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Sustainable CALL development

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Introduction

The rapid pace of technological development, along with the uncertainty and unpredictability that characterise the knowledge society, have brought to the fore the issue of sustainability and sustainable development on various international, national and local educational research and policy agendas. Sustainability is a complex concept that gives rise to many definitions and interpretations. In this chapter, we draw on environmental/ecological definitions of sustainability and sustainable development, as well as system theories, to propose a multidimensional framework for sustainable CALL development. Following a definition of sustainability that employs systems theories and ecological economics, we briefly review the literature on sustainable e-learning in general and CALL in particular. We then propose a systemic view of sustainable CALL and discuss two models, the ‘institutional model’ and the ‘CALL ecosystem model’ that can be used to help integrate sustainability in our CALL designs and development.

What is sustainability? Preliminary definitions

Sustainability has become a hot topic in the 21st century, whether in relation to society, economics, politics, education, and most of all, the environment. Environmental scientists

warn us against the impact of climate change that threatens our lifestyle, businesses strive to remain sustainable in a rapidly changing economic context, and universities struggle to sustain their teaching and research activities in the face of increased competition and reduced funding. But what is sustainability?

Sustainability is a complex concept that gives rise to many definitions and interpretations. Everyday definitions, as found in most dictionaries, refer to ‘the capacity to endure, to maintain or prolong’ (Wikipedia), ‘the ability to be sustained, supported, upheld, or confirmed’ (dictionary.com), or the ‘ability to maintain or support an activity or process over the long term’ (BusinessDictionary.com). Systems, actions, or processes are said to be sustainable when they are supported by sufficient material, human or financial resources (dictionary.com). With regards to the environment, the United Nations published, in June 1987, the *Report of the World Commission on Environment and Development: Our Common Future*, commonly known as the Brundtland Commission's report (Brundtland 1987), which introduced the concept of *sustainable development*, defined as ‘development that meets the needs of the present without compromising the ability of future generations to meet their own needs’ (Brundtland 1987: chapter 2, item 1). The report further identifies two key concepts: ‘the concept of needs’ and ‘the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs’ (*ibid*).

Since the publication of the Brundtland Commission's report, sustainable development has been seen as 'a combination of three dimensions or "pillars": namely, the environmental (ecological), economic, and social dimensions' (Lehtonen 2004: 200). The nature of the relationship or interaction between these three pillars has given rise to controverted interpretations (Lehtonen 2004), represented by different visualisations as illustrated by Figure 16.1. According to Lehtonen (2004: 201), in the 'institutional version' represented by a Venn diagram, the three dimensions are hierarchically equal and mutually interacting. No priority is given to any of them, and 'the model gives the impression of pillars as independent elements that can be treated, at least analytically, separately from each other' (*ibid*). By contrast, in the bio economy model represented by concentric circles, the environment circumscribes the social dimension, and the economic dimension constitutes the innermost circle (Figure 16.1). According to Lehtonen,

This reflects the idea that economic activities should be in the service of all human beings while at the same time safeguarding the biophysical systems necessary for human existence. The social would thus be in the command of the economic, but at the same time submitted to the ultimate environmental constraints.

(Lehtonen 2004: 201)

Different political philosophies underpin each model and an in-depth discussion of these would go far beyond the scope of this chapter. However, both provide a useful starting point to explore the concept of sustainable development and its possible applications to CALL

development as we will see later on in the chapter.

[FIGURE 16.1 INSERT ABOUT HERE]

The environmental/ecological concept of sustainable development outlined above, and more particularly the ‘institutional model’, underpins most current debates on sustainability at all levels of society. According to the US Environmental Protection Agency (EPA) website, ‘sustainability creates and maintains the conditions under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic and other requirements of present and future generations’. In the business world, sustainability can be defined as the ‘continued development or growth, without significant deterioration of the environment and depletion of natural resources on which human well-being depends’ (businessdictionary.com), or as ‘managing the triple bottom line - a process by which companies manage their financial, social and environmental risks, obligations and opportunities’ (Financial Times Lexicon). In a blog post, Bent (2011) argues for the adoption by organisations of a ‘sustainable business model’, which must be commercially successful, future ready, and part of a sustainable society.

Universities around the world are also embracing this tripartite definition of sustainability, which increasingly drives Higher Education developments. For example, the Vanderbilt

University (USA) website defines sustainability from an institutional perspective as ‘the development of a process or management system that helps to create a vibrant campus economy and high quality of life while respecting the need to sustain natural resources and protect the environment’. They further define sustainable programmes as ‘those that result from an institution’s commitment to environmental, social and economic health’ (Vanderbilt University na). In the UK, Kingston University is ‘committed to fostering a culture of sustainable practice throughout the University, ensuring [the university community] contribute[s] positively to the economy, environment and society from the local to the global scale’. This is done by ‘facilitating and promoting best practice in the development of [their] campus operations, curriculum, research and partnerships’ (Kingston University na).

A sustainable curriculum or programme of studies does not necessarily mean that any or all three sustainability pillars are core components of a given study programme. While a university may offer 'flagship' programmes or courses on different aspects of sustainability (including Development Education or 'Green Finance'), a sustainable programme can be defined in terms of its capacity to respond to present and future societal or economic needs within the limitations imposed not only by the institution business model and funding opportunities, but also by its 'human capital', physical and technological infrastructure, and by the local or national culture and values. In most cases however, the sustainability of programmes, courses, or simply of new pedagogical initiatives is likely to be conceived in its more basic form, that is, as *the capacity to be maintained or prolonged* through adequate funding and resources. This seemingly narrower view of sustainability is also espoused by the

European Commission in relation to international cooperation projects under the auspices of the now defunct Lifelong Learning Programme (2007-2013). For example, in the context of Tempus projects, a project is deemed sustainable ‘when it continues to deliver benefits to the project beneficiaries and/or other constituencies for an extended period after the Commission’s financial assistance has been terminated’ (EC Directorate General Education and Culture 2006: cover page). This extended period usually covers two years after the end of the allocated funding. Similarly, in the contexts of Leonardo projects,

Sustainability means that **crucial** activities and results of the project are maintained and continue to deliver benefits to the target group, structure, sector or system **after** the end of the EU funding. Ideally, the sustainability of a project should also generate impact, meaning direct or indirect long-term effects on actors, structures, sectors or systems **beyond** the original project environment.

(Leonardo da Vinci, na, checklist for project coordinators, emphasis in the original)

Towards a definition of sustainable CALL

Interestingly, the environmental/ecological dimension of sustainability also tends to be absent from the institutional or academic discourse surrounding the development and diffusion of e-learning, including CALL. However, concepts and principles of sustainable development, as well as the need for the implementation of a development education framework, are often

implicit in the e-learning literature, at least in its social and economic dimensions, through the renewed emphasis on lifelong learning that accompanies many curriculum and e-learning developments within and across disciplines. Lifelong learning, according to UNESCO is ‘the philosophy, conceptual framework, and organizing principle for education in the 21st century’ (2013: 3), and is regarded as essential to empowering the citizens of the world to respond to the global environmental, social, cultural, economic and technological changes that characterise the 21st century. A lifelong learning framework must ‘provide comprehensive and flexible pathways combining formal, non-formal and informal opportunities, in order to cater to the diversity of learning needs’ (UNESCO 2013: 3). E-learning has been hailed by governments, higher education authorities and third level education providers, either public or private, as crucial to the operationalisation of the global educational vision and goals formulated by international organisations such as UNESCO or OECD. However, this requires the *sustainable embedding* of successful e-learning initiatives in institutional contexts (Sharpe, Benfield and Francis 2006; Nichols 2008; Robertson 2008) as well as in non-formal or informal settings.

The sustainable embedding of an e-learning initiative or innovation is normally defined in terms of its diffusion within an institutional (or cross-institutional) context, and of its adoption by a wider community, beyond the immediate context of its development (see for example Nichols 2008: 599), leading to its sustainable embedding, that is, to a ‘sustainable and effective uptake of technologies that improve[s] the student experience’ (Sharpe *et al.* 2006: 136) and learning outcomes. Robertson (2008: 819) defines sustainable e-learning as

‘e-learning that has become normative practice and which has the capacity to meet the needs of the present and the future’. The notion of a ‘normative practice’ points to the concept of *CALL normalisation*, which has been the focus of much of Bax’s (2000, 2003; Chambers and Bax 2006) work. According to Bax (2003: 23), ‘[t]his concept is relevant to any kind of technological innovation and refers to the stage when the technology becomes invisible, embedded in everyday practice and hence “normalised”’. If *CALL normalisation* and sustainability are not identical concepts, they nevertheless share some features, more particularly those that focus on the diffusion and adoption of *CALL* initiatives or innovations by the wider community and on change and development (see, for example, Chambers and Bax 2006: 466). Keeping with Robertson’s (2008) definition of sustainable e-learning, we thus define *sustainable CALL* as *CALL* initiatives or innovations that have been, or are in the process of being normalised - and thus will be maintained and prolonged - and which have the capacity to meet the needs of present and future language teachers and learners.

The capacity to meet language teachers’ and learners’ present and future needs is often assessed through the investigation of factors that may impede or promote normalisation and/or sustainability, such as logistics, stakeholders’ conceptions, knowledge and abilities, syllabus and software integration, and training, development and support (Chambers and Bax 2006: 476). Looking at *CALL* development, within one institution and against rapid technological change, Kennedy and Levy (2009: 446) argue that the success of a new initiative requires that it is tailored to the particular context, integrated into the curriculum, and that it goes through an iterative development process. They identify a range of factors that have shaped, over a 15-year period, the ‘genesis, development and longevity’ of a

number of CALL projects for Italian within their own institution: key factors include institutional support (that is, funding, reliable infrastructure, adequate technical support), the practitioners' skills, attitudes, and collective strategic decisions, and student evaluation and feedback, with the latter being fully integrated into an iterative enhancement process (Kennedy and Levy 2009: 455). In doing so, they stress that rapid technological change is not incompatible with a long-term approach to CALL projects, nor does it require that 'we have to continually upgrade or convert to new platforms' (Kennedy and Levy 2009: 460).

While Kennedy and Levy (2009) discuss CALL sustainability at a 'macro' level, and more specifically at the institutional level, other researchers have focused on CALL sustainability at the level of learners ('micro' level), and are more particularly concerned with online language learning practices that can be sustained over time thanks to the development and integration of language learning technologies. For example, Hiroya Tanaka *et al.* (2013) developed *Lexinote*, an e-portfolio system designed to help Japanese learners of English to sustain their vocabulary learning over time. Sustaining vocabulary learning outside the classroom is also the motive behind Stockwell's (2013) study, in which he investigates the effect of a 'push' mechanism (via the sending of notifications to students' mobile phones) on learners' engagement with 'pull' web-based vocabulary learning activities. His conclusions suggest however that 'push' notifications via their mobile phone do not result in students immediately carrying out the suggested activities. They seem to prefer to engage with these activities on a PC at home or at the university, and thus appear to 'make calculated decisions about which platform to use depending on their particular learning needs' (Stockwell 2013:

322, see also Stockwell, Chapter 21 this volume). In this case, ‘pushing’ notifications and reminders via learners’ mobile phones may have very little impact on helping them sustain their vocabulary learning activities outside the classroom. In an earlier study, Stockwell and Levy (2010) investigate the relationship between the sustainability of email exchanges between native and non-native speakers of English on the one hand and learner online profiles on the other. Starting from the commonly held view that e-mail exchanges that are sustained over time are likely to have an impact on the development of language proficiency, these authors seek to determine whether or not a relationship exists between the number and length of email interactions and L2 proficiency gains, and if so, what factors have an effect on the sustainability of these interactions. The results of their study suggest that students who produce higher numbers of messages are indeed more likely to demonstrate L2 gains. However, they also show that higher proficiency learners are more likely ‘to be more prolific e-mail writers than those with a lower proficiency’ (Stockwell and Levy 2010: 437). They derive some suggestions for learner training, in particular in the area of strategic training,

In the same way that students need strategies to initiate and maintain face-to-face interactions, which have their own particular dynamic, students will also need strategies for the on-line interactional environment.

(Stockwell and Levy 2010: 437)

Finally, Chow (2013) reports on a longitudinal study (over a two-year period) that sought to establish the degree of sustainability of informal language learning via *Livemocha*, which

combines social networking and more traditional online language learning activities. Not only does she show that the use of the *Livemocha* platform gradually increased over the two-year period, thus suggesting the emergence of a sustainable language learning practice, she also highlights the significant role of environmental factors (for example, the *Livemocha* platform itself, students' professional and social environment, etc.) and learner characteristics (for example, learning styles, attitudes, and everyday engagement with social networks).

While looking at different aspects of sustainability and CALL in various educational settings and technological environments, the above studies all point to factors that can facilitate or impede sustainable language teaching and learning mediated by technology. Such factors may include institutional support, tools development and maintenance, teacher and learner training and development, and last but not least, the building of a community of teachers and/or learners collectively contributing to the establishment of new language teaching and learning practices. In line with Chambers and Bax (2006), we believe that these various factors interact with each other. What is true for CALL normalisation also applies to sustainable CALL: '[...] in working towards normalisation it is therefore important to address more than one factor at a time, taking account of the 'ecological complexity' of the whole context in each case' (Chambers and Bax 2006: 477).

Sustainable CALL, even in its most basic representation, that is the 'capacity to maintain and

to prolong' language teaching and learning practices mediated by technology, can only be realised to its full potential if we look at CALL from an ecological perspective" (see Blin, Chapter 3 this volume), and more specifically, by adopting a system view of the world, which 'helps us to understand the true nature of education as a complex, open, and dynamic human activity system that operates in ever-changing multiple environments and interacts with a variety of societal systems' (Banathy 1992: 17).

A systematic view of sustainable CALL

The systems view or systems theories have emerged in recent decades both in education and in the corporate world to help understand and manage sustainable change. These theories describe and highlight the dynamic nature of complex systems, such as language or bio systems. In CALL, these ecological approaches have also become an area of interest and inquiry (see Blin, Chapter 3, this volume). These approaches offer many useful concepts and metaphors for understanding how the different levels and elements of a CALL complex system are always affected by changes in any other part of the system. Thus, a systemic approach to sustainability organises and conceptualises these different components, as well as documents and analyses the interaction between them. In other words, sustainability is built on understanding and acknowledging the relationships between the different components of the system across different timescales.

An example of systemic thinking for sustainable CALL

To illuminate the sustainability approach further, an EU funded project (under the auspices of the Lifelong Learning Programme), SpeakApps (2013)¹, is provided as an example to show how systemic thinking can be applied in CALL research and development projects. The main objective of the project was to create online tools for oral practice and to design pedagogical templates and examples of tasks for their use. Four main areas, seen as key components of a complex system that was to become *SpeakApps*, were to form the basis not only for the various work packages that constituted the project, but also for the development of a sustainability framework that would underpin the research and development work throughout the lifecycle of the project. These areas were: 1) development of a platform and tools enabling the learning and practice of spoken skills online, 2) pedagogical and professional development, 3) building of a community of practitioners, and 4) development of an exploitation plan and of a business model that would ensure the sustainability and the financial viability of the system beyond the funding period.

While the fourth and last area directly relates to the overall sustainability of the SpeakApps system (and was required by the funders), the other three were integrated into a sustainability framework from the very beginning of the project (Blin, Jalkanen, Taalas, Nic Giolla Mhichil, and Ó Ciardubháin 2012). From a sustainability perspective, the tools and platform component is primarily *technological* and refers to the longer term maintenance and development of the SpeakApps technologies in response not only to future technological

¹ <http://www.speakapps.org>

changes but also to the changing needs of language learners with regards to the learning and practice of spoken skills online. The pedagogical and professional development component is *developmental* and relates to initial and continuing professional development through the creation of pedagogical designs and artefacts, by and for language teachers, that can respond to the present and future needs of teachers and learners. Finally, the third component is *social* and concerns not only the building and maintenance of a community of SpeakApps practitioners, but also the community's capacity to transform itself and to create new knowledge and practices.

The above components can be seen as interacting sub-systems, whose elements were identified and linked to factors that could either support or constrain the objectives and sustainability of other sub-systems. Relationships within and between the four main components were drawn in order to better understand their interconnectedness (see Figure 16.2).

[FIGURE 16.2 INSERT ABOUT HERE]

Using Figure 16.2 as a roadmap throughout the project made it possible to see which component could be affected by changes in another. For instance, the modification of a particular tool would require changes in a planned training workshop or in the design of pedagogical tasks. Similarly, the creation of new tasks, in response to a new emerging need,

may require the available tools to be modified. Guiding questions were formulated with respect to each component and their main elements (see Blin *et al.* 2012). They could then serve as a check-list to assist project partners in their efforts to define sustainable objectives and strategies during the development phase. In order to measure progress and achievements with regards to the sustainability of the project results (that is, platform and tools, pedagogical and professional development, community building), provisional indicators were developed for each component (see Table 16.1 for examples). Indicators such as these can help identify the potential for further development as well as emerging sustainability issues.

[TABLE 16.1 INSERT ABOUT HERE]

The SpeakApps sustainability framework is not restricted to a commercialisation plan. While it does include an exploitation plan that should ensure the medium term financial viability of the project (for example through a license fee structure), it does not seek to maintain products and services that are no longer relevant nor does it seek to preserve existing organisational structures and processes. Rather, it views SpeakApps as an open and flexible system, whose technological tools and pedagogical artefacts will be used in ways or for purposes that were not part of the developers' initial plan. It seeks to enable the self-organised continuation of the project and the self-sustainability of its operations, activities and communities as they evolve over time and across multiple spaces (Blin *et al.* 2012). In other words, the SpeakApps sustainability framework is primarily concerned with the *sustainable development* of the SpeakApps system, which needs to take into account the present and future needs of its users,

both teachers and learners, as well as their current language teaching and learning practices. The framework is useful for evolving the three dimensions or elements of sustainability discussed earlier in this chapter into a model for sustainable CALL development.

The four pillars of sustainable CALL development

The four main areas of activity identified in the SpeakApps project need to be renamed to make them more general, adaptable and scalable. The tools and platforms become environments and tools for learning, the pedagogical and professional development remain as is, community building is expanded to community and knowledge building, and the business model is incorporated into an organisational structures component. These are proposed as the ‘four pillars of sustainable CALL’ and they will be explained further in the coming sections.

Environments and tools for learning

From a sustainability point of view it is important to analyse the various technological tools and environments from the points of view of potential and their added value and always in relation to the current practices and how these practices are affected by the infusion of technology. It is important to realise that different environments and tools provide different affordances, that is, action possibilities that are offered by the environment (see Blin, Chapter 3 this volume for a more detailed discussion) for different types of learners and in different types of activities and task designs. Affordances are realised depending on the learner’s

perception, motivation and capacity (Gibson 1986; van Lier 2000) meaning that the technologies don't necessarily have self-sustained value, but their potential or affordance will become reality through activities that are contextualised and purposefully planned for the specific group of learners and with realistic expectations for the outcome and added value. As Jones *et al.* (2006: 51) point out, '[t]echnologies do not have affordance within them, affordances occur in relationships with active agents or actants'. In other words, 'it is the activity that determines what is picked up, not the complex environment' (van Lier 2004: 93). To summarise, for the creation and use of the tools and environments to be sustainable, they need to be planned and chosen for the intended users, learning goals and with existing practices in mind.

Pedagogical and professional development

There is a great deal of discussion and even debate around the role of pedagogical innovation in relation to pedagogical development. Teachers develop their teaching and themselves as professionals through their everyday practice. When trying out different types of activities they eventually develop a tacit understanding of what works and what does not. In the middle of the constantly hurried life in schools and universities, they develop new teaching materials and, when interacting with students in the classroom situation, aim at fixing things that do not work (in more academic terms, this could be called a local configuration). Whereas they have adopted a certain theoretical approach to language and learning during their studies and the 'pedagogical atmosphere' of institutions might encourage a certain type of pedagogy, in the classroom they are very much on their own.

Fullan (2007: 30) reminds us of the multidimensionality of pedagogical innovation. According to him, there are at least three dimensions or levels of 'new' in terms of introducing a change in education whether at the policy or practice level:

1. The possible use of new or revised *materials* (instructional resources such as curriculum materials or technologies),
2. The possible use of new *teaching approaches* (that is, new teaching strategies or activities), and
3. The possible alteration of *beliefs* (for example, pedagogical assumptions and theories underlying particular new policies or programs).

All of the above dimensions are needed to bring about a systemic change, but very often the change takes place at the first level only (for example, in the case of introducing new technologies). To ensure a systemic, and thus more sustainable integration of technology, continuous professional development is a must. It will also make it possible for the teachers to gain ownership and agency over the technological changes and to re-design the pedagogical approaches to align with the changes in the learning environment. The underlying ideology in all professional development is to help the teachers to eventually become familiar with for instance an e-learning platform, not as a technological tool but as a

vehicle to expand the teachers' pedagogical thinking as well as learning opportunities and optimal conditions for the different learner groups in different contexts.

Community and knowledge building

Community as a more or less stable entity has for quite some time been the unit of focus for many researchers. The basic premise behind *communities of practice* (Lave and Wenger 1991) has been that there is a community of people who share a way of communicating in certain ways, and gradually, by interacting with the members of the community, a new member becomes part of this community. This process has also been seen as a shift from a novice to an expert. In their attempt to define a new culture of learning, Thomas and Brown contrast communities with collectives,

As the name implies, [a collective] is a collection of people, skills, and talent that produces a result greater than the sum of its parts. For our purposes, collective is not solely defined by shared intention, action, or purpose (though those elements may exist and often do). Rather they are defined by an active engagement with the process of learning. [...] In communities, people learn in order to belong. In a collective, people belong in order to learn.

(Thomas and Brown 2011: 52)

The idea of community put forward by Thomas and Brown (2011) is that of a more dynamic collection of people. A similar notion is characteristic of Engeström's work (see for instance Engeström 2008), who has extensively studied learning that takes place within and across the contexts of workplace. In his many studies he has demonstrated how a great deal of learning in the workplace occurs in dynamic formations in which 'the center does not hold' and which are created around a task, a purpose or a goal. The same can be seen in today's youths' informal learning communities that can involve quite sophisticated and ambitious goals for learning, for instance in 3D design or for creating new guitar riffs. From a sustainability perspective, teacher communities or collectives need to exist not only to maintain, but also to recreate and reinvent the understanding and purpose of the implementation and use of certain tools and environments.

Organisational structures

Designing for sustainable development necessitates a systems view of the learning setting that represents the whole organisation as one ecology. In such a system most development is planned and carried out together with all levels of the organisation and with the larger organisational goals and factors in mind, while also recognising the possibility that something completely unplanned and unexpected might emerge as a result.

As noted by Boreham and Morgan,

[M]ost contemporary researchers define learning as organizational to the extent that it is undertaken by members of an organization to achieve organizational purposes, takes place in teams or other small groups, is distributed widely throughout the organization and embeds its outcomes in the organization's system, structures and culture.

(Boreham and Morgan 2004: 308)

In her framework for sustainable ICT integration that builds on the systems view, Taalas (2005) identifies teacher and learner support, mental and financial resources, and theoretical links to learning, language learning, and assessment as integral components. Based on the data from the SITES-M2 study, Owston (2007) proposes a model with almost identical elements. The main difference is that Owston's model lacks the theoretical aspect, and instead highlights the importance of the role of educational policies. However, as Taalas *et al.* (2008: 243) point out, the aspects of theory or research 'are often separated from both the practice and policy levels and thus form an isolated existence adjacent to both these levels, but without a real linkage to either. In addition, Owston (2007) maintains that some of these factors are essential whereas others can be seen as merely contributing to sustainability.

Jalkanen and Taalas (2013) discuss the idea of designing *for* sustainability and link

sustainable pedagogical development to organisational learning. They maintain that whereas organisational structures are important, there must also be room for emergence, discovery and new pedagogical initiatives. The sustainability of environments for learning also needs to be considered as these environments need to be both negotiated and rooted in the transforming organisational and pedagogical practice. In this way funding periods and project timeframes will no longer be the sole determining factors for the lifespan of the environments and new practices.

Two models for sustainable CALL development

The four pillars of CALL sustainable development briefly described above bear some analogy to the three pillars of environmental/ecological sustainability introduced at the beginning of this chapter. The economic and environmental pillars have been replaced by the organisational structures and learning environment pillars respectively. The social pillar has been divided into two components reflecting its collective and individual elements, as well as the interaction between them. In line with Lehtonen's (2004) discussion of the three pillars of environmental sustainability, we can conceptualise the relationships and interactions between the four pillars with the help of two distinct models.

The first model, or *institutional model*, takes, as a starting point, that the four pillars are equal and mutually interacting. However, they are likely to be treated as separate and independent

entities during the design, development and deployment of the CALL project. In line with Lehtonen (2004: 201), we can voice a number of criticisms against such a model, such as the risk of maintaining a status quo (for example, the non-transformation of existing pedagogical practices), a potential over-emphasis on 'productivity' (for example, the efficient delivery of courses to increasing number of students) as opposed to the quality of the language learning experience and outcomes, and the emergence of potential conflicts between the different pillars that may prove difficult to resolve. For example, the development of new pedagogical practices within an institution may conflict with the existing organisational structures, or with the learning environment available to language teachers and students at a point in time. The institutional model does however provide a useful sustainability roadmap for large collaborative projects, such as the SpeakApps project briefly discussed earlier, where different partners, usually from different countries and institutions, bring different contexts and practices that have to be taken into account in the collective design for sustainability.

The second model, which we identify as the *CALL ecosystem model*, assumes a form of hierarchy between the four pillars, which constitute nested systems. By analogy to the bioeconomy system discussed by Lehtonen (2004), the *environments for learning* circle circumscribes the social components and the *organisational structures* component constitutes the innermost circle. According to this model, and drawing on Lehtonen (2004), organisational structures should be in the service of all actors in the learning environment, while ensuring that the technologies, tools and language learning artefacts are adequately maintained and developed in response to the changing needs of teachers and learners. At the

same time, the social components should drive the organisational structures while being ‘submitted to the ultimate environmental constraints’ (Lehtonen 2004: 201) and ensuring that the affordances of the learning environment are realised. The environmental constraints and affordances for language learning are however frequently changing as a result not only of rapid technological changes, but also of institutional and national (or even international) priorities and policies in relation to e-learning. Borrowing from Lehtonen (2004: 202), and recalling Kennedy and Levy (2009), this does not mean however that the learning environment, and more particularly the technologies, ‘would necessarily always be the most important and relevant dimension’. Depending on the context, the development of individual teachers’ pedagogical and professional development and the community or collective to which they belong, or the organisational structures supporting (or impeding) the existing pedagogical practice may be ‘the most relevant and meaningful point of departure’ to ensure the sustainability of a CALL initiative. We believe that the CALL ecosystem model is particularly suited, at the local level, to CALL innovations that aspire to be self-organised and self-sustainable in the medium or longer term.

[FIGURE 16.3 INSERT ABOUT HERE]

A glance into the future

Throughout this chapter, we have highlighted the multidimensional facets of sustainable CALL from a systemic perspective while drawing on the literature on environmental/ecological sustainability. What we have called the *four pillars of sustainable*

CALL, by analogy to the *three pillars of sustainable development* discussed at the beginning of the chapter, constitute the foundations on which to build sustainable CALL initiatives and innovations, whatever their initial scope and context of deployment. Indeed, as mentioned earlier, designing for sustainability, as well as for teaching and learning (see Blin and Jalkanen 2014), and more specifically for sustainable CALL development, should be an integral part of all CALL designs from the outset.

The two models for sustainable CALL development we presented above are still very much in their infancy and require further work. They provide nevertheless a useful point of departure for developing CALL sustainability frameworks that take into account the dynamic interactions between the four dimensions within a particular context. In line with Lehtonen (2004: 211), we indeed believe that ‘[d]ifferent geographical and temporal scales as well as situational contexts require their own framework, which do not necessarily provide a coherent picture, but a mosaic of partly contradicting views of reality’. Context-specific sustainability measurements and indicators are also needed to evaluate the sustainability of a CALL innovation as well as trace the transformation of its different components and elements across multiple timescales.

When applied to CALL development, and when combined with systemic and ecological views of language, language teaching and language learning, the concepts and principles of

environmental/ecological sustainability are powerful tools that can only enrich the CALL research agenda and ensure that our designs and development activities will be maintained and prolonged while addressing the present and future needs of language learners and teachers.

Further reading

Lehtonen, M. (2004) 'The environmental–social interface of sustainable development: capabilities, social capital, institutions', *Ecological Economics*, 49 (2): 199–214.

In this article, Lehtonen explores the social dimension of sustainable development and the environmental-social interface. Although this work is located in ecological economics and not in CALL (nor in any cognate domain), the concepts presented and discussed provide an interesting starting point to explore the multidimensional features of sustainable CALL, and more particularly the role of the social dimension and of its dynamic interactions with other components.

Banathy, B. H. (1992) *A Systems View of Education: Concepts and Principles for Effective Practice*, Englewoods Cliffs, NJ: Educational Technology Publications.

In this book, Banathy defines his pioneering concept of systems thinking. His thinking has been used to help design strategies and methods in various contexts, for instance in the Educational Design System (EDS). In Banathy's work, design process is

viewed as a creative, iterative, holistic, decision-oriented process resulting in a model of a new system. He also emphasises that the designers must transcend current approaches and solutions to design a completely new model of a system appropriate for the specific, unique context.

Sterling, S. (2004) Higher Education, Sustainability and the Role of Systemic Learning. In Corcoran P. B. and Wals, A. E. J. (eds.), Higher Education and the Challenge of Sustainability: Problematics, Promise, and Practice. Dordrecht: Kluwer Academic.

In this paper, Sterling argues for a fundamental change in educational cultures and practices. Instead of approaching sustainability as an 'add on' to existing structures and curricula, he advocates a systemic learning approach, which places the transformation of practices and structures at the core of pedagogical and organisational development. The ideas presented in the paper are useful in repositioning and expanding the discussion of sustainable CALL development.

Owston, R. (2007) 'Contextual factors that sustain innovative pedagogical practice using technology: an international study', *Journal of Educational Change*, 8(1): 61-77.

In this article, Owston offers an explanatory model of sustainability that is based on the analysis of a great number of cases in the SITES-M2 project. He has identified

two sets of contextual factors that are either essential for or contributing to sustainable innovative teaching practices using technology. This model functions as a valuable point of departure for rethinking development projects and processes in CALL.

Ludvigsen, S., Lund, A., Rasmussen, I. and Säljö, R. (eds.) (2011) *Learning across sites. New tools, infrastructures and practices*. EARLI publications series. Routledge.

This collection of articles brings together a diverse range of contributions from leading international researchers to examine the impacts and roles which evolving digital technologies have on our navigation of education and professional work environments. Viewing learning as a socially organised activity, the contributors explore the evolution of learning technologies and knowledge acquisition in networked societies through empirical research in a range of industries and workplaces.

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