion to prompt, a series of assignments to collect, a summary to be made, or a question to be answered. And I can just go on and on (Q49:12:20).

This is representative of the effort put into balancing between academic and pastoral support by regular monitoring students' progress, contributing directive posting or prompting content-related discussion. In summary, academics need to find the time to nurture trusting and empowering relationships, through proactively engaging students in discussion, critical thinking and in the requirements for pedagogical success and attainment:

When compared to traditional campus-based teaching, it becomes apparent that e-learning generates new teaching tasks, new teaching moments that seem continuing, in sharp contrast with the defined cycles of preparing lectures, delivering lectures and making students sit a classic exam. E-learning demands more effort and commitment from both teachers and students (Q36:9:14).

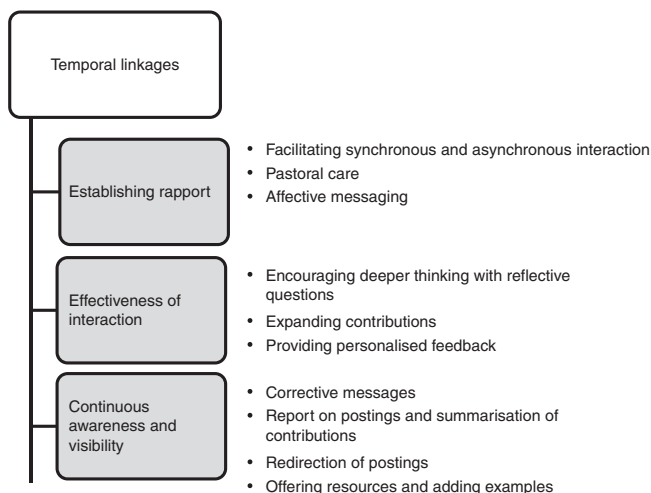


Figure 6. Illustration of the emerging category of "Temporal linkages" from axial coding

However, many times the response of academics is reactive and insufficient, mostly because the demands of their roles are such that being simultaneously on top of teaching, research or tutoring activities becomes a difficult task. Online instructors feel, more often than not, inundated by queries:

Discussion fora were weekly and about topics such as scenarios on interest rates, inflation rates, etc. Participation was so high I ended up collecting records of more than 60.000 students' entries. It is a colossal task for a single teacher and today I am much more selective (Q:1:8).

4. Discussion

From a sociological perspective that embraces the dimensions of time, identity and work, the transformations of work that make time fluid can be explained as the transition from an industrial era in which "time measured as the length of the working day was pivotal in the exchange between worker and employer" (Kamp *et al.*, 2011, p. 229) to an era of increasing volatility in which multiple task-orientation and an output-oriented culture overpower the old notions of time spent at work. Within the specific context of academia, this has led to the emergence of what Ylijoki and Mäntylä (2003) describe as "conflicting time perspectives in academic work", notably the fluid yet tensional coexistence of simultaneous perspectives such as: longer and fragmented working days that make individuals constantly feel under time pressure; becoming entirely immersed in tasks due to deep personal dedication; and the general perception of lacking personal time.

The emergent findings in this study do not claim to offer a definitive theory of temporality in a positivistic sense. However, they uncover trends in terms of academics' conceptions concerning the temporal properties of e-learning, and in terms of the practical time-related challenges academics face when developing teaching and learning activities online.

The dominant conceptions extracted from informants' accounts seem to correspond to a clock-time conceptualisation of time (Adams, 1995). In our view, this translates academics' understanding of e-learning implementation in Higher Education Institutions as essentially being programmable and amenable to proper management. From such a perspective, the difficulties in transitioning to e-learning's polychronic time orientation is attributed to Higher Education Institution's inadequate management and administration of the development and implementation process. This resonates with Lee's (1999) assertion that organisational conflicts are expectable when there is a mismatch between members' monochronic ways and certain events' polychronic features, and calls for managerial alleviation of tensions, notably through training.

By exposing the contingencies under which particular aspects of time in online teaching become more salient in the context of Higher Education Institutions, the findings reported in this paper contribute to the process of initial theorising on the topic of academics' conceptions of time in e-learning. Theory inductively derived from organisational actors' conceptions provides a "linguistic medium of conceptual and symbolic discourse" (Astley and Zammuto, 1992, p. 457), which can be particularly helpful in the process of informing managerial practice about the phenomenon of temporality.

The proposed concept of polychronicity, in particular, reveals how important instructor availability and immediacy are to creation of enabling online teaching and learning environments, where meaningful interaction develops.

However, only a deep understanding of the properties of technology and their congruence with educational and pedagogical goals – such as inquiry-based or self-regulated learning – can “help sustain effective research-led academic environments” (Land and Bayne, 2008, p. 680) and “build sustainable educational communities of inquiry” (Garrison and Akyol, 2009, p. 27).

In the last years, frameworks that address the issues related to educational technology integration have been explored both conceptually and in practice. Examples of these include Levels of Teaching Innovation (LoTi), Technological Pedagogical Content Knowledge (TPACK) and substitution, augmentation, modification, redefinition(SAMR) (Moersch, 2014). TPACK, in particular, identifies the different types of knowledge teachers need in order to effectively use technology in teaching and learning (Mishra and Koehler, 2006; Lee and Tsai, 2010; Chai *et al.*, 2011; Voogt *et al.*, 2013). These types of knowledge include knowing how to use technologies (technological knowledge), knowing how to teach (pedagogical knowledge) and knowing what students are meant to be learning (content knowledge), but the framework proposes that it is the combination of these types of knowledge into new configurations that offers enhanced opportunities for meaningful integration of technology in education. Notwithstanding the existence of these frameworks, academics face the existence of several barriers that go beyond content, pedagogical and technology beliefs or even barriers related to academics’ lack of design thinking (Tsai and Chai, 2012). The subsistence of what Ertmer (1999) describes as first-order barriers – mostly the lack of adequate time, training and institutional support – remains a significant obstacle to educational technology integration.

Concerning the issue of time in particular, the wider literature on e-learning and instructor’s roles oscillates between reports of time efficiency when the locus of responsibility is moved to the student (Anderson, 2004; Morris, 2008; Brady *et al.*, 2010; Waite *et al.*, 2011), perceived increased flexibility in delivery as a consequence of asynchronous teaching and learning (Al-Qahtani and Higgins, 2013; Hrastinski, 2008), and several of the time-related difficulties disclosed by the participants in this study, in particular: having to deal with the flow of content questions and answers from students, which can easily become overwhelming (de Vries *et al.*, 2005; Kester and Sloep, 2009); and being able to improve closeness and cognitive learning through mechanisms of instructor immediacy (Nagel and Kotze, 2010, p. 46).

These are in fact time-intensive and time-consuming tasks, which somehow contradict the rhetorical idea that e-learning can actually set academics and learners free of temporal constraints (Goodyear, 2006, p. 84). Extensive evidence of this is provided in the various citations, where academics reflect on the whole new set of responsibilities associated with moving into online teaching, namely going beyond concerns with skills imparting and acquisition and focusing on the mechanisms of social interaction, discussion, engagement and negotiation of meaning.

According to Goodyear (2006, p. 94), it is the multiplication of time-intensive and time-consuming teaching and learning activities introduced by e-learning that “intensifies the need for co-presence among those who co-ordinate it”. Therefore, beyond acting as an inhibitor to the adoption of educational technologies because of a perceived lack of time and increased teaching load (Cavanaugh, 2005; Tabata and Johnsrud, 2008; Birch and Burnett, 2009), temporal constraints are additionally related to requirements of design, development and delivery of online instruction (Spector, 2005, p. 18), and to the cost-effectiveness of ensuring “transactional presence” – the connected and continuous availability of academics to students’ requests (Shin, 2002, p. 132).

To counter the impracticality of permanent immediacy, Shi *et al.* (2006) propose tools, timeframes and time management strategies that academic can employ to make online learning efficient and effective. Examples of these include increasing the intelligibility of materials by designing easily navigable contents to “minimise student confusion and sense of being lost” (Shi *et al.*, 2006); offering guidelines on how to use resources and making nonessential information optional; being emphatic about turn-around times for response, thus establishing expectations of tutor feed-back and availability patterns; (and being explicit about participation rules (e.g. how often, how focused) in asynchronous discussions.

Issues of instructional design quality are also identified as barriers to the successful implementation of e-learning, namely the ways in which creating interactive learning environments affects academics’ work arrangements (McPherson and Nunes, 2006), and the insufficiencies of some of the popular learning management systems (Sridharan *et al.*, 2010).

Barriers of this kind confirm that overcoming surface approaches to e-learning remains a challenge. Mansvelt *et al.* (2008) share this view, attributing this problem to academics’ heavy workloads and to institutional policy that fails to fully recognise the “the demands and constraints that working in a digital context impose” (Mansvelt *et al.*, 2008, pp. 579-580).

Furthermore, the lack of guidelines for the evaluation of online teaching and the absence of supportive institutional responses make academics anxious “about how their online teaching is regarded in the context of promotion and tenure” (Spector, 2005). If institutions do not reflect the importance of e-learning in their performance appraisal mechanisms and in their workload allocation frameworks, academics will feel that their valuable time should otherwise be allocated to better rewarding activities such as research and publishing.

Because of this lack of institutional rewards and incentives, academics find it uninviting to think of e-learning in terms of an equitable, temporal-sensitive experience (Loureiro-Koechlin and Allan, 2010), notwithstanding the acknowledgement that successful e-learning requires intensive instructor presence through the definition of course processes, evaluation and interaction (Baker, 2010).

In the end, e-learning’s overriding feature is the direct invitation – addressed to both academics and learners – to “handle multiple activities at the same time rather than handling individual activities one at a time” (Allan, 2007, p. 561). Accepting this invitation – willingly or amid resistance – is crucial in establishing a culture of polychronicity in academic practice.

5. Conclusion

Emergent academics’ conceptions concerning the temporal properties of e-learning indicate the existence of unregulated and unaccounted for dynamics, mainly deriving from changes in the approaches to teaching online. The consequences of these changes result in perceived disruptions to established workload metrics, work patterns and conflicts with dominant modes of instructional delivery that are not synchronised with the demands of online interaction and immediacy. These problems seem to be reinforced by entrenched organisational practices and change-resistant institutional processes.

Academics’ response to cope with these challenges is polychronicity, or in other words the ability to adjust to fast paced teaching and social negotiation rhythms, synchronise tasks for adaptive course generation and swiftly decide which contents, resources, tools and interaction strategies best fit to students’ needs at different moments.

This is not an easy task in the context of current career pathways and performance expectancies, which reward research output over innovative teaching, and which overvalue a metric approach to hours of teaching – many times neglecting the extended hours spent preparing online educational resources, moderating online discussions and facilitating online social negotiation of meaning.

As strategies for enhancing academics' temporal efficacy we suggest the negotiation and establishment of two types of norms regulating e-learning in Higher Education Institutions. These strategies are proposed in response to the temporal dimensions of e-learning uncovered by research participants. Moreover, they attempt to bridge e-learning temporal dimensions that are essentially based in event time, and the traditional arrangements of academia that mostly mobilise clock time (e.g. semester dates, lecture times and corresponding credits, etc.).

The first type of norms should regulate academics' virtual presence. This would imply the legitimisation of teaching online in workload allocation frameworks and the reward of time devoted to the scholarship of teaching online in terms of performance appraisal and career advancement.

The second type of norms should regulate the interaction expectations of teachers and learners in the shared electronic learning environment, in order to sustain productive engagement, homogeneity in experience and the coherent connection between geographically and temporally distributed individuals. The alignment of temporal frames of reference should begin by taking inventory of participants' expectations and levels of expertise, and then move on to implementing agreed upon rules of conduct in messaging and communication. This would not only regulate teaching presence, but also discipline the sequence of delivery and interaction, in order to make the learning process more productive.

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