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# Digistylus – An Online Information System for Palaeography Teaching and Research

Antonio Cartelli, Marco Palma

## Abstract

This paper starts by describing the experiences the authors recently had with online information systems for teaching and research in palaeography. The study also considers the differences in the students' access to the site "Teaching Materials for Latin Palaeography" when they attended the palaeography courses, as it was usually used in the lectures by one of the authors. With the increase in the quantity of plates (reproducing pages or parts of them from medieval manuscripts) and texts (concerning the analysis of the writing styles, the cataloguing, the history of manuscripts, the codicology and other important topics in the palaeography's scientific debate), it became clear that there was a difference in the way students approached those materials: when students first used the systems in the academic year 2001–2002, they read all the documents and used all the plates; more recently, with the quantity of materials on the site considerably increased, the students wait for the professor's suggestions and evidence uncertainties and difficulties when autonomously looking for a document or a plate. As a consequence, the online information system Digistylus has been planned and is going to be created for the management of the data in the site "Teaching Materials". The main consequence of the above observations has been the detection of a new knowledge construction paradigm and the development of new research procedures in palaeography.

## Zusammenfassung

Der Artikel beschreibt die Erfahrungen der Autoren, die sie kürzlich mit dem Online Informationssystem für Lehre und Forschung zur Paläographie gesammelt haben. Die Studie betrachtet insbesondere die Unterschiede, die sich beim Zugang der Studenten zur Website »Teaching Materials for Latin Palaeography« während ihrer Paläographiekurse zeigten. Mit steigender Anzahl der angebotenen Bilddigitalisate mittelalterlicher Handschriften und von Texten zu Schreibstilanalyse, Katalogisierung, Manuskriptgeschichte, Kodikologie und anderen wichtigen Bereichen paläographischer Forschung wurde der Unterschied deutlich: die ersten Studenten im Studienjahr 2001–2002 lasen alle Dokumente und benutzen alle Bilddigitalisate. Im letzten Studienjahr, in dem die Anzahl des verfügbaren Materials deutlich angestiegen ist, warteten die Studenten auf

die Vorschläge des Dozenten und zeigten Unsicherheiten und Schwierigkeiten, wenn sie eigenständig nach Dokumenten oder Bilddigitalisaten suchten. Infolge dieser Beobachtungen ist das Online-Informationssystem Digistylus für das Datenmanagement der Website »Teaching Materials« geplant. Das Hauptergebnis der obigen Beobachtungen ist die Entdeckung von neuen Wissenskonstruktionsparadigmen und das Finden von neuen Forschungsvorgängen in der Paläographie. Als Hauptergebnis der Studie kann die Beobachtung eines neuen Paradigmas zur Wissenskonstruktion sowie neuer Herangehensweisen im Bereich paläographischer Forschung genannt werden.

## 1 Introduction

Since 2001 the authors have worked on the construction of special web sites (mostly online information systems), used both for research and teaching. The spread of the Internet and the easy use of the web for retrieving information and putting new data in a given database were the main reasons for the construction of the online information systems. The sites described below have been used to manage bibliographical data on medieval manuscripts; they also implemented the processes usually adopted by researchers for the collection of bibliographical data.

*Women and written culture in the Middle Ages* (Cartelli et al.), contains the names of the women who wrote manuscripts in the Middle Ages, and the manuscripts they wrote; when suitable images are available, people accessing the site can also see the women's handwriting styles. The database can be accessed by the persons who planned the system and by those authorized to input the bibliographical data, the images, the bibliographies etc. and can be queried by everyone.

The *Open Catalogue of Manuscripts of the Malatestiana Library* (Cartelli and Palma; Cartelli et al.), is the most complex system among the ones created until now (it derives from the more general idea of the *Open Catalogue* and has been created by the staff of the Malatestiana Library). Among other things, it lets people know the history of the library and provides open access to all available pages in the manuscripts<sup>1</sup>.

*BMB on line* (Cartelli and Palma) is a pure bibliographical information system; it manages the quotations of Beneventan manuscripts. People engaged with the collection of the quotations of those manuscripts are grouped into three categories: contributors, who can access web forms by writing, modifying and deleting bibliographical data; scientific administrators, who can manage all the data that the contributors are charged with and write, modify, and authorize bibliographical materials (i.e. this last operation can be done only once, because authorized records cannot be reviewed by

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<sup>1</sup> See the paper of Cartelli et al. "Il catalogo aperto dei manoscritti Malatestiani" in this volume, to get an idea of the different sections and autonomous information systems it is made of.

contributors and scientific administrators but can be retrieved by general users); the system administrator, who is allowed to do all operations, including the modification or deletion of authorized bibliographical records.

General users can access authorized materials on the site according to different query pages: by author, by manuscript, by contributor, and by one or more words or part of them in the title, the location, or the bibliographical abstract of a given publication.

It has to be noted that there are different elements also implemented within the system:

- *a closed communication subsystem*: it can be accessed only by people working on the information system (contributors, scientific administrators and system administrator) allowing the quick exchange of messages and texts;
- *special functions*: available only to the system administrator, for the production of printed versions of the collected data (to be used to create a printed publication concerning the bibliographies collected yearly).

Until now all the web sites and the information systems mentioned above have been used for research and teaching in palaeography and the following effects have been detected (Cartelli 2006a, 2007):

1. Every group of persons working on a given information system (students, professors, researchers etc.) showed the features of a community of practice as described by Wenger (2004): people identifying themselves in the community they belong to, people having a common and shared commitment, people sharing special signs, symbols and strategies (i.e., the repertoire of the knowledge instruments in the community).
2. The sites have been good examples of constructivist learning environments and have helped the students to develop cognitive apprenticeship strategies (very useful for the improvement of their learning and performance).
3. The features of communities of learners (CoLs) and fostered communities of learners (FCL) were detected in the classes working on the systems described; otherwise stated, the online information systems, while supporting and extending traditional learning strategies, induced the creation of special communities, which is never detected in traditional palaeography courses.
4. New skills emerged in the students involved in the experiences described above, such as the ability for team work, the management of complex tasks and the raising of the individual's skills within the community.
5. New transversal competences were detected: better computing skills of the students attending traditional computing literacy courses and meta-cognitive / cognitive apprenticeship strategies.

It should be noted that the greater benefits for the students (points 2–5 above), compared to researchers (point 1), is mostly due to the desire of involving them in the use of

new ways of learning, so that the sites were used for teaching very early. Comparing the performance of these students with those of traditional students and qualitatively analysing the simple questionnaires and the interviews at the end of the lectures, a similarity of the results reported above with those of the North American researchers on communities of learners has become clear.

Similar procedures could not be adopted with the scholars and researchers who worked on the systems, because most of them collaborated with students for the creation of special documents or images only occasionally. In these last cases the simple observation of the individuals' behaviours and qualitative enquiries were used to deduce the presence of the features of communities of practice in the groups of persons working on the information systems.

## 2 Information Retrieval and the Digistylus System

The online information systems described in the first section of this paper have both been used for research and teaching, but the need for helping the students to easily access teaching materials led to the creation of the static web site "Teaching Materials for Latin Palaeography". It aimed at making the materials for the understanding of the ancient writing styles available to the students, and to prepare them for their final examination in Latin palaeography (Cartelli and Palma 2005).

The site, which continuously evolves, comprises three sections:

- The first section contains the plates, reproducing folios of the ancient manuscripts (texts written in different medieval scripts); together with the images there are the transcriptions (i.e. digital full texts where symbols, special signs and abbreviations are clearly written). All the documents are organized as a tree structure, based on the writing style adopted in the different plates.
- The second section contains full or partial documents reproducing papers, presentations and articles (from conferences, catalogues and books), on different topics such as book archaeology, scripts, cataloguing, history of palaeography etc.
- The third section is used for work in progress, it hosts special documents, usually simple archives created with office automation programs (like MS Excel or MS Access); they are managed by the professor and students (and can be downloaded from the site).

The web site began in 2001 and helped students to develop skills for reading and understanding ancient handwriting styles, learning the history and the evolution of European national languages (especially Italian) and for dealing with the processes, the strategies and the policies for the preservation of ancient manuscripts.

A relevant change in the way the students accessed the materials on the site was detected during the last years by observing students' behaviours and by asking them

(when attending final examinations) about the pages and materials they visited and the time they spent working on them.

The main unexpected conclusion was that the more the materials, the more the difficulties the students had in autonomously managing the study materials. The following two opposite behaviours emerged from all students' answers: at the beginning (i.e. when only a few documents were available), the students read all the texts and autonomously transcribed almost all the plates (then compared the text they produced with the professor's solution); later (during the last course), when 86 documents and 281 plates with their transcriptions were available, the students mostly read only the texts the professor suggested in his lectures and limited themselves to the analysis of the plates they discussed in class.

What are the reasons for the last behaviour? Students say that they have trouble finding the "right documents" to study or to analyse when they autonomously browse the site. Very often, in fact, they have to read more than one document before finding the right information or before understanding what document to search for and, sometimes, this time-consuming job prevents them reaching their goal.

The points below can be useful to outline the reasons for the changes in students' behaviour:

- The increase in the quantity of materials in the site,
- The overestimation of the students' knowledge and skills when they are requested to find information,
- The generational differences and the approach which younger students have to technology.

It is not hazardous to include the above points in a wider hypothesis by which we are facing a more general problem concerning the search of information on the web.

Perhaps the solution can be found by asking the following questions: what difficulties do people have while searching materials on the web? Do they succeed in finding the right data on the web? How can the students be helped in searching for the information they need and to build new and meaningful conclusions?

The last question does not completely include all the other questions but it is the most comprehensive one, so that we'll concentrate on it in the following section. In this regard the Digistylus information system, which hopes to address the question, will be discussed.

## 2.1 The Information System Digistylus

The planning and execution of an information system which could help students to easily access the plates and the documents available on the site of the "Teaching Materials

for Latin Palaeography” looked like the best solution to the problems that students had in retrieving documents.

Many different considerations guided the creation of the information system and some of them are reported here: students must be the creators of the information on the site (they must organize and input in the system all the data concerned with the documents in the site); the information in the database must be available to everyone who may be interested in it (by means of the web); any information the students put in the system must be approved by one or more scientific coordinators before being available on the web; special indices must be implemented in the system to let people measure the difficulty in the transcription of the plates; a closed forum within the information system is needed, which lets students communicate among themselves and with the professor; the evaluation of the students’ work and the final score they obtain at the final examination must include different elements: the evaluation of the work he/she made up, the evaluation of the support he/she gave to colleagues, the evaluation of the accessibility and usability of the information retrieved by external readers (i.e. general users), the evaluation of criticism he/she gave to the system and its functions.

It can be easily recognized that students are involved in the project at different levels:

- Individually: by critically studying and assimilating the basic topics of the discipline, by applying those ideas to the materials on the site and by writing the records in the database (this job is made easier by the presence of supporting materials and the use of communication subsystems).
- At a community level: by adopting various strategies: a) the legitimate peripheral participation (LPP) suggested by Lave and Wenger (1991), helping the management of the community while including the weakest subjects, b) the implementation of practices with the Information Communication Technology (ICT), proposed by Cartelli (2008), letting the system implement the processes people had to conform to, and governing the management of the information acquisition, storing and validation, c) team competency learning, suggested by Jewels and Albon (2006), inducing the professor to act as a coach and assign to every student the best role with respect to his/her basic knowledge and skills.
- Socially: by considering the usefulness of the information the students produce for their professor and their community, but especially to the people not necessarily expert in Latin palaeography or in any other discipline concerning the study of ancient manuscripts.

The structure of the information system based on the ideas mentioned above is outlined in Figure 1, where a snapshot of the data structure and the flow of information is drawn.

Before any other consideration the following remarks should be made: the creation of the Digistylus information system leaves the former site “Teaching Materials for Latin Palaeography”, with all the documents and the plates within it, unchanged; people who



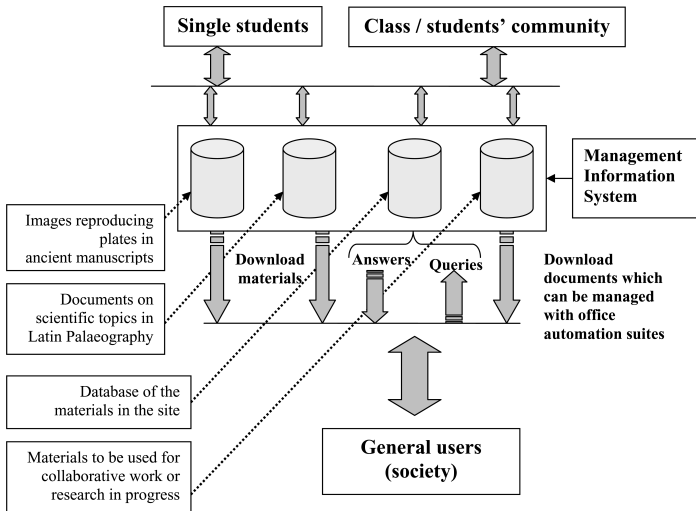


Figure 1. The Digistylus information system built around the site “Teaching Materials for Latin Palaeography”.

like to access those materials in a more traditional way can do so by using the links in the web pages and browsing the site.

The Digistylus information system has been created with Open Source software, which is used for the web server (Apache), the Relational Data Base Management System (PostgreSQL) and the creation of special web pages interfacing the database (PHP).

Digistylus' structure is based on one database, a sophisticated user rights management, a query system and a specific data flow. In what follows, the above elements are explained in greater detail:

1. The relational database underlying the site is made of tables containing the following data:
  - Contributors' (students) and scientific administrators' personal identification data.
  - Shelfmarks of the manuscripts containing the plates reproduced in the site.
  - The bibliography of the manuscripts and of the medieval documents in the site.
  - The graphic style of the plates and all the data (as far as they are available) which can be used for a better description of those plates.
  - The links to the web pages with the reproduction of any plate and its transcription.
  - The keywords letting people access the transcription of a given plate.

- The parameters for the calculation of the difficulty in making the transcription of a given plate.
  - The bibliographic records of the documents in the site, with the links to the corresponding documents.
  - A communication subsystem which allows people working on the system to communicate, manage bibliographical records and input new data in the Digistylus database.
2. The users accessing the database have different roles and permissions: the users with the lowest permission on the data are the ones who can only query the system; they can see the plates, the transcriptions, the list of the bibliographies and any other information on the site, but they cannot insert or modify information in the database. At the next level are the contributors (students) who can access a special web area (by means of their ID and password) with a menu of the allowed operations (i.e. they can manage the records on the plates and their transcriptions, the bibliographic cards and the electronic blackboard). At last the scientific administrator/s can manage all the data in the database and write, modify and authorize the bibliography. At the top of the access pyramid is the system administrator who can conduct all the operations allowed to the scientific administrator/s and can access the verified bibliography to modify or to delete it.
  3. When the record on a given plate is written, the transcription is prepared and the bibliography is compiled, the scientific administrator can verify and authorize it. All these data can then be queried by a general user. People interested in the information have different query pages:
    - The first queries the author of one or more texts in the manuscripts (the list of the links to the web pages with the plates and their transcriptions completes the system answer);
    - The second lets the user select the author of one or more catalogues and gives back the list of the catalogues used for the reproduction of the plates (like in the former case the list of the links to the web pages with the plates and their transcriptions completes the system answer);
    - The third lets people search for key words (or parts of them) in the transcription of a plate and gives back the list of the plates containing them;
    - The fourth and last page lets the user type in a query the name of the author of a text, the topic, words in the title or in the text and search for any document in the web site which respects these constraints.
  4. When the system starts, the data base is empty and the system administrator has to input the data for at least a scientific administrator; once a scientific administrator is enabled, he/she can input the data for one or more contributors and give them access to the system; he can also input the records on the plates and their transcrip-

tions and the bibliographic data. Then the contributor can compile the bibliography in the database. Finally the bibliography is analysed, revised and verified by the administrator/s and can be read and queried by a general user.

It is desirable that the Digistylus system, when completed and ready to use, will contribute to change teaching and research methods in palaeography.

The reasons for the prospected changes are described in the next section.

### **3 New Paradigms for Knowledge Construction and Palaeography Research**

In the introduction the effect the information systems had on students' performance and skills was described. The idea that online information systems influenced the creation of learning communities led to the hypothesis that new technologies changed or at least introduced new approaches to the construction of knowledge.

By following Ong's (2002) and Olson's (1991) ideas of a connection between technology, literacy and new orality, new possibilities for human communication and knowledge construction could in fact depend on the use of the ICT.

The following remarks describe the features of the different levels of influence of the ICT on knowledge construction by looking at two different points of view, the personal development of knowledge and a more theoretical one.

In the first case, the subject's point of view is considered. From this perspective, people build their knowledge in three different ways. The first is the autonomous interaction with phenomena, whether they are real or virtual (mostly constructive). The second is the social interaction with other individuals in a community, where mediation, interpersonal contacts, informal knowledge sharing and support from peers have a more relevant role (and ICT are important in helping subjects create communities or induce communities). The third implies the active participation in the society they are immersed in (with respect to community, emulation of behaviours as well as codified and socially accepted rules may modify pre-existing learning strategies or determine new ones). As a conclusion, subjects' knowledge is made of three components: the individual, the community and the social ones, with their own contents, learning strategies and possible communication channels (Cartelli, 2006b). Figure 2 gives a snapshot of the tri-partition of this viewpoint.

The second viewpoint is concerned with the analysis of knowledge by itself. Knowledge is now seen as a theoretical construction, or an artifact of mankind. In this case, like the former one, at least three kinds of knowledge can be recognized. The first is individual knowledge, built by subjects who construct their knowledge while interacting with the environment they are immersed in (natural or virtual, populated by other subjects or not etc.). The second is community knowledge, belonging to com-

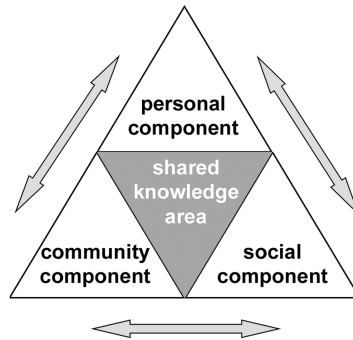


Figure 2. Knowledge components and their interactions.

munities as autonomous entities (by using Wenger’s words, it is the knowledge letting communities identify themselves in an autonomous social environment, where people have common aims and motivations and share a repertoire of instruments, which are made of signs, symbols, processes and strategies). The third is society knowledge (often called scientific knowledge), which is well codified, evaluated and approved by a relevant number of individuals and communities (it can probably be identified with the scientific knowledge or with its paradigms).

Figure 2 illustrates the described situation.

The main results one can deduce from the considerations above are:

- Knowledge construction is the result of the influence of all three components.
- Planning and carrying out an information system for the management of information must consider all the knowledge components described until now.
- Using information systems for the implementation of the practices shared by a group of specialists or by subjects working together can be considered a new pedagogical paradigm; it forces other people (students, general users etc.) to create a new community or enter into the already existing community and displaces the problem of “information research” with that of “information creation”.

In the introduction the consequence for the use of the new teaching paradigm on the students has already been discussed, now a question sounds interesting: how much is palaeography research influenced by the knowledge construction tri-partition proposed above?

At least two very important effects can be hypothesized:

- Before the Internet and the use of information systems for data management, scholars of Latin palaeography mostly interacted with knowledge they used for studying

ancient manuscripts alone (social knowledge); now new relationships arise, at least among people in the community they belong to (i.e. when special information systems are adopted), and community knowledge becomes an important element to guide research in the discipline topics,

- Whatever the role knowledge plays in the development of community processes for study and research, the subjects in the community working surrounding an information system tend to specialize and to construct research teams in order to avoid conflicts and have the best results.

Another relevant effect of the knowledge tri-partition hypothesis is the opening towards the society of the researcher work and its transparency. It has, in fact, a double influence on the management of activities. Firstly, those who are interested in the information in the site can give a feedback to system administrators; new information, new hypotheses and applications will be the starting point for new research. Secondly, the control of process management is possible by means of the results available; everyone can verify the evolution of a research project and the reaching of the pre-defined goals.

It is too early to say whether the above ideas will have impact on more traditional research methods and especially on qualitative and quantitative methods, and future investigations are needed to analyse the results of the use of information systems in palaeography.

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