NEW CHALLENGES AND OPPORTUNITIES OFFERED BY CROWDSOURCING IN LIFELONG LEARNING AND ADULT EDUCATION: THE EXPERIENCE OF CIHEAM-MEDITERRANEAN AGRONOMIC INSTITUTE OF BARI (MAIB)

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ABSTRACT

The current technologies, which are increasingly captivating and “ubiquitous”, provide an essential means of supporting shared information systems. Recent studies have shown that “crowdsourcing” techniques, carried over from other areas than distance learning, are a valuable tool in lifelong learning and adult education. The term “crowdsourcing” is obviously referred to concept maps exchanged through different contributors and via an appropriate applied technology (social software) and an approach close to the “wiki” philosophy. Hence, it can be assumed that the experience gained by MAIB through a Learning Management System (LMS) and based on a cooperative/collaborative-constructivist teaching method might be oriented to future crowdsourcing experiments. New educational tools could thus be supported to create synergies between participants who could share the phases of production, use and reuse of tools. Besides describing the available technological solutions, this article also identifies some results derived from the “best practices” implemented by MAIB that match the model under discussion and are related to different issues of “knowledge management”. A further task has been to analyse the “cognitive sustainability” in relation to “crowdsourcing” approach, through the experience gained so far in distance learning. The last part focuses on “inclusive education” that is indicated as a new effective method in favourable environments, such as virtual learning communities (LCs).

KEYWORDS: Cognitive sustainability, Crowdsourcing, Inclusive learning environment, Knowledge management

FOREWORD

Technologies offer significant opportunities by network tools available to over one third of the world population (2.26 billion people, 2011 data). These estimates that are expected to increase by 40% thanks to broadband connections, will be confirmed by the end of 2016. In Europe, over 60% of the population has regular access to the Internet, in north America, over 78% (Internet World Stats, 2012). The web pages indexed only by Google exceed 30 Trillion. The International Telecommunication Union reports that in 2012 there were over 6 billion active mobile phones. However, there are still huge inequalities and digital divide problems. In developing countries, only 24% of people have access to the Internet due to censorship and existing prohibitions. MAIB that is particularly interested in the careers of its former trainees coming from the above countries, organises followup and subject-specific courses using ICTs, and notably e-learning. Through these online refresher courses, in which shared learning contexts are used, the Institute responds to the real needs of building local agricultural expertise.

By crowdsourcing different people can share their experiences, express their creativity, and
acquire new skills and knowledge. Moreover, the technologies supporting crowdsourcing (social software) may aggregate different forms of knowledge, as demonstrated by the theorists of the TPACK\(^1\) (Technological, Pedagogical Content Knowledge) model, which was investigated by MAIB (Lorusso, Sisto, 2013) within a case study concerning the use of a learning management system (social software). The term “crowdsourcing” is a combination of the words “crowd” and “outsourcing” and redefines the concept of outsourcing job functions to a crowd of workers (Wired Magazine by Jeff Howe, 2016). A practical application of crowdsourcing has been published in a recent article (Sharples et al., 2013) dealing with new forms of teaching through shared learning and participatory evaluation. These are informal and spontaneous forms of teaching where, in principle, everybody can teach, provided he or she holds some knowledge. Isman et al. 2012 report an experience on crowdsourcing efficiency and effectiveness, in which it is shown that the use of social software technologies has enabled communities to collaborate and exchange information on different themes. The most well-known examples of crowdsourcing are Wikipedia and Google Search.

### GENERAL INFORMATION ON CROWDSOURCING

The idea of working on the same project with people living in other world regions would have been utopia without the Internet. The growing number of “solving” and “crowdsourcing” platforms has actually enabled all those wishing to share a training project to actualise it, via the cognitive contribution of a community. Wikipedia (http://www.wikipedia.org) is the most obvious example of a free and universal online encyclopaedia, created through a huge range of inputs and made available in different languages.

In addition to Wikipedia, there are other examples of communities based on this approach, in areas such as language learning and development of software. Little et al. described in 2009 the implementation of a crowdsourcing platform, named Turkit, intended for a project to build software by developing distributed algorithms. In other cases of crowdsourcing strategies, one of the main advantages is the possibility of “gathering” different interactive contributions for a common objective (Zhang et al. 2011). However, these platforms that support different ideas on a given topic generally involve the subsequent validation of the starting project. Moreover, the above solutions give access to work environments comparable to open and transparent locations where access is free and active participation is actually due

### SOCIAL SOFTWARE

The term “social software” is attributed to Clay Shirky (2003) who defines it as a software supporting group interaction. Moreover, Tom Coates (2002) highlights its functional characteristics that may even extend human communication skills. To further clarify the term “social software”, in an educational context we may consider it as a network tool supporting and helping adult individuals to “learn together “ while maintaining the control of identity, time, space and relations

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\(^1\) http://www.tpack.org
In concrete terms, the social software is the best technological response to the following methods and modes of communication:

- One-to-one: the interaction of a single person with another one
- One-to-many: the interaction of a single person with many others
- Many-to-many: the “multi way” interaction among many people
- Many-to-one: the interaction of many persons to a single one

It also contributes to reorganise the knowledge of a group through information, which is expressed freely, shared, discussed and replicated. Sharing can improve knowledge, provided an idea or an ability enhance or increase the “native concept” providing an optimal condition for learning. According to William Glasser (1986) “we learn 10% of what we read; 20% of what we listen to; 30% of what we see; 50% of what we both listen to and see; 70% of what is discussed with others; 80% of what we experience personally; and 95% of what we teach to others”. Hence, according to this theory, the discussion that is developed in social software enables a high learning rate. In the table below you find the description of some very common social software, grouped according to the type of interaction.

<table>
<thead>
<tr>
<th>Brief Description</th>
<th>Examples</th>
<th>One-to-one</th>
<th>One-to-many</th>
<th>Many-to-many</th>
<th>Many-to-one</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uses SMTP protocol and IMAP or POP for Inboxes, with dedicated clients</td>
<td>Gmail, Thunderbird, Outlook</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Instant messaging</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uses proprietary protocols and dedicated clients that typically run as background processes for a continuous connection at any time, enabling real-time or near real-time text interaction</td>
<td>AIM, Skype, Jabber, SMS</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Similar to instant messaging but uses protocols such as IRC or runs on the Web, typically with “rooms” or pages that must be explicitly visited rather than running in the background</td>
<td>Internet Relay Chat (IRC) Facebook chat, Google Talk</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Video/audio conferencing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tools for connecting in real time using audio, and optionally, video</td>
<td>Phone, Skype, Google Hangouts, Viber</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social networking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A way to make connections with others, either reciprocally (typically called “friending”) or asymmetrically (typically called &quot;following&quot;). Almost always associated with other tools, and usually involving the creation of personal profiles or pages representing an individual</td>
<td>Facebook, Google, Orkut, MySpace, Bebo, His</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td></td>
</tr>
<tr>
<td>Learning management systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A particular form of content management system designed with education in mind, incorporating tools to manage the learning process including assessments, discussions, class management, and so on</td>
<td>Moodle, Blackboard, Desire2Learn Claroline</td>
<td>•</td>
<td>•</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Some examples of social software drawn from Teaching Crowds (Dron, Anderson, 2014)
Research, experimentation and strong methodological influence (collaborative-constructivist approach) have led MAIB, since the start of distance learning activities, to identify a technologically appropriate tool that continues to be sustainable. The Institute has been actually using for over a decade a Learning Management System (Claroline ©2001-2010) that has proven to be compatible with its e-learning activities and belongs to the category of social software (Table 1). This tool (platform) is certainly suitable for sharing and collaborative contexts and particularly fit for social dynamics facilitating learning and co-working. In addition to social software solutions characterised by forms of communication suitable for a given group working online, there are solutions designed for groups with a number of participants initially non-quantifiable (crowd) and more suitable for creating synergies targeted to reorganise wide-ranging educational content online. One of them is the UClass\(^2\), used as a repository platform of content; it provides a valuable support for experts who wish to share their teaching resources. In Skillshare\(^3\) for example, there is a large learning community characterised, in this case, by lectures created via distributed skills. The main features common to both solutions include the quality of resources and collaborative specifications for students.

**Learning Communities (LCS) & Inclusive Learning Environment (ILE)**

Recent studies and the first applications of crowdsourcing have proven to be effective for both teachers and learners. The latter would prefer a personalised instruction tailored to their skills and cognitive style. For teachers, instead, repeating the same lectures may be unmethodical (Weld et al., 2012). A new properly developed approach would enable reorganisation of high quality lectures using shared teaching materials and methodology. Students might access them and could contribute to effectively complete their training, using ICTs. On this subject, recent studies have shown that “peer-grading” crowdsourcing would facilitate optimal conditions of motivation and interest. The Massive Open Online Courses (MOOCs) overcome the traditional concept of class and provide high quality content to a large public. However, the intention of the latter is not to replace traditional educational programs, but rather to meet training needs that are not adequately satisfied. This is expressed through a geographically large organisational structure. However, though the system was globally recognised also by developing countries, the latter encounter severe difficulties due to many restrictions (Internet access, language, digital literacy, etc.). Moreover, the MOOCs could not be an effective solution in terms of “sense of belonging”. An important study on the sense of belonging explains that “Inclusive Learning Environment” is an ideal environment to facilitate inclusive learning (Tisdell, 1995). The above article deals with the teacher’s personal experience, the educational context and participants’ features. Emphasis has been laid on the fact that in the choice of learning materials and methods, it is important to consider the most appropriate institutional and social levels (Universities, community of practice, life-long learning, etc.) responding to the features and profiles of the group’s members.

\(^2\) http://www.uclass.io
\(^3\) http://www.skillshare.com
According to the author it is essential:

- to reflect the diversity of participants in the same learning activity;
- to adhere to the institutional frameworks in which participants work and live;
- to meet the changing needs of a society that is increasingly diversified.

In Inclusive adult learning environments Kathleen Taylor and Catherine Marienau (1995) defined “inclusive” teaching as the “new teaching”, considering:

- the effectiveness of student’s experience
- the student’s knowledge on the subject-matter
- the awareness that learning may be a transformation process

In short, the student should be made socially conscious, at both group and individual levels. Student diversity (in language, culture, origin, social background) is certainly a critical aspect of inclusion. Moreover, the “feeling of loneliness” that is typical of self-learning systems is often a cause of failure leading to dropout, which is also an adverse factor for inclusion.

To obviate the above critical aspects of inclusion and in line with the principles of cognitive ergonomics⁴, MAIB basically applies the cooperative-collaborative-constructivist approach in training students from different Mediterranean countries.

**Background And MAIB Case Study**

Within social software the Learning Management Systems (LMS), and notably the one used by MAIB (Claroline ©2001-2010), enable detailed monitoring of the activities carried out (daily recording of the number of connections to the platform, quantification and classification of the messages exchanged in fora and detailed description of other moments useful for a specific analysis).

In the e-learning courses organised by MAIB, students may consult learning materials and leave their comments voluntarily. Hence, it has been observed that activities in fora have quite often been so extensive as to become additional material on the subject-matter under study. Moreover, to support group dynamics in favour of learning by a cooperative, collaborative-constructivist spontaneous approach, scheduled specific sessions, like web seminars (webinars) were avoided. MAIB thus believes that the forum is a tool that, for its specificity and based on the outcomes of analyses discussed later, may be considered an effective crowdsourcing practice.

According to Bill Hopkinson (2002) the messages produced in a social discussion context are grouped into four categories: “Initiate”, when the content concerns the start-up of discussion or the first participation; “Social”, the content of this category is related to what can enhance socialisation and cohesion of the group: greetings, family news (birthday, marriage, birth, etc.), various events (journeys, illness, etc.), messages of support, encouragement, recall, etc. “Help”,

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⁴ Cognitive ergonomics is the branch of ergonomics dealing with the interaction between men and the tools for processing and handling information, by studying the cognitive processes involved (perception, attention, memory, thinking, language, emotions) and suggesting solutions to improve such tools.
when asking for help for technical, organizational and various requests; “Develop”, when writing comments on the content of teaching, asking questions on specific subjects, answering participants' comments and questions in order to share personal experiences associated with proposed arguments. An interesting experience is a recent training course delivered by MAIB in e-learning on the subject “Tutoring online”. In this case study, all contributions of discussion fora useful to develop teaching content have been examined and quantified. More specifically, using the above classification by Hopkinson (2002) it has been found that the difference between the quantities of a given kind of post (Develop = 187) in different fora gives a clear indication of preference over the others (“Initiate”, “Social” and “Help”). Accordingly, it is supposed that there has been “the first phase” by a crowdsourcing approach confirmed by the production of a group of participants and various personal contributions (posts) shared in order to deeply examine the theme under study.

The following table shows the data observed in the discussion fora of the 5 teaching modules of the course being analysed.

<table>
<thead>
<tr>
<th>Module</th>
<th>POSTs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Initiate</td>
</tr>
<tr>
<td>Module 1: General principles of education</td>
<td>5</td>
</tr>
<tr>
<td>Module 2: e-learning</td>
<td>7</td>
</tr>
<tr>
<td>Module 3: Virtual Learning Community</td>
<td>5</td>
</tr>
<tr>
<td>Module 4: On line Tutoring</td>
<td>10</td>
</tr>
<tr>
<td>Module 5: Basic Principles and tools for e-learning evaluation</td>
<td>11</td>
</tr>
<tr>
<td>TOT</td>
<td>38</td>
</tr>
</tbody>
</table>

Table 2. Numbers of posts for each module

In the “second phase”, in particular for “Initiate” and “Develop” posts, a further quantitative analysis was made using another model known in the literature (Lambropoulos et al., 2012), according to whom: “it is proposed to measure its pedagogical value in real time with attributes described as follows: inform (suggestion), question (reflection), explain (elaboration), explore (elaboration), idea (co-construction), agree (judgment), evaluate (estimation) and others”. This analysis enables highlighting the level of investigation of subjects through different kinds of interactions (Episode post) proposed by the selected model. The table below indicates different types of interaction and describes them.
Table 3. Type of episode post* according to Lambropoulos et al., 2012

Assuming that the combination of 2 or more forms of interaction originates a dialogue-based process, it may be stated that in this case a knowledge creating process has occurred. This assertion is expressed through the identification/interpretation of different post “episodes”.

In the table below, for the same case study, some more frequent “episodes” have been indicated, such as for example “idea” with 62 posts, “explain” with 51 and “agree/disagree” with 46. Moreover, it has been observed, for example, that module 3 has recorded the highest number of total episodes (72).

<table>
<thead>
<tr>
<th>Episode posts/Modules</th>
<th>M1</th>
<th>(%)</th>
<th>M2</th>
<th>(%)</th>
<th>M 3</th>
<th>(%)</th>
<th>M 4</th>
<th>(%)</th>
<th>M 5</th>
<th>(%)</th>
<th>T OT</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inform</td>
<td>7</td>
<td>15.2</td>
<td>4</td>
<td>6.8</td>
<td>7</td>
<td>9.7</td>
<td>4</td>
<td>8.0</td>
<td>4</td>
<td>7.8</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>3</td>
<td>17.4</td>
<td>15</td>
<td>25.4</td>
<td>17</td>
<td>23.6</td>
<td>10</td>
<td>20.0</td>
<td>12</td>
<td>23.5</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>Explore</td>
<td>8</td>
<td>13.0</td>
<td>5</td>
<td>8.5</td>
<td>11</td>
<td>15.3</td>
<td>4</td>
<td>8.0</td>
<td>4</td>
<td>7.8</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Agree/disagree</td>
<td>11</td>
<td>23.9</td>
<td>7</td>
<td>11.9</td>
<td>11</td>
<td>15.3</td>
<td>12</td>
<td>24.0</td>
<td>6</td>
<td>11.8</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>Evaluate</td>
<td>3</td>
<td>6.5</td>
<td>4</td>
<td>6.8</td>
<td>5</td>
<td>6.9</td>
<td>6</td>
<td>12.0</td>
<td>8</td>
<td>15.7</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>T OT</td>
<td>46</td>
<td>100</td>
<td>59</td>
<td>100</td>
<td>72</td>
<td>100</td>
<td>50</td>
<td>100</td>
<td>51</td>
<td>100</td>
<td>277</td>
<td></td>
</tr>
</tbody>
</table>

Table 4. Numbers, totals and percentages of “episode posts”.

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Types of interaction | Description
--- | ---
Inform | Suggestion and innovative proposal with respect to the contents of the module
Question | Question arising from considerations on the subject
Explain | Elaboration of a text or explanatory depiction following “Inform” and/or “Question”
Explore | Post for exploration and search of subjects related to “Inform”, “Question” and “Explain”
Idea | Expression of additional concepts or elements to “Inform”
Agree/disagree | Critical expression and negotiation following “Inform”, “Question”, “Explain”, “Explore” and “Idea”
Evaluate | Judgment and shared assessment of new information and ideas
Hence, we can state that the survey conducted in the first phase on “initiate” and “develop” posts according to Hopkinson’s classification and the subsequent analysis following the model provided by Lambropoulos et al., has enabled the identification and quantification of all the contributions that are considered as “value-added” contributions. Both analysis phases have thus been useful to verify the existence of “develop” contributions first, and to show their level of detail assuming the crowd approach (forum context) later. However, the results obtained derive from the combination of several complementary components facilitating the cognitive process, i.e. socially conscious adult users, cooperative-collaborative-constructivist method, teaching materials with low cognitive impact, and “sustainable” technology.

6. Conclusion

Crowdsourcing is a relatively new concept that is not yet extensively used in education, where teachers and students still maintain their traditional identities and roles. The new challenges, supported by the available technologies, will tend to smooth the difference in roles (teacher and student) in order to give priority to the source of knowledge in a new “smart” educational environment.

The analysis carried out in the present article tends to support the concrete assumption that during the experience of the case study concerned, the conditions of “crowdsourcing” approach have developed spontaneously, supported by an appropriate “social” technology.

Moreover MAIB, due to its nature, has always included the diversity of students, the appropriateness of contents and of training programmes as important factors stemming from “inclusive learning environment”.

The study carried out suggests new factors that could strengthen assumptions and theoretical principles of the new e-learning which relate to social constructivism and offer undoubted educational benefits to adults in life-long learning.

Participants in these contexts would learn together through their own and “self-directed” experiences, by developing “cooperative-collaborative research” in order to create new knowledge, and emphasise the importance of quality control and of the adequacy of new contents.

The challenge that MAIB intends to face in future will concern the experimentation of shared activities of coproduction and validation (instructional designing) of contents for e-learning.


Internet World Stats (2012), http://www.internetworldstats.com


Shirky Clay (2003), Social software and the politics of groups http://www.shirky.com/writings/group_politics.html

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