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Multimedia: a learning experience with special reference to Indology

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Abstract: The paper aims at analysing the experience of an Indologist who participated as content-expert in the production of a CD-ROM on a temple of Karnataka in India. It has been a learning experience, in the sense that it has been an occasion for methodological reflection and adaptation to the computer tool.

Any researcher in the field of humanities disciplines is trained in preparing a book. Preparing a CD-ROM is obviously a different exercise. The contrast between both activities is analysed in the following areas:

1.1 Writing vs. digitisation of text

1.2 Drawing vs. digitisation of graphic data

1.3 Photography and video vs. digitisation of visual data

1.4 Recording vs. digitisation of sound data

2. Indexing and card-making vs. database management

3. Comparative research vs. automatic linking

In spite of constraints imposed upon them by computer techniques, the expectations of researchers from Multimedia are high. They arise during research and at the time of presentation. The researcher sees multimedia as a powerful tool to explore large quantities of data, consult and search items, compare and sort out, improve presentation and communication with the user. The new tool will definitely lead towards new directions. Profitable or detrimental? Right from now, it appears that the incitation to interactivity is the greatest benefit to be derived from the CD-ROM. However, the breaking down of knowledge in small units to which database management and screen-wise presentation are leading to, may be a drawback, as being detrimental to the continuity and strength of thinking.

A responsible indologist is concerned by research and by presentation of the knowledge he acquires. For many years his goal has been to produce a book in which a category of readers, having reasonably advanced knowledge of his discipline, is targeted. If he cares more for research, he may be content with a mere exposition of his research to a circle of scholars. If he cares more for presentation, he may aim at a larger audience, cultured or of student-level. He may care for both and face the difficulty of adapting his knowledge to a larger audience with divergent interests. In the world of book-production, the result of this situation is that there are erudite books with little diffusion and popular books with larger dissemination. Popular does not mean cheap and in the history of indology, there are masterpieces of research and presentation that are equally scholarly and accessible, thanks to the talent of an author. *The Monuments of Sanchi* by Marshall, Fouche and Banerjee are a memorable example.

Since some twenty years we have entered the computer age. Indologists have not been the first

researchers to become aware of this dawn of a new civilisation that is going ahead so fast before our eyes. Some of them even have developed some reluctance to follow the movement and resist being carried away by the tide. The general cause of such reluctance is the new character of the computer tool, which imposes on the indologist a change in his habits of work, if not in the conception of his task itself. Now, a change of habits is a difficulty that requires only some goodwill and temporary effort from the researcher to be dissolved and forgotten. Any responsible researcher will strive at adapting himself to the new tool, if there it offers a strong and deep motivation to him. One expects from a tool not only to make a task earlier, but also to achieve something that could not be done otherwise. One can fix a screw with two fingers, but cannot tighten it thus. The screw driver not only renders the effort easier, but also provides a much stronger tightening. Efficiency, more than mere comfort, is expected from the computer tool. Unless the computer provides him with an ability to do something he could not do with traditional tools, the researcher in humanities disciplines will not be deeply motivated to adapt himself to the new tool.

The purpose of this paper is to analyse the innovative features, the utility of the new tool and the ways of adaptation of the researcher, referring to the personal experience of preparing a CD-ROM on a medieval temple of South India. We will examine jointly the work of research and the task of presentation undertaken by the indologist, separately for the convenience of this exposition, even though in practice they are often mixed together.

Let us first review the main characters of the traditional tools in the hands of an indologist, to appreciate the contrast offered by the computer tool.

In the field with which the indologist is concerned, before computer age, the main tools have been writing for the sake of language data, reproduction through magnetic tapes, etc. for sound data, reproduction through design, photography, etc. for image data. The faithfulness of these tools has been improved through the ages and has been brought to a state of near perfection in very recent times. Nobody will question their comfort and efficiency. Nobody will question the user-friendliness of the script he has learned in his young age to reproduce his language. Nobody will question its efficiency. Writing produces a clear reproduction of the main features of language and in this way serves the same purpose as language. The only difference is that it facilitates communication in certain situations: the written message can be carried at a long distance, where the sound message does not reach for example. Writing can also produce some results that are not at all realisable through speech. Human memory is limited and writing permits the preservation of what memory is unable to keep. The degree of civilisation can be quantified by the amount of knowledge data it handles. Writing is a powerful tool of storage of knowledge, with which an oral tradition cannot compete. India has reached its high degree of civilisation through many currents of oral traditions strongly supported by writing materials.

The same can be told of tools reproducing visual material. Communicating visual information through language is often quite laborious. The ancient tools of reproduction of visual objects such as painting, sculpture, etc., those offered by contemporary technology, such as photography, facilitate the communication immensely. It is much easier to explain an architectural form with a drawing than with mere words. The new possibilities offered by these tools are equally immense. The tools of all visual arts are used to create, as well as to reproduce. In this field also the tools are a cause for the advancement of civilisation. The quality of a civilisation goes with the development of the visual arts, plastic arts, theatre, etc.

When there exist powerful tools, which we are accustomed to handle, is it necessary to think of another unfamiliar, new tool? the reluctance of some to use a computer may come from the quality and the successfulness of the traditional tools.

Now, the limitations of writing of design, of photography, etc. are well known. They are not able to reproduce a number of knowledge data. They cause a kind of reduction of the material. For example the latter of writing do not reflect all the properties of spoken sounds. Language transposed in writing is deprived of many of its living characters. A language that exists only in writing is a dead language. The

best product of writing is the book. The book contains knowledge data in a somewhat stiff and unchangeable form, lacks flexibility in using this knowledge, when compared to the same knowledge data kept in human memory. The knowledge that is present in our memory is a stock in which one has the ability to pick up objects, to link them, to circulate with great facility and speed. The book has only one instrument, the index to search for an item, and indices of all words of a book are exceptions. It has only three instruments of internal navigation, the index, the table of contents and internal references inside the text. The circulation from a book to a book is still more difficult, as multiple indices, tables of contents, sets of references have to be consulted.

An even larger amount of limitations can be analysed in the case of preparing and handling images. The difficulties of circulation observed in the case of textual matter are the same for visual material. In the case of video data there is the constraint of time-sequence, which renders circulation more laborious. A specific drawback of visual rendering of knowledge data with the traditional tools is the difficulty to control its faithfulness and reliability. Taking the example of architectural survey, the target of the surveyor is to produce a true visual account of the form and size of monument. Photography reproduces faithfully the reality, but produces an image in which size data are quite difficult to read. Perspective entails changes of measurements of all portions, which are at increasing distance from the camera-eye. Photogrammetry can calculate these changes and restore the real measurements, but this is an advanced technology not accessible to common historians of architecture. In fact for his purpose the historian wishes to read immediately the measurements of an item in a picture. For example, when seeing two similar elements on photographs of two monuments, he wants to compare their respective size and proportions. This drawback of photography does not exist in traditional architectural drawings. All the elements of architecture are measured on the monument and drawn on paper at a selected scale. Architects have a number of conventions of drawing, which render more easily readable all size-data. Now, the architectural survey in the form of plan, elevation and section is an artificial manner of representing the reality, but does not produce the visual impression that the eye receives in reality. In fact drawing often involves some artistic deviation from reality.

Coming to sound material, the above-mentioned drawbacks are the same, especially the difficulty of navigation in an audio-database. We may add that the tools of storing and retrieving are much less powerful.

To the specific limitations of these three types of knowledge data, one must add the difficulty of circulation from one type to another. The three relevant tools, writing, drawing, recording are well handled by specialists. The difference of nature of these tools is so great that no indologist can claim to be a professional in handling all the three. And the result is that indology has become the affair of specialists living in tight compartments, with little possibility of exchange. There are specialists of language and literature working with writing in the form of books and manuscripts; there are specialists of plastic arts working with drawing and photography; there are specialists of scenic arts working with audio and video-recording. This division is a recent phenomenon. And the lack of communication between the compartments is the greatest failure of indology as a whole. The responsibility of indology is to give a true account of culture as a whole. Culture is an integrated and structured set of language, visual and sound data. The separation between these types of data introduced by specialists is artificial and gives a wrong image of reality. The subjects handled by specialists are different but not completely separated. The division in compartments has happened not because of the subjects, but because of the tools used by the researchers. As one masters only one tool, one is confined to that which the tool permits to explore. The researcher has adapted himself to the tool, instead of adapting the tool to his needs. This is the negative, noxious influence of the tool on the task.

The limitations of the traditional tools used by the indologist define his expectations from a new tool. From the new tool he expects nothing else than to extend his capacity, to go beyond the limits in which he has been confined. The importance of the computer tool lies in the fact that it helps to break the partition of specialisation, by the resources offered by the rich functions that go by the generic name of multimedia.

Let us review the benefits offered by the computer to a researcher, for example during a casestudy for an Indian temple of South India. This is a revealing subject for the procedures of work, which it involves. To achieve a good understanding of a temple one has to collect documentation on the architecture, the iconography, the rituals, the history. The relevant tasks are respectively the architectural survey consisting in measured drawings, the photographic survey and identification of icons, the survey of the rituals, including ritualistic recitations, and of their scriptural sources, the survey of inscriptions and of other historical sources. The three types of data, textual, visual and sound are involved.

Multimedia is a unique tool to accommodate the three materials. It can be used to digitise text, line-drawing, photograph and sound, for classification, exploration, linking of data.

1. Digitisation

1.1 Multi-language, multi-script text

For textual matter, there are word-processors easy to use and generally accepted by content-specialists. The word-processor contains all that is required to prepare a book. An indologist can provide to the publisher a camera-ready-copy of the book. The indologist does the formatting work himself. The latest word-processors, such as MS-Word, Xpress, LaTeX, yield a satisfactory result regarding the get up of the book. The indologist has still a desideratum regarding the rendering of Indian scripts. The good word-processors have ready-made fonts only for Roman script. Indian scripts are adapted in diverse and awkward ways to the American keyboard. The best system is LEAP, which is a word-processor offering the use of a number of modern Indian scripts, with the good device of automatic conversion of a script into another. However as a word-processor it is weak comparatively to others and complicated compared to the more common MS-Word. ISM is a variant system, which has the advantage to be accessible in Word, Access and other common applications, but it does not do directly the automatic conversion. The scripts offered by these two do not contain certain special letters of ancient and medieval languages, such as *Samaveda* special notations of accents, etc. The best word-processor incorporating Indian scripts is LaTeX based on the powerful TeX. It is available for Mac and PC with full compatibility between both. The only debatable point is its lack of user-friendliness. The text has to be typed in roman transliteration, formatting instructions are written in the programming language with many brackets and parenthesis. The final text in the desired script cannot be viewed in the time it is typed. It is viewed only after conversion in a different application.

1.2 Visual material

1.2.1 Drawing

For scientific drawing the computer has a powerful tool, that is Autocad. It helps considerably to palliate the drawbacks of photography and manual drawing. The line-drawing can be entered in the application by writing the measurements in a system of two or three co-ordinates. Autocad draws the lines, from the numeric data, shows immediately the lines on the screen and, at demand, the measurement of each selected item. Maximal accuracy and facility of reading are obtained. A two-dimension drawing can be built in a three-dimensional one automatically. Automatic shifting from a view-point to another can be done. A filling-up of line structures with colours and textures, eventually reproducing the original texture of the building material, can be worked out.

1.2.2 Photography

Photographic material can be digitise with the help of a scanner, or even digitised images can be obtained straightaway with a digital camera. The digitised document can be viewed and processed by the computer. The standard application for this purpose is Photoshop. It facilitates the study of an image by a zoom function. It enhances the quality of the image by filters, automatic sharpening, etc. It allows the removal of stains. All processing can be done on different layers, which can be disabled and reactivated

on demand. A poor, unclear photograph can be made readable. It is often difficult to obtain a good photograph of an old palm-leaf manuscript. Because of the long shape of palm-leaves and the lack of contrast between the natural colour, darkening with age, of the palm and the slightly blackened letters, photographs and Xerox copies are often difficult to read. Once the photo or Xerox is digitised and opened in Photoshop, there is the possibility to select the background shades of grey and to delete them. We obtain a much clearer image, with black letters on white background, whereas before the letters had very little contrast with the dark background. The user can try to redraw the letters on a transparent layer to note down a tentative reading for a difficult passage and see it inserted in the original. The original layer is not changed, as he works on an upper layer. This is a very useful and creative tool to help in reading manuscripts.

1.3 Sound-material

There are applications to digitise a pre-recorded document from a cassette-player, or to digitise straightaway the sound source. There are applications for processing the digitised data, with devices of enhancement, eventual deletion of parasite sounds. It facilitates the synchronisation of a recitation and a written text, a translation, etc.

A general remark can be done at this stage. With the help of these applications we prepare the presentation of data to be viewed on the computer screen or in print. There may be a difference of quality between the screen image and the printed image. A good screen image is not necessarily what we know as good in print. It is generally not possible to produce on the screen the real aspect and quality of the printed page of a book. And if one aims at a good screen image, one should forget the familiar model of the printed page and think of another new model fitting to the screen.

2. Exploration of data

Once data have been entered and processed for a good presentation on the screen, the indologist plans to work on it, retrieve, search, browse. Research means exploring. In this direction again the computer has a lot to offer to the researcher. And the expectations of the latter are great. The computer has a vast capacity to move fast in a large quantity of data, which the human mind cannot do. Many search activities can be deputed to the computer. That will be successful, if the data are well organised for this purpose. The possibilities of database management by computer are also superior to manual management with written cards. Indexing of a book is a limited tool. There are database management systems that enhance considerably the possibilities of classification of data for quick retrieval. There are two commonly available applications, 4D and Access, which can render service to scientific research. It provides forms for classifying information under different headings, selected by the user; it empowers the user to design forms himself. And it performs operations, statistics for example, involving one or several fields having different headings. The most powerful tool offered by these applications is the search tool: search of a sequence of letters, i.e. a part of a word, an individual word or a set of several words; search for a theme, if data have been classified under different themes; search of a combination of items related by logic operators. For instance in a database of temple architecture, the search can be done on the basis of complex questions such as: which are the Calukyan temples having a *frieze* of hamsa on a plinth, question implying a search in different fields: temple style, decorative motif with location and architectural component. An equally efficient tool is the browse function. It allows the user to go through a number of classified items, presented on the screen by a code name, a thumb-size image, or a full image.

Access, 4D and other commonly available database management applications have been designed more for business companies or administrations than for humanities disciplines. The researcher in such areas misses some features that are quite important for him, or experiences difficulty in conducting trivial tasks. Fields accept only one script, font and style, whereas multi-language, multi-script facilities are such a necessity for him in every circumstance that it should be available to him in the most easy manner. Most of all, the indologist may also feel uneasiness in computer ways of classification in general. He has to deal with unfamiliar methods of sorting number data and indexing, an unfamiliar thinking in matter of

classification. Preparing a database on computer is something quite different of preparing a model of card for a manual index. In fact, the computer offers so many more possibilities, so much more flexibility of classification, compared to preparing cards, that it is a boon for the researcher. It invites him to think more of the logical organisation of the data he is handling. Programs like 4D or Access require as a preliminary a thorough examination of the nature of data and of the would be questions and later use of the data. They offer the possibility of defining fields under definite headings, the possibility of connecting tables of different types of data, so that much re-writing of some common data is avoided, etc. A complete preconception of the classification of data is not always possible in certain domains that are not well known. At the time of collecting and entering data some of a new type can occur and a new field has to be created.

3. Linking of data

This is the most promising domain opened by the computer before the eyes of the indologist. And this has to be conceived in the sphere of multimedia.

Linking data is the decisive step in course of research. For instance tracing a similar sentence is an argument for chronological relation of two texts; tracing a similar idea is an indication on the school to which a text belongs; tracing similar decorative motifs on monuments is the method to define the style of a region and a period in the history of temples, etc. The enhanced possibilities of exploration offered by the computer promise to be very creative in this regard. The possibility to ask composite formulas of search in a database system is a powerful tool to trace possible links.

A remarkable progress achievable with the help of the computer is the facility to link different media, text, image and sound. This is made easier, first because the text, image and sound database are stored in the same unit, then because at every moment, in any part of the database, processes of search can be conducted from text to text, text to image, text to sound and viceversa, links can be fixed between data of any medium.

The multimedia technology of the computer changes completely the possibilities of presentation of the results of research. It invites the author to combine the media at every stage of his exposition. It offers an original mode of presentation of linked data, that is the hyperlink. Let us take a simple example. A text describing the architectural components of a temple appears in a window on the screen and the photograph of the temple appears in a second window. This is a first-level link. Now there are a number of components mentioned in the text and which have to be identified on the image. Generally a book lets the reader search by himself the connection between the described item and the corresponding part in the image. The computer can supply this service to the user. It offers a hyperlink or second-level link between both details in the following form. The linked details in the image and in the text are simultaneously highlighted in both windows, when the user brings the mouse on any of the details. Hyperlink can be also a third-level link, when it connects an item present in a window on the screen with another item not present on the screen. In the active window the item is highlighted by the passage of the mouse-arrow and at a click the window containing the related item is brought to the screen. Hyperlinks can be used to attach a glossary definition to a technical word, each time it occurs in a text, to attach a graphic illustration to a word or expression, to attach text description to an item in an image, to connect ideas from different passages of a text, from text to text, etc., to connect related motifs or details in different images, to connect graphics and photographs, etc.

The CD-ROM is the best current output of a creative work on computer. We have seen that the indologist can produce a book in the traditional manner on his computer with a simple wordprocessor. If he desires to draw benefits from the other devices offered by the computer technology he can work at the production of a CD-ROM. Preparing a CD-ROM is something else than preparing a book. To take full advantage of the computer tool one has to forget the methods of book composition he is familiar with and take a different line of thinking to conceive the CD-ROM. The new requirements, sometimes felt as new

constraints, may be analysed as follows.

First, multimedia are required at every stage. In a good standard book of indology, even in the field of art history, the textual written part is dominating, if not in volume, at least in importance. Image is attached as illustration of the text, and selected from the contents of the text. The CD-ROM invites the author to a different situation, in which text, image and sound are equal in importance and interacting constantly between themselves. This is a creative attitude, which reveals new possibilities. For instance in the book form a poetical text is diverted from its musical quality, because it is presented in its mute written form only. The CD-ROM produces a better reflection of its real nature, when it is presented in written and sound forms simultaneously. There are medieval inscriptions in sanskritised Kannada, beautifully engraved on huge stelaes of stones in some temples of Karnataka. They are masterpieces of poetry and of calligraphy. They are the work of several artists, a poet who probably conceived his work in oral form and sung it, a scribe who wrote on the stone ornate letters, a sculptor who executed the engraving. The joined presentation of the inscription in the form of photograph, audio reproduction of a vocal rendering, with modern transliteration, translation and explanatory notes, on the same computer screen, will be the most complete account of the reality. It has an enhanced scientific quality and can also convey and communicate more of the feelings and subjective aspects attached to a work of art.

Another major difference between the book and the CD-ROM is in the basic conception of the organisation of the subjects. The book is based on a linear conception. At the outset of his work the author thinks of the order of the subjects he has to present and fix a logical sequence, which he proposes to the reader. And the reader receives an invitation to follow that sequence from the beginning to the end. Cross consultation is secondary in the conception of a book. The CD-ROM changes this situation. It suppresses any constraint of sequential consultation, it invites to all types of movements inside the database. In that case it is not necessary to give importance to the order and sequence of matters. On the contrary the classification of the data is to be thought of to allow the easiest and fastest possibilities to search and bring the data. A logic of circulation has to be thought of. The main requirement is the linkage of information. Hyperlinks are the main channels of circulation, and the more links are created, the more flexibility of navigation is achieved.

The continuity of the text in a book, the quality of the logic that supports its continuous line is a major factor of its quality. A fascinating book is that one, which is read from the beginning to end without break in the attention and interest. Transitions from a subject to the next are an important feature of book composition. Smooth transitions only produce smooth and sustained reading. The same type of continuity is not a quality for a CD-ROM. Its base is a net of links between cells, not a unique line. For example it may be made from units of texts, each connected to an audio unit and one image. The unit of text has to be short, limited to the screen, or if exceeding the limits of its window, not too long, as the scrolling facility becomes an uncomfortable device if it is to be used too many times to see the complete text and does not allow an easy view of it. A next-button leads from one cell to the next one. There is no scope for transitions from one to the another. If attached at the beginning of the next cell it will make it longer and be a burden more than a help. Even the sequence of cells one after the other does not appear as the best way to sustain interest. The links play this role, and only an attractive logic of linkage can enhance the quality and efficiency of a CD-ROM.

There is thus a tendency of CD-ROM making to collect and order data in separate cells. A consequence is that it causes a kind of break down of knowledge. That may be a danger for the strength and cohesion of thinking. Therefore some restraint may be observed in this respect. From our experience of preparing a CD-ROM we have learnt in what direction this new technique can lead us with great profit, but we feel also that without control and constant awareness it could be detrimental to the quality of thought and information.