

CHAPTER 8

Moral reasoning in knowledge authoring: An e-learning 4.0 prospect!

Gonalo Jorge Morais da Costa, ISLA Leiria, Portugal

Nuno Sotero Alves da Silva, Lusada University of Lisbon, Portugal

Tiago Filipe Rodrigues da Fonseca, Lusada University of Lisbon, Portugal

ABSTRACT

The 21st century has produced novel perceptions for education based on autonomous and intelligent agents that web semantics commences and e-learning 4.0 acknowledges.

Therefore, it is crucial to debate what ethical and moral dilemmas arise in regard to knowledge authoring since a major shift pertaining to the concept of *knowledge author* can occur through moving from individuals (coordinator, tutor, or even learners) to non-human agents. However, mainstream e-learning literature seems to pay little attention to this *explanandum* evolution, as it merely focuses on technological development, e-learning 1.0 and 2.0 (individuals' behavior or ethical and moral issues), moral reasoning, and education challenges. Against this background, this chapter considers challenges related to knowledge authoring in e-learning 3.0 and 4.0. For that, the chapter is divided into four sections: disclosure (guiding concepts and additional constructs); digital knowledge (from traditional to distributed knowledge, digital authorship and the importance of pedagogy); e-learning (definition, technological generations and knowledge authoring); debate (moral reasoning and

ethical and moral array); future trends (an epiphany, 4.0-ethical and moral debate and an exponential epiphany).

INTRODUCTION

In order to discuss the higher education of the 21st century, it is vital to examine the key features and terms that illustrate and are associated with informational society. These include communication, interaction, automation, post-industrial, specialist, service, immaterial needs, postmodern, and learning society (Webster, 2006). Yet it is crucial to highlight e-learning evolution:

- 1.0-learning and communication facilitation despite impoverished interactivity (Codone, 2001)
- 2.0-active learning and collaboration through multiple interactions due to a mash-up of technologies such as blogs, wikis, podcasts, etc. (Codone, 2001)
- 3.0-active learning through the incorporation of autonomous and intelligent systems that assist in knowledge production (Schone, 2009). Although 3.0 e-learning requires the existence of a future semantic web (Anderson, 2004).

Hence, this evolution is promoting a major shift pertaining to the concept of *knowledge author*, its nature, and moral responsibility (Tapscott and Williams, 2006). According to Roberts (2005), in a Web 2.0 setting it is possible that learners may exchange with their lecturers the role of being active and leading the learning process and knowledge

construction. However, Spalding (2007) defines Web 3.0, or intelligent web, as “Highly specialized information silos, moderated by a cult of personality, validated by the community, and put into context with the inclusion of meta-data through widgets,” implying, to some extent, a non-human knowledge creation. This scenario will be a complete reality according to Web 4.0 predictions, leading to an obligatory discussion of ethical and moral dilemmas in knowledge creation.

Despite the importance of this debate, e-learning literature ignores its existence focusing, instead, on technological development (Wheeler, 2009), individuals’ behavior in education 1.0 and 2.0 (Baozhen, 2010), ethical and moral issues of education 1.0 and 2.0 (Jagger, 2010), moral reasoning (Reynolds and Ceranic, 2009), and pedagogical challenges arising from this evolution (Reis, 2011). Against this background, this chapter considers knowledge authoring challenges in 3.0 and 4.0 e-learning environments. For that, the chapter is divided into four sections: disclosure (guiding concepts and additional constructs); digital knowledge (from traditional to distributed knowledge, digital authorship and the importance of pedagogy); e-learning (definition, technological generations and knowledge authoring); debate (moral reasoning and ethical and moral array); future trends (an epiphany, 4.0- ethical and moral debate and an exponential epiphany).

DISCLOSURE

Disclosure is the act or procedure of revealing or exposing as well as formulating a revelation (The Free Dictionary, 2011a). In the context of this chapter, a revelation involves two analytical dimensions: guiding concepts (author, knowledge, and digitization), and additional constructs (e-learning, knowledge authoring, and moral reasoning). It is the authors’ aim to shed some light over the etymological assumption pertaining to author, knowledge, and digitization.

After careful reading of the following subsections, it is possible to argue that these guiding concepts are tremendously influenced by its etymological roots such as author acknowledges a human perception; knowledge refers to human learning process; and, despite digital information creation, the truth is that information and knowledge are different concepts. Whereas information is a flow of messages, knowledge indicates how schemas and mental models of the author influence what meaning is constructed (Nonaka, 1994). Furthermore, the future development of information and communication technology (ICT) will imply non-human knowledge creation.

Guiding concepts

Etymological roots.

Author is referred to as an “enlarger, founder, master or leader” or, even “who sets forth written statements” (Online Etymology Dictionary, 2011a); knowledge is a combination of *know* (“learn from experience”), and *ledge* (“action or process”) (Online Etymology Dictionary, 2011b); and digital means a combination of *digitus* (“finger” or “toe”, as well as numerical sense of counting) and *alis* (like or related to), which is a suffix to form adjectives from nouns or other adjectives (Online Etymology Dictionary, 2011c).

Definitions.

Following The Free Dictionary (2011b), author is the originator or creator of a book, article, text (including electronic documents), and, in addition, creator of a master plan (religious perception). Knowledge involves the awareness of understanding through personal experience or the study of several different subjects (The Free Dictionary, 2011c). Finally, digital refers to electronic devices that allow for generating, recording, processing,

transmitting, and displaying information presented in a discrete numerical form (The Free Dictionary, 2011d).

Additional constructs

E-learning.

A possible definition of e-learning entails “the use of a computer or electronic devices in some way to provide training, educational or learning material” (Stockley, 2003). Even so, the authors provide additional information in the e-learning section.

Knowledge authoring.

According to The Free Dictionary (2011b), it is an individual who is responsible or ought to be responsible for creating a book, article, or other text content (including electronic documents).

Moral reasoning.

Decision-making is a complex process recognized in the literature (Bennet and Bennet, 2008), although Jones (1991) argues that moral reasoning is a combination of moral intensity (MI) and moral sensibility (MS). MI refers to “the extent of issue-related moral imperative in a situation through six constructs” (Jones, 1991, p. 372) including magnitude of consequences (the sum of positive and negative circumstances resulting from a moral act); social consensus (the degree of social agreement in regard to the ethical validity of an action); probability of effect (probability of an action or a circumstance); temporal immediacy (length of time between the action and its consequences); proximity (social, cultural, psychological,

or physical closeness of the moral agent regarding other individuals); concentration of effect (impact versus the number of individuals affected). MS is the individual cognitive process (Jones, 1991) which is highly influenced by the work of Piaget (1965) on cognitive development, something that Kohlberg and Kramer (1969) applied to moral psychology.

DIGITAL KNOWLEDGE

After discussing the key concepts of this chapter, it is crucial to understand their relationship with the unique and novel nature of digital knowledge and authorship, as well as the importance of pedagogy.

From traditional to distributed knowledge

Plato in his work “Protagoras” considers knowledge as “the food of the soul” (Jowett, 1899) since ancient academic knowledge embraced a non-formal structure; yet, higher education requirements imply formal knowledge categories. For that, the work of Mannheim (1936) and Weber (1946) concerning the bound between the development of ideas and the exact social setting as well as individuals and groups interests, can be characterized as praxis. However, Nash, Dutton, and Peltu (2004) advocate that network connectivity unlocks novel opportunities for rethinking educational relationships and enhances the level of complexity that characterizes our civilization. This complexity is reflected in educational knowledge taxonomies, normative versus non-normative ones (Cavanagh, 2007). Despite this argument, a knowledge category that demonstrates a great potential to act as an enabler of learning experiences is distributed knowledge (Silva, Alvarez, and Rogerson, 2011; Hardaker and Smith, 2002) supported by two broad principles (Bonifacio, Bouquet, and Cuel, 2002):

- Autonomy — every individual ought to have a high level of autonomy to manage its local knowledge (similar to personal knowledge management)
- Coordination — each individual should be free to share knowledge with others, and not through imposition. Coordination is possible without possessing much knowledge of the other elements.

Even so, it is a challenge to understand the boundaries between knowledge and content (Costa and Silva, 2010a; Silva, Costa, Rogerson, and Prior, 2009) as well as particular cultural attributes such as language, discourse, former peculiar forms of expression, and emotions that learner's use to interpret and build knowledge (Anderson, 2008).

Digital authorship

Foucault (1969), suggesting that authorship as a concrete notion is not a reasonable assumption, questions as to why authors are often considered to be the product of their time. This argument reveals Foucault's critique regarding authors' powers and privileges as well as how they transcend history. Besides, this transcendental assumption may be related to Heidegger's philosophy because it manifests an underlying reality and heralds other remaining assumptions (Knight, 2007). "Without a proper perception of 'being' no proper knowledge is possible, so is beyond each entity and every potential features pertaining to any entity (*dasein*)" (Costa and Silva, 2010b, p. 37). Therefore, it is necessary to investigate the author functions and not the concept of author itself.

"Function" acknowledges a set of values or assumptions that rule knowledge creation, sharing, categorization, and utilization throughout four main features (Foucault, 1969):

- It is related to the legal system and is a consequence of transgressive behaviors
- It does not comprise a rigorous analysis, because it clearly depends on the topic

- Deciding about the editorial attribution (sole author) is not an easy process
- “Author” as a concept does not engage an individual, since an author is similar to a “narrator”.

Holland (1993) explains that digital technology challenges the normative individual author, “since it creates two types of authors/editors, re-fusing to distinguish between the two: those who write sentences and those who re-structure materials” (p. 21). This author also argues that plagiarism is a weak concept given the ongoing (changing) nature of digital knowledge.

The importance of pedagogy

The importance of pedagogy throughout educational history is well documented (Ólafsson and Thorsteinsson, 2009) in spite of compulsory challenges that online learning has promoted. Hence, the literature acknowledges the following online pedagogies: instructivism (behaviourism), cognitivism, constructivism, connectivism, and connethionism. While Instructional Systems Design (ISD) involves a platonic learning model (solitary drive for understanding) through the definition of learning objects design (Jones and Mercer, 2003), a cognitivism acknowledges the acquisition or reorganization of cognitive structures (Ravenscroft, 2001). This conceptualization informed curriculum’s informational structure. Constructivism assumes individual knowledge as an adaptive and active process which might be continuously changed due to social and cultural interactions. These social and cultural interactions increase with the rise of educational networks, since collaboration is the key to solving practical problems (Bednar, Cunnigham, Duffy and Perry, 2002). According to Siemens (2004), connectivism is characterized by the “amplification of learning, knowledge

and understanding through the extension of a personal network.” This theory reflects upon self-efficacy in personal knowledge management within educational environments.

Connethionism is a proposal for the future e-learning environments, and it “resumes an overlap between connectivism (pedagogy and learning theory for collaborative environments), ethicism (the demand for ethical ideas) and connectionism (human and non-human learning agents)” (Reis, 2011, p. 123).

E-LEARNING

The theoretical assumptions regarding digital knowledge do not arise in a vacuum, but as a *sine qua non* circumstance of educational technology which impacts knowledge authoring.

Definition

E-learning literature has gained tremendous pace since its inception, so it is easy to acknowledge Stahl’s (2005) definition: “e-learning will be defined as the use of ICT in higher education, which aims mainly at independent use of technology by students” (p. 21). E-learning involves online delivery of information for informal educational purposes, training, or knowledge management which occurs off-campus and typically, but not always, through online resources (distance learning) (Turban, Chung, Lee, and Chung, 2006). Alternatively, Wenmoth (2006) argues that these assumptions give rise to a continuum of thoughts pertaining to educational design, i.e., from an “established” to an “emergent.” The endeavor to induce formal education in developing student-centered learning environments, as for instance 2.0 or 3.0 should be criticized (Barnes and Tynan, 2007) since these contravene with the traditional boundaries of educational institutions and boost self-organized learning

(Wheeler, 2009). Likewise, e-learning is moving from collective (e-learning 1.0) to person-centered learning (e-learning 3.0).

Regardless of this evolution, the literature illustrates four generic categories of technological systems:

- *Learning Management System* supports administrative tasks (Lassila and Poyry, 2007)
- *Managed Learning Environment* comprises all information systems and processes, which enable a direct or indirect input to learning and learning management (Winter, 2006)
- *Learning Content Management System* permits creators to store, manage and provide access to pieces of content used in e-learning (Abazi-Bexheti, 2008);
- *Virtual Learning Environment* promotes online interactions among learners and tutors (Weller, 2007).

Nevertheless, Amaral, and Leal (2004) plead that lecturer, content, learner, place, time, and interactivity are the key factors of an e-learning project, because such a project involves conceptual and physical components grounded in standards with reference to procedures and technologies.

Technological generations

Crump and Costea (2003) suggest that technology-related learning exists in a dynamic continuum recognized by a particular generation of learners. Likewise, some definitions are necessary for understanding the context of this chapter:

- 1.0 learning creates the traditional perception of e-learning (Turban, Chung, Lee, and Chung, 2006)

- 2.0 learning refers to “interlocking set of open-source applications, where learning is becoming a creative activity and that the appropriate venue is a platform rather than an application” (Downes, 2005)
- 3.0 learning entails semantic web technologies to provide contextual information and organization of text, voice, and images throughout workflow tools as supporting infrastructure (Teten, 2007).

In spite of these definitions, it is important to debate the relationship among each generation’s technology (Turban, Lee, King, Liang, and Turban, 2010; Wheeler, 2009), pedagogy (Reis, 2011; McRobb, Jefferies, and Stahl, 2007), and knowledge authoring (Table 8.1).

Table 8.1. E-learning generations (technology versus knowledge authoring)

E-learning generation	Technology	Pedagogical theory	Knowledge authoring
1.0	Content portals, websites, enterprise portals, databases, file servers, file sharing, and search engines	Instructivism (learning objects design), socio-constructivism (peer review, forum/chat), and cognitivism (information consumption)	Coordinator and tutor
2.0	Community portals, social bookmarks and networks, multi-user games, instant	Connectivism (distributed collaboration), socio-cognitivism (social interaction), and socio-	Coordinator, tutor, and learner

	messaging, blogs, wikis, and RSS	culturalism (cultural competences)	
3.0	Intelligence agents, personal assistants, semantic web, semantic search, and knowledge bases	Connethionism (distributed collaboration, social interaction, social-culturalism, connectionism)	Coordinator, tutor, learner, and non-human agents

Knowledge authoring

Coordinator.

According to Wright (2007), a coordinator must reveal deep knowledge pertaining to new utilization of ICT across the curriculum and educational steps as well as inter-personal skills in developing, implementing, and evaluating the university e-learning program following appropriate policies and procedures. Thus, his or her responsibilities include developing and supervising pilot programs; providing faculty training; establishing quality standards, research, and development; ensuring a communication policy; and pursuing grants.

Tutor.

In order to debate tutor's activities throughout the learning process in e-education, the authors introduce Salmon's (2004) five-stage model, as shown in Table 8.2.

Table 8.2. Tutor's responsibilities

Stage	Tutor's responsibilities
-------	--------------------------

Stage 1 (access and motivation)	Welcome and encouragement; guidance about technical support
Stage 2 (online socialization)	Introductions, ice-breakers, proceeding rules
Stage 3 (information exchange)	Facilitate structured activities, assign roles and responsibilities, support learning materials utilization, encourage debates, and summarize findings
Stage 4 (knowledge construction)	Facilitate open activities, facilitate the process, raise queries, and promote reflection
Stage 5 (development)	Support, respond only when necessary, and encourage reflection

Source: Adapted from Salmon (2004)

Learners.

Today's learners, almost digital natives, have functioned in a digital environment for the most of their lives, so the use of web technologies is their routine (Prensky, 2001). The difference is that Web 2.0 allows learners to generate knowledge through collaboration by taking advantage of the wisdom of others' (Franklin and van Harmelen, 2007). Education 2.0 enables access to massive data, but, above all, authors use such data to generate new learning through remixing content (according to the creative common licensing) (Ivanova and Ivanova, 2009), which afterwards they share with the community. This learner's participation embraces a *long tail*, how culture and economy shift the demand of market niches concerning

knowledge authoring, construction, and publishing (learning personalisation) (Anderson, 2006).

DEBATE

Bearing in mind the aim of this chapter, it is necessary to explain authors' moral reasoning as well as to debate what ethical and moral dilemmas arise in knowledge authoring.

Moral reasoning

According to (Reynolds, 2006), “stages of moral decision making may not be discrete elements of a formulaic thought process but may actually be interrelated in a very complex way” (p. 241). This, in turn, implies moral intention (Frey, 2000). Moral intention represents a new paradigm in professional computing since it focuses on all individual processes (causes and conditions) associated with moral behavior (Huff and Frey, 2005). However, in order to discuss non-human agents due to e-learning 3.0, it is necessary to shed some light over the concept of moral intelligence. Moral intelligence resumes the operational interaction among the three levels of moral conduct: action, cognition, and spirituality (Panã, 2006). This author also suggests (L. Panã, personal communication, November 2005) that moral intelligence in non-human agents is doable but extremely difficult due to a) the synthetic nature of moral intelligence; b) the multitude of the implied aptitudes; c) moral values are generated by diverse activity fields; d) the realization of moral values is ensured by cooperation of entities; e) the normative structure of moral conduct; f) the possibility to develop moral techniques as variants of intellectual techniques; g) the chance to apply a wide range of methods; and h) the opportunity to conceive and design all practical intelligence forms as clusters.

Therefore, moral intelligence can be bonded to moral conscience (component of spirituality) and moral values (particular value system within a generic framework societal value system) (L. Panã, personal communication, November 2005). In spite of these important factors, the literature focuses on professional moral reasoning (Huff, 2011) or moral intelligence in non-human agents (Goertzel and Bugaj, 2008), not paying attention to knowledge authoring issues in educational environments.

Ethical and moral array

Stahl (2002) points out that in order to accomplish a responsible utilization of learning technology, participants need a considerable degree of education concerning social and ethical norms. This author also introduces a conceptual matrix with three analytical dimensions pertaining to the ethical dilemmas of e-learning such as perceptions of the ethical impact, the subject involved, and the distinction between a theoretical and a practical problems. These dilemmas can be scrutinized at three scales. Moreover, ethical theories over time become associated with the micro-level (individuals). Whereas the meso-level entails the e-learning project itself, the third component deals with the educational institutions (macro-level) (Stahl, 2002). Nevertheless Stahl's matrix requires an update in order to respond promptly to 3.0 characteristics of e-education (Spalding, 2007) as well as to the evolution of knowledge authoring (Davis, 2008) (Table 8.3).

Table 8.3. Patterns of tutors' responsibilities versus knowledge evolution.

Pattern	Knowledge-centric
Developers	Prosumers and peer-to-peer review
Knowledge expressions	United platforms handle documents and behaviors (images

	and natural language), and massive open local semantics
Knowledge and logic	User input and from system learning
Patterns for system learning	System learns and evolve with individuals utilization, and autonomic learning (adaptation)
Patterns for knowledge representation	Data intensive storage with semantic operators, external declarative knowledge structures, and full spectrum of logic
Patterns for underlying infrastructure	Adaptive configurations, ubiquitous semantic meshes and grids, and social autopoiesis
Patterns for security	Autonomic identity with granular levels
Patterns for change management	Automated change management, autonomic intellectual property, and emergent behaviors

Source: Adapted from Davis (2008)

Based on these assumptions, it is possible to raise an array of queries in regard to knowledge authoring in these new learning environments:

- Query 1. Are the ethicultural challenges similar? If not, which major differences occur in each evolutionary stage?
- Query 2. Assuming the “platform” (non-human agent) is *knowledge creator*, who owns the intellectual property rights?
- Query 3. Who is morally responsible for authoring that knowledge?
- Query 4. What does moral reasoning in knowledge authoring mean?

Below we will consider the four quires in detail.

Query 1: Ethicultural challenges.

According to Silva, Costa, Prior, Rogerson, and Stahl (in press; 2010), ethicultural sensitivity acknowledges a combination of ethical and cultural sensitivity because knowledge creators have social responsibility to achieve cultural authenticity (Thomas, Mitchell, and Joseph, 2002) and technology is not neutral (Tripathi, 2010). Despite this claim, empirical data reveals that such reality is an unattainable aspiration in e-learning 1.0 and 2.0 (Silva, Costa, Prior, Rogerson, and Stahl, in press; 2010). Remembering a technological mash-up of e-learning 3.0, namely, non-human and human dialogue and interactions, is the authors' belief that ethicultural sensitivity will continue to be a wishful thinking. The reasons for this argument are as follows. If the system will learn and evolve with individuals' utilization (see Table 8.3), assuming that, despite memetic computing, a non-ethicultural sensitive *human knowledge creator* implies a non-ethicultural sensitive *non-human knowledge creator*. Memetic computing is an attempt to capture the biological-cultural combination and optimization in non-human agents (Emergent Technologies Task Force on Memetic Computing, 2010), i.e., ethicultural sensitivity in non-human agents.

Query 2: Intellectual property rights.

Consider an example: team-writing an article. There is a relation between the name order of the authors and their respective contributions to the article, including intellectual property rights (Laband, 2002). However, it is difficult to identify each author's contribution to a multidisciplinary scientific collaboration (Tscharncke, Hochberg, Rand, Resh, and Krauss, 2007). This example clearly demonstrates the critical evolution of e-learning generations and its implications regarding intellectual property rights, which Web 2.0 already

acknowledges since learners are *knowledge creators* (Ivanova and Ivanova, 2009). This debate becomes even fuzzier in the context of e-learning 3.0 due to the following two factors:

- Autonomic learning which is based on the inner mechanism of self-directed learning including learners' attitudes, competences and learning strategies (Wang and Li, 2007)
- Autonomic non-human learning which is based on systems that create or ought to create self-knowledge (Cofino, Doganata, Drissi, Fin, Kozakov, et al., 2003).

If an article is prepared jointly by a *human* and *non-human knowledge creator*, what is the outcome? In this context, Gutwirth and Hert (2006) inquire:

- Assuming autonomic human learning, what balance will occur among users and knowledge "owners" of these technologies?
- Assuming autonomic non-human learning, who owns intellectual property rights? Humans that assume a "pastoral care" relationship or an autopoietic non-human agent?

Query 3: Moral responsibility.

From the previous analyses the following question arises: Who is morally responsible for authoring this knowledge? This question points at the legal subjectivity of intellectual property rights (Gutwirth and Hert, 2006) since a *non-human* agent's own actions continue to illustrate difficulties about a copyright law. In fact, their polymorphic behavior leads to unpredictable outcomes which even hurdle the legal and moral analysis (Shoyama, 2005). Thus, two ideas attempt to understand the exclusion of non-human agents as *knowledge creators* (Groom, 2004): technological exclusion (defined as design measures to prevent or restrain copyright or related rights) and contractual exclusion (Internet structure facilitates contractual interactions in a variety of ways as, for instance, the immediate communication regarding agreement terms and conditions).

Query 4: Moral reasoning.

According to Frohmann (2000), moral dangers are a consequence of incorporeal conceptions of knowledge that *non-human* agents produce. In order to ascribe moral reasoning to non-human agents, it is vital to positively respond to the following questions (Sullins, 2006):

- Are the non-human agents considerably autonomous?
- What is the meaning of intentional behavior?
- Are the non-human agents morally responsible?

Autonomy is a condition or state that assumes self-government and self-determination (The Free Dictionary, 2011e). However, if it is unclear that personal autonomy belongs to individuals (Christman, 2011), what will be the answer for autonomous non-human agents? According to Sullins (2006), it is possible to assign moral agency to a non-human agent (due to autonomic learning), but is not a satisfactory argument to acknowledge moral agency. Moreover, because the interaction among humans and non-human systems may produce unforeseen results, it is crucial to explore this cognitive interaction (Marino and Tamburrini, 2006). By the same token, if the complex interaction among non-human agents and their environment causes moral hazardous or benefits through deliberate and calculated actions, than such agents are moral agents (Sullins, 2006). Despite revealing the intention, it is impossible to ignore that their level of autonomy depends on external information and design constraints (Gotterbarn, 2010). From the above assumptions it is reasonable to state that a non-human agent simply entails moral agency, since “quasi-responsibility indicates that the speaker intends to use the idea of a social construction for the purpose of ascribing a subject to an object with the aim of attributing sanctions (the heart of responsibility) without regard to

the question whether the subject fulfills the traditional conditions of responsibility” (Stahl, 2006, p. 210).

PROSPECT: AN EPIPHANY!

An epiphany!

“The best way to predict the future is to invent it” (A. Kay, personal communication, September 1971), which, to some extent, may be an allusion to the concept of epiphany. An epiphany comprises two analytical dimensions: a divine (revelatory manifestation of a Christian feast) and non-divine (unexpected manifestation of the essence or comprehending something through intuition) (The Free Dictionary, 2011f). This section will shed some light over the ethical and moral debate of 4.0 education and, of course, will include the authors’ epiphany.

4.0 education- Ethical and moral debate

Bearing in mind that it is impossible to dissociate educational technology and web evolution, the authors debate the key characteristics of the fourth generation of the Internet. Kurzweil (2009) suggests that Web 4.0 will involve a combination of human and non-human brain recognition, which will “download” skills and knowledge (post-human society). Tow (2010) pleads complete ubiquitous capabilities (repository for past and present human civilization knowledge) as the core assumption of the Web, since it will become a conscious and cognoscenti multidimensional network (joint human and artificial intelligence due to the quantum computing) from which meta-knowledge (complex decision-making) will arise in order for a progress to be achievable. Likewise, haptics (different sensations that objects and interfaces provide to individuals) will permit communication among human and artificial

intelligence (Kambil, 2008), as well as a continuous exchange of our behavioral profiles and activities (Nash, 2008). Also, Spivack (2007) advocates a mash-up of the previous perspectives. However, in order to promote a reliable argument, it is essential to understand what will be the effect of Web 4.0 on the above four queries.

Query 1: Ethicultural challenges. Following Panã (2006), moral intelligence of *non-human* agents can provide a basis for cultural abilities, because intelligence represents compliance with requirements, norms, and values from the miscellaneous spheres of activities. Likewise, this author acknowledges that moral intelligence will allow for generating manifestations of cultural existence through intellectual spaces and processes. If Web 4.0 embraces a “total relationship” (physical and virtual) among *non-human agents* and *individuals* through haptics, it is reasonable to claim that intelligence is distributed across the social, natural, cultural and technological environment (“glocal memory”) (Goertzel, 2008). Moreover, due to informational existentialism (Costa and Silva, 2010b), ethicultural sensitivity may become a reality.

Queries 2 and 3: Intellectual property rights and moral responsibility. With fully conscious *non-human agents* that produce knowledge according to our behavioral profiles and activities (Nash, 2008), “authorship can no longer either account for a linear development which has a *beginning* and an *end* . . . or account for invention and form” (Eisenman, 1976), given human perception of decentralization and individual creativity. Therefore, a major legal change must occur not only in the context of intellectual property rights. Due to the blend of body and mind and their extension into virtual environments, the boundaries of human agents will become more malleable (Yakhlef, 2008). Furthermore, the methodological and

ontological perceptions of knowledge will change (Baofu, 2008), suggesting sophisticated holism (methodology) and existential dialectics (ontology) consistent with informational existentialism (Costa and Silva, 2010b). These assumptions enable the authors to argue that moral responsibility concerning knowledge authoring is a human charge, despite the fact that non-human agents may, to some extent, generate knowledge (queries 2 and 3 in regard to the previous analyses of ethical and moral issues).

Query 4: Moral reasoning. Following Himma (2009), moral agency implies two conditions: free choice (rational agent), and understanding the consequences of actions. The issue of conscience within *non-human agents* assumes a traditional anthropocentric conception (Floridi and Sanders, 2004), and non-human agents do not possess functional consciousness (Torrance, 2008). Although, the neurobiological bond between humans and agents will promote a synthetic concept of moral intelligence (L. Pană, personal communication, November 2005).

An exponential epiphany

An exponential epiphany will shed some light beyond Web 4.0! Despite the fact that it is even more complex to predict the future, the authors acknowledge the arrival of Web 5.0. This sensory-emotive web represents an emotional responsive environment concerning the users' experiences and interactions between physical and virtual world (Kambil, 2008). This author argues that the lack of emotional awareness is a key characteristic of the Web today, despite the attempts of recognizing emotions through the Web (Kamvar and Harris, 2011). The difference is that *non-human agents* through interaction will be able to recognize our mental and emotional states, because emotions comprise a significant ingredient of our

existence (Randrup, 2005). In his latest work, Damásio (2010) evolves neurobiological theories regarding our consciousness in spite of the mereological fallacy (reductionism) (Bennet and Hacker, 2003). This debate will permit the development of this emotional conscientious in *non-human agents*. Nonetheless, what are the consequences pertaining to knowledge authoring? Will it be possible to achieve a truly cognitive emotional pedagogy? Considering that cognitive emotional pedagogy recognizes distinct emotional experiences as the key feature of knowledge construction (Chabot and Chabot, 2006), some crucial queries arise: Who will have access to these *non-human agents* and, ultimately, to individuals' emotions? Will these *non-human agents* generate contradictory feelings? Will these *non-humans agents* generate new emotions in knowledge authors? If yes, what will be the effects on knowledge authoring?

CONCLUSION

The evolution of e-learning has been widely debated in the literature, although, as this chapter has demonstrated, the dilemmas concerning knowledge authoring have been neglected. This scenario is even more problematic since the concept of authoring is being challenged, and education 3.0 and 4.0 will enhance these dilemmas since *non-human widgets* (agents) will generate knowledge and possess the ability to evolve with individuals' utilization. Furthermore, a considerable amount of new queries arise due to the rise of Web 5.0, so the future educational systems must be “*localitas* (as a necessary quality of bodies), *connectivitas* (fusion status about multi-glocal experiences), and *humanitas* (capacity for self-consciousness, self-exploration, and self-determination as the Roman philosopher Cicero describes)” (Silva, Alvarez, and Rogerson, 2011, p. 148).

REFERENCES

- Abazi-Bexheti, L. (2008). Development of a learning content management system. *International journal of systems applications, engineering & development*, 1(2), 1-5.
- Amaral, L. A., & Leal, D. (2004). *From classroom teaching to e-learning: The way for a strong definition*. Braga: Universidade do Minho.
- Anderson, C. (2006). *The long tail- Why the future of business is selling less of more*. New York, NY: Hyperion.
- Anderson, T. (2008). Towards a theory of online learning. In T. Anderson (Ed.), *Theory and practice of online learning* (2nd edition, pp. 45-74). Edmonton, AB: AU Press.
- Anderson, T. (2004). The educational semantic web: A vision for the next phase of educational computing. *Educational technology*, 44(5), 5-9.
- Baofu, P. (2008). *The future of post-human knowledge: A preface to a new theory of methodology and ontology*. Oxford: Woodhead Publishing Limited.
- Baozhen, L. (2010). Personalisation and sociability of open knowledge management based on social tagging. *Online information review*, 34(4), 618-625.
- Barnes, C., & Tynan, B. (2007). The adventures of Miranda in the brave new world: Learning in a Web 2.0 millennium. *ALT-J: Research in learning technology*, 15(3), 189-200.
- Bednar, A., Cunnigham, D., Duffy, T., & Perry, J. (2002). Theory into practice: How do we link. In G. Anglin (Ed.), *Instructional technology: Past, present and future* (pp. 100-112). Denver, CO: Libraries Unlimited.
- Bennet, A., & Bennet, D. (2008). The decision-making process in a complex situation. In F. Burstein, & C. W. Holsapple (Eds.), *Handbook on decision support systems 1- Basic themes* (pp. 3-20). Leipzig: Springer-Verlag.
- Bennet, M. R., & Hacker, P. M. S. (2003). *Philosophical foundations of neuroscience*. Malden, MA: Blackwell.

- Bonifacio, M., Bouquet, P., & Traverso, P. (2002). Enabling distributed knowledge management. Managerial and technological implications. *Informatique*, 3(1), 23-29.
- Cavanagh, A. (2007). *Sociology in the age of the internet*. Buckingham: Open University Press.
- Chabot, M., & Chabot, D. (2006). *Emotional pedagogy- To feel in order to learn*. Victoria, BC: Trafford Publishing.
- Christman, J. (2011). *Autonomy in moral and political philosophy* [Paper]. Available: <http://plato.stanford.edu/entries/autonomy-moral/>.
- Codone, S. (2001). *An e-learning primer*. Pensacola, FL: Raytheon Interactive.
- Cofino, T., Doganata, Y., Drissi, Y., Fin, T., Kozakov, L., & Laker, M. (2003). Towards knowledge management in autonomic systems. In K. Nyberg (Ed.), *Eighth IEEE Symposium on Computers and Communications* (pp. 789-794). Kemer-Antalya, Turkey: IEEE.
- Costa, G. J. M., & Silva, N. S. A. (2010a). Knowledge versus content in e-learning: A philosophical discussion! *Information systems frontiers*, 12(4), 399-413.
- Costa, G. J. M., & Silva, N. S. A. (2010b). Informational existentialism! Will information ethics shape our existence? *International review of information ethics*, 13(013), 33-41.
- Crump, N., & Costea, B. (2003). *Pedagogical objects in management education: A cultural historical critique* [Working paper]. Available: http://eprints.lancs.ac.uk/26287/1/Pedagogical_Objects_Lancaster_Working_Paper.pdf.
- Damásio, A. (2010). *Self comes to mind: Constructing the conscious brain*. New York, NY: Pantheon Books.
- Davis, M. (2008). *Semantic wave 2008 report: Industry roadmap to web 3.0 & multibillion dollar market opportunities* [Report]. Available: <http://www.cs.uwaterloo.ca/~j55wu/pub/swwave2008.pdf>.

- Downes, S. (2005). *E-learning 2.0* [Article]. Available: <http://www.elearnmag.org/subpage.cfm?section=articles&article=29-1>.
- Eisenman, P. (1976). Post-functionalism. *Oppositions* 6. New York: Institute for Architecture and Urban Studies.
- Emergent Technologies Task Force on Memetic Computing (2010). *Memetic computing* [E-text]. Available: <http://www3.ntu.edu.sg/home/asysong/ETTC/ETTC%20Task%20Force%20-%20Memetic%20Computing.htm>.
- Floridi, L., & Sanders, J. W. (2004). On the morality of artificial agents. *Mind & machines*, 14(3), 349-379.
- Foucault, M. (1969). What is an author? *Bulletin de la societe francaise de philosophie*, 63(3), 73-104.
- Franklin, T., & van Harmelen, M. (2007). *Web 2.0 for content for learning and teaching in higher education* [Document]. Available: <http://www.franklin-consulting.co.uk/LinkedDocuments/Web2-Content-learning-and-teaching.pdf>.
- Frey, B. F. (2000). The impact of moral intensity on decision making in a business context. *Journal of business ethics*, 26(3), 181-195
- Frohmann, B. (2000). Cyber ethics: Bodies or bytes? *The international information & library review*, 32(3/4), 423-435.
- Goertzel, B. (2008). Glocal memory: A new perspective on knowledge representation, neurodynamics, distributed cognition, and the nature of mind. *Dynamical psychology: An international, interdisciplinary journal of complex mental processes* [Paper]. Available: http://www.goertzel.org/dynapsyc/2008/glocal_memory.pdf.
- Goertzel, B., & Bugaj, S. V. (2008). Stages of ethical development in artificial general intelligence systems. In P. Wang, B. Goertzel, & S. Franklin (Eds.), *AGI 2008* (pp. 448-459). Memphis, TN: IOS Press.

- Gotterbarn, D. (2010). Autonomous weapon's ethical decisions; "I'm sorry Dave; I am afraid I can't do that. In M. Arias-Oliva, T. W. Bynum, S. Rogerson, & T. Torres-Coronas (Eds.), *ETHICOMP 2010* (pp. 219-229). Tarragona, Spain: University of Rovira i Virgili.
- Groom, J. (2004). Are "agent" exclusion clauses a legitimate application of the EU database directive? *SCRIPTed- A journal of law, technology & society*, 1(1), 83-118.
- Gutwirth, S., & Hert, P. D. (2006). *Law and autonomic computing: Mutual transformations* (GOA Proposal). Brussels, Belgium: Free University Brussels, Faculty of Law.
- Hardaker, G., & Smith, D. (2002). E-learning communities: Virtual markets and knowledge creation. *European business review*, 14(5), 342-350.
- Himma, K. E. (2009). Artificial agency, consciousness, and the criteria for moral agency: What properties must an artificial agent have to be a moral agent? *Ethics and information technology*, 11(1), 19-29.
- Holland, P. (1993). Authorship and collaboration: The problem of editing Shakespeare. In W. Cherniak, C. Davis, & M. Deegan (Eds.), *The politics of the electronic text* (pp. 17-24). Oxford: Office for Humanities Communication.
- Huff, C. W. (2011). What does knowledge have to do with ethics? In G. J. M. Costa (Ed.), *Handbook of ethical and social issues in knowledge management: Organizational innovation*. (pp. 17-26). Hershey, PA: IGI Global.
- Huff, C. W., & Frey, W. (2005). Moral pedagogy and practical ethics. *Science and engineering ethics*, 11(3), 1-20.
- Ivanova, M., & Ivanova, T. (2009). Web 2.0 and Web 3.0 environments: Possibilities for authoring and knowledge representation. *Revista de informatică socială*, 7(12), 7-21.
- Jagger, S. (2010). Measuring moral judgment in computing undergraduates using the defining issues test. In M. Arias-Oliva, T. W. Bynum, S. Rogerson, & T. Torres-Coronas (Eds.), *ETHICOMP 2010* (pp. 321-331). Tarragona, Spain: University of Rovira i Virgili.

- Jones, A., & Mercer, N. (2003). Theories of learning and information technology. In P. Scrimshaw (Ed.), *Language, classroom and computers* (pp. 11-26). London: Routledge.
- Jones, T. (1991). Ethical decision making by individuals in organizations: An issue-contingent model. *Academy of management review*, 16(2), 366-395.
- Jowett, B. (1899). *Protagoras: Dialogues of Plato*. Michigan, MI: The Colonial Press.
- Kambil, A. (2008). What is your 5.0 web strategy? *Journal of business strategy*, 29(6), 56-58.
- Kamvar, S. D., & Harris, J. (2011). We feel fine and searching the emotional web. In E. M. Voorhees, & L. P. Buckland (Eds.), *WSDM 2011* (pp. 117-126). New York, NY: ACM.
- Knight, K. (2007). *Aristotelian philosophy: Ethics and politics from Aristotle to MacIntyre*. Malden, MA: Polity Press.
- Kohlberg, L., & Kramer, R. (1969). Continuities and discontinuities in childhood and adult moral development. *Human development*, 12, 93-120.
- Kurzweil, R. (2009). *The intelligent universe* [Post]. Available: <http://softtechnic.blogspot.com/2009/09/intelligent-universe.html>.
- Laband, D. N. (2002). Contribution, attribution and the allocation of intellectual property rights: Economics versus agricultural economics. *Labour economics*, 9(1), 125-131.
- Lassila, A., & Poyry, P. L. (2007). Online education and learning management systems from service- Centered perspective source. In V. Koskov (Ed.), *Proceedings of the international conference web-based education* (pp. 322-330). Anaheim, CA: ACTA Press.
- Mannheim, K. (1936). *Ideology and utopia: An introduction to the sociology of knowledge* (Translated L. Wirth, & E. Shils). New York, NY: Harcourt Brace and World.
- Marino, D., & Tamburrini, T. (2006). Learning robots and human responsibility. *International review of information ethics*, 6(006), 46-51.

- McRobb, S., Jefferies, P., & Stahl, B. C. (2007). Exploring the relationships between pedagogy, ethics & technology: Building a framework for strategy development. *Technology, pedagogy & education*, 6(1), 111-126.
- Nash, S. S. (2008). *Web 3.0, web 4.0 and personal agents: Will they open or restrict choice?* [Post]. Available: <http://elearnqueen.blogspot.com/2008/10/web-30-web-40-and-personal-agents-will.html>.
- Nash, V., Dutton, W., & Peltu, M. (2004). *Innovative pathways to the next level of e-learning* [Forum discussion paper] Available: http://www.oii.ox.ac.uk/resources/publications/OIIFD2_200409.pdf.
- Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization science*, 5(1), 14-37.
- Ólafsson, B., & Thorsteinsson, G. (2009). Design and craft education in Iceland, pedagogical background and development: A literature review. *Design and technology education: An international journal* [E-journal], 14(2), 10-24. Available: <http://jil.lboro.ac.uk/ojs/index.php/DATE/article/viewFile/246/183>.
- Online Etymology Dictionary (2011a). *Author* [E-text]. Available: <http://www.etymonline.com/index.php?term=author>.
- Online Etymology Dictionary (2011b). *Knowledge* [E-text]. Available: <http://www.etymonline.com/index.php?term=knowledge>.
- Online Etymology Dictionary (2011c). *Digital* [E-text]. Available: <http://www.etymonline.com/index.php?term=digit>.
- Panã, L. (2006). Artificial intelligence and moral intelligence. *Triple C*, 4(2), 254-264.
- Piaget, J. (1965). *The moral judgment of the child*. New York, NY: Free Press.

Prensky, M. (2001). Digital natives, digital immigrants. *On the horizon* [E-journal], 9(5).

Available: <http://www.marcprensky.com/writing/prensky%20-%20digital%20natives,%20digital%20immigrants%20-%20part1.pdf>.

Randrup, A. (2005). *Conscious experience, existence and behaviour: Significance of consciousness in human life*. [Paper]. Available: <http://cogprints.org/4368/1/experienceexistence.html>.

Ravenscroft, A. (2001). Designing e-learning interactions in the 21st century: Revisiting and rethinking the role of theory. *European journal of education*, 36(2), 133-156.

Reis, A. (2011). From connectivism to “ethicism”. In G. J. M. Costa (Ed.), *Handbook of ethical and social issues in knowledge management: Organizational innovation* (pp. 113-130). Hershey, PA: IGI Global.

Reynolds, S. J. (2006). Moral awareness and ethical predispositions: Investigating the role of individual differences in the recognition of moral issues. *Journal of applied psychology*, 91(1), 233-243.

Reynolds, S. J., & Ceranic, T. L. (2009). On the causes and conditions of moral behaviour: Why is this all we known. In D. De Cremer (Ed.), *Psychological perspectives on ethical behaviour and decision making* (pp. 17-34). Charlotte, NC: Information Age Publishing.

Roberts, G. (2005). Technology and learning expectations of the net generation. In D. G. Oblinger, & J. L. Oblinger (Eds.), *Educating the net generation* (pp. 3.1-3.7). Boulder, CO: EDUCAUSE.

Salmon, G. (2004). *E-moderating: The key to teaching and learning online*. London: Kogan Page.

Schone, B. J. (2009). *The future of e-learning is social learning* [Post]. Available: <http://elearningweekly.wordpress.com/2009/05/02/the-future-of-elearning-is-social-learning/>.

- Shoyama, R. M. (2005). Intelligent agents: Authors, makers, and owners of computer-generated works in Canadian copyright law. *Canadian journal of law and technology*, 4(2), 129-140.
- Siemens, G. (2004). *Connectivism: A learning theory for the digital age* [Resource document]. Available: <http://www.elearnspace.org/Articles/connectivism.htm>.
- Silva, N. S. A., Alvarez, I. M. S. B., & Rogerson, S. (2011). Glocality, diversity and ethics of distributed knowledge. In G. J. M. Costa (Ed.), *Handbook of ethical and social issues in knowledge management: Organizational innovation* (pp. 131-158). Hershey, PA: IGI Global.
- Silva, N. S. A., Costa, G. J. M., Prior, M., Rogerson, S., & Stahl, B. C. (in press). To be or not to be ethically sensitive in e-learning: An analysis to knowledge authoring. *ED-Media 2011*.
- Silva, N. S. A., Costa, G. J. M., Prior, M., Rogerson, S., & Stahl, B. C (2010). Knowledge authoring in e-learning: An ethically diagnosis! In P. Dondon, & O. Martin (Eds.), *7th WSEAS International Conference on Engineering Education* (pp. 48-53). Corfu. Greece.
- Silva, N. S. A., Costa, G. J. M., Rogerson, S. & Prior, M. (2009). Knowledge or content? The philosophical boundaries in e-learning pedagogical theories! In A. M. Vilas, A. S. Martín, J.A. González, & J. M. González (Eds.), *m-ICTE 2009: Research, reflections and innovations in integrating ICT in education* (pp. 221-225). Lisbon: Formatex.
- Spalding, S. (2007). *How to define web 3.0* [Post]. Available: <http://howtosplitanatom.com/news/how-to-define-web-30-2/>.
- Spivack, N. (2007). *How the webOS evolves?* [Post]. Available: http://novaspivack.typepad.com/nova_spivacks_weblog/2007/02/steps_towards_a.html.
- Stahl, B. C. (2006). Responsible computers? A case for ascribing quasi-responsibility to computers independent of personhood or agency. *Ethics & information technology*, 8(4), 205-213.

Stahl, B. C. (2005). E-voting: An example of collaborative e-teaching and e-learning. *Journal of interactive technology & smart education*, 2(1), 19-30.

Stahl, B. C. (2002). Ethical issues in e-teaching- A theoretical framework. In G. King, M. Ross, G. Staples, & T. Twomey (Eds.), *Proceedings of Inspire VII, quality in learning and delivery techniques* (pp. 135-148). Limerick, Ireland: The British Computer Society.

Stockley, D. (2003). *E-learning definition and explanation* [E-text]. Available: <http://derekstockley.com.au/elearning-definition.html>.

Sullins, J. P. (2006). When is a robot a moral agent? *International review of information ethics*, 6(006), 23-30.

Tapscott, D., & Williams, A. D. (2006). *Wikinomics: How mass collaboration changes everything*. New York, NY: Penguin Books.

Teten, D. (2007, June). *Web 3.0: Where are we headed?* Paper presented at the Web 2.0 New York Conference, New York, NY.

The Free Dictionary (2011a). *Disclosure* [E-text]. Available: <http://www.thefreedictionary.com/disclosure>.

The Free Dictionary (2011b). *Author* [E-text]. Available: <http://www.thefreedictionary.com/author>.

The Free Dictionary (2011c). *Knowledge* [E-text]. Available: <http://www.thefreedictionary.com/knowledge>.

The Free Dictionary (2011d). *Digital* [E-text]. Available: <http://www.thefreedictionary.com/digital>.

The Free Dictionary (2011e). *Autonomy* [E-text]. Available: <http://www.thefreedictionary.com/autonomy>.

The Free Dictionary (2011f). *Epiphany* [E-text]. Available: <http://www.thefreedictionary.com/epiphany>.

- Thomas, M., Mitchell, M., & Joseph, R. (2002). The third dimension of ADDIE: A cultural embrace. *TechTrends*, 46(2), 40-45.
- Torrance, S. (2008). Ethics and consciousness in artificial agents. *Ethics and information technology*, 22(4), 495-521.
- Tow, D. (2010). *Future web* [Post]. Available:
<http://futurewebblog.blogspot.com/2010/06/future-of-web.html>.
- Tripathi, A. K. (2010). Ethics and aesthetics of technologies. *AI & society*, 25(1), 5-9.
- Tscharntke, T., Hochberg, M. E., Rand, T. A., Resh, V. H., & Krauss, J. (2007). Author sequence and credit for contributions in multiauthored publications. *PLoS biology*, 5(1), e18.
- Turban, E., Lee, J., King, D., Liang, T. P., & Turban, D. (2010). *Electronic commerce 2010*. Upper Saddle River, NJ: Prentice Hall.
- Turban, E., Chung, H. M., Lee, J. K., & Chung, M. (Eds.). (2006). *Electronic commerce: A managerial perspective*. Thousand Oaks, CA: Prentice Hall.
- Wang, J., & Li, F-z. (2007). Autonomic learning model and algorithm based on DFL. In T. Y. Lin (Ed.), *Granular computing 2007* (pp. 259-264). Fremont, CA: IEEE.
- Weber, M. (1946). The social psychology of the world religions. In H. H. Gerth, & C. W. Mills (Eds.), *From Max Weber: Essays in sociology* (pp. 267-301). New York, NY: Galaxy.
- Webster, F. (2006). *Theories of the information society* (3rd edition). London: Routledge.
- Weller, M. J. (2007). *Virtual learning environments: Using, choosing and developing your VLE*. London: Routledge.
- Wenmoth, D. (2006). *OLE scope* [Core Education Ltd Whitepaper]. Available:
<http://blog.core-ed.org/derekarchives/archives/OLE%20Scope.pdf>.
- Wheeler, S. (2009). *E-learning 3.0* [Post]. Available: <http://steve-wheeler.blogspot.com/2009/04/learning-30.html>.

Winter, M. (2006). *Learning management systems in the workplace: A research report*

[Research Report]. Available: http://www.tanz.ac.nz/pdf/LMS_Final.pdf.

Wright, J. (2007). *The primary ICT and e-learning co-ordinator's manual: Book 1, a guide for new leaders*. London: Paul Chapman Educational.

Yakhlef, A. (2008). Towards a post-human distributed cognition environment. *Knowledge management research & practice*, 6(4), 287-297.