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Media Publishing in Distance Teaching

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Abstract: MediaPublishing is an application project within the BERKOM programme. More and more publications for different target groups are produced on multimedia basis. By using high speed communication networks and standardized protocols, distributed applications and scenarios for planning, editing, production and partially also for usage of multimedia publications became possible. In the realisation and test of such complex, distributed production chains for the development of media in distance teaching lies the goal of the project MediaPublishing. The first course produced with the editorial environments and communication facilities now in progress is „Technical data security in communication networks".
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1 Multimedia Development

1.1 Intentions of an Application Project within the DeTeBerkom

MediaPublishing is the acronym for an application project concerned with multimedia publishing. It is primarily established in the telepublishing area. Publishing is one of the most innovative industries in the introduction and usage of new computing and communication technologies. Its development started with printing books by Gutenberg and it had its last highlights with the entry of desktop publishing (DTP). But publishing does not only mean creating and distributing printed materials, in a broader sense it means media development and distribution of information on the other hand on all sorts of media like records, cassettes, disks, compact disks and so on. The production environments are mostly quite different, the procedures of development are similar and become more similar everyday since computing is the common basis to all production environments. Electronic publishing does no longer differentiate between processing textual, graphical, pictorial, auditive and animated information.

The starting-point for media publishing is almost the same as for publishing printed media. The traditional publishing procedure is well known, but the concepts of desktop publishing require new strategies in organizational procedures. Further milestones on the way to modern electronic publishing announce themselves in terms of printing from computer to plate, direct imaging, database publishing, printing on demand and publishing service centre. Experiences in these areas are nowadays adequately applicable to media publishing. The structure of the organizations participating in this development process is always the same: specialists create modules of the totality, publishers, producers and editors combine them and distributors market them to consumers. All participants in this scenario are separated from each other and do their work using computers with a lot of sophisticated software. All these agents need data, they work on data and they transmit data. The amount of data has grown with regard to quality and quantity so that the whole process may not longer be transacted using parcels containing specific materials like manuscripts, printing forms, colour-separated outputs, repros and so on. Ambitious transmission mechanisms are needed to deal with a lot of problems in this process. The key technology in this domain are flexible and multifunctional communication networks; however the requirements turn out to be more difficult than expected.

The main providers of communication networks are telekom companies, this is also the situation in Germany. DBP Telekom offers several services for communication purposes. But the adaptations, renovations and innovations necessary under actual circumstances are immense and demand high investments. Therefore providers have to observe the market trends in order to keep the required network facilities up to date. One of the Telekom's subsidiary companies working in this area is DeTeBerkom, which resides in Berlin. It sponsors investigations of new network concepts and applications. MediaPublishing is a project in this framework.

There are a wide range of requirements which were investigated in the project. However, only the main aims will be summarized here. Firstly, the situation of distributed editorial environment for multimedia will be analysed in different application domains. One of the relevant domains is distance teaching as represented by the FernUniversität. A second domain is related to the tasks of a publishing service centre with special emphasis on data conversion of technical documents. The third domain is concerned with a publishing company. Both domains are represented in the project by eps Bertelsmann, Gütersloh. A publishing consulting company, Preprint in Berlin, participates as a third partner. Secondly, the project examines the limits, where DTP-like production methods become inefficient, because the amount of data swells, the demand of multimedia productions grows and the facilitation of multimedia productions increases. Thirdly, a prototype tool system for distributed media environments is being developed and tested using existing Telekom networks as well as the special test bed BERKOM at Berlin. An important aspect of the tool system is that it is based on already well known existing tools of the different branches of multimedia development. It has to harmonize different data formats, device platforms and communication systems. A further aim is to develop an online system in the distance teaching area. This aspect will be treated in the second section of this lecture note.

1.2 Optimal Utilisation of New Media in Distance Teaching

The potential of new media technology rapidly increases and awaits being used in distance teaching. As it is true that distance teaching is a complex issue, advance in media technology will not automatically mean an improvement in distance teaching. There are two main reasons why enthusiasm should be limited. Firstly, distance teaching based on high-quality media requires first class equipment at the site of learning i.e. at the local workstation of the students. Fortunately the equipment which can really be accessed by students nearly keeps up with the progress of technology. The main problem are the expenses, but they seem to be controllable. Participants in distance education primarily ask for direct benefits and they do not hesitate to invest if they expect a rich and qualitative offer of study materials which will ease their learning. Investigations show that the local equipment is often of excellent standard.

While consumer's side difficulties of distance teaching are manageable, problems arise at the other end, i.e. the suppliers' side. What are the reasons for this imbalance? Let me point out that traditional distance teaching developed from face to face teaching by printing the contents of the lessons as lecture notes and distributing them to remote sites. This process of transfer only partially affect the subject matter of the courses, but there remain deficits with regard to interaction, communication and so on. Experts in distance teaching have tried hard to reduce these deficits and it seems that multimedia products and new media applications would be further steps to neutralize the deficits mentioned.

Let us focus on multimedia in distance education. It became a commonplace headword long before its meaning could be verified by concrete products using relevant standards. Especially realisations in distance teaching are a long time in coming while products from the entertainment industry are gaining ground after a long period in which the announcements dominated real publishing. I claim that this is not only due to technical relapses but that it can be traced to shortcomings of creativity and publishing know-how with regard to multimedia. Further hindrances were caused by the enormous amount of financial resources needed for the implementation of the first multimedia products. It is risky to invest a considerable amount of resources without knowing whether it will pay off in the long run.

In distance teaching the problems are intensified by two facts. Firstly, educational institutions lay claim to develop training methods and materials under their own responsibility. Teaching at university level is done by individualists and even course development teams operate with terms like „authors". But similar to film, multimedia production no longer restricts activities to a small group of persons but involves several groups with a sophisticated allocation of tasks and responsibilities. Later on we will show how such a team might be designed. Secondly, all educational efforts in our society, in companies, in professional training and even by individuals are always restricted by certain percentage limits of the respective budget. Expenditures on hobbies may increase more and more, but those on multimedia in education must be calculated carefully. The borderline between public sponsoring of education and private share is being newly established today.

1.3 Distributed Production Teams in Media Publishing

Within the project MediaPublishing a concrete multimedia product is being developed at the FernUniversität. At present the different activities take place at the Centre for the Development of Distance Education (ZFE) in close cooperation with the Institute of Communication Systems of the Department of Electrical Engineering. The final result will be an integrating teaching software, in future to be distributed on CDs. The subject matter covers a part of the curriculum of electrical engineering and is entitled „Technical Data Security in Communication Networks". Up to now no printed course on this topic is available at the FernUniversität.

Because requirements in multimedia publishing are very diverse, all qualifications needed are gathered in a joint venture team. Every member in such a team takes a role on the base of his professional competence. A selection of roles will be enumerated now [see Fig. 1], [Fig. 3].

At first there are academics representing the specialized knowledge of subjects selected. In our multimedia project they come from the electrical engineering institute mentioned above. They are responsible for the allocation within the curriculum of the focused course of study and they have to select the topics in detail. They draft a treatment of the subject and formulate the items of the course.

As a second role the competence of specialists in teaching methods is required. It is their job to transfer the treatments into practical multimedia scenarios, e.g. in terms of films they develop story boards or scripts. Furthermore they facilitate the dialogue between subject experts and the other specialists. Therefore they are predestined for the coordinator function with the development team.

The next role is based on the competence in software engineering. Unfortunately a dream of most multimedia producers is the realisation with an authoring tool which can be mastered by everyone. Our experience showed that authoring tools are manageable to a certain degree by everyone, but they seldom solve all the software problems, rather they may create additional ones. This job in our project was shared by members of the ZFE as well as by members of the institute.

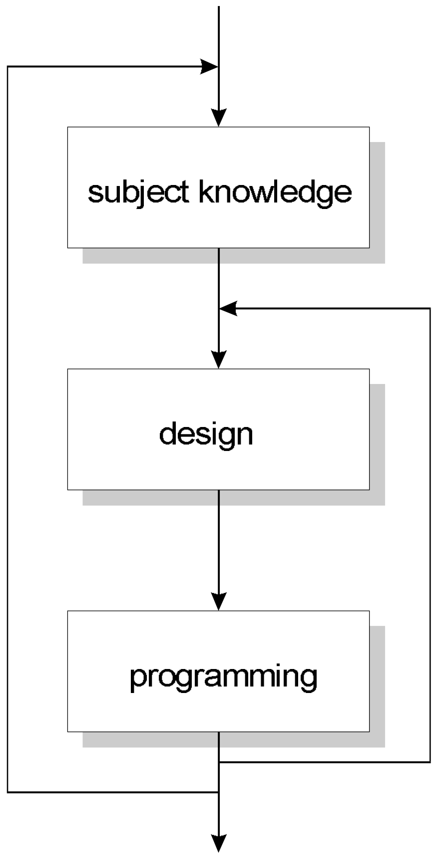

Figure 1: Flowchart of multimedia development

Text and graphic designers arrange the outfit of the multimedia product. There is a tendency to underestimate their roles. We have to recognize that it is their job to make the products acceptable. User interface is the place, where acceptance has to be won.

Finally multimedia productions require the competence of AV-media designers. These includes in broad terms all specialists needed for sound and video production. They are especially in charge of those media components that emphasize multi-media within the usual media assemble. All the designer functions were located at ZFE.

The above characterized multimedia development team represents minimal staffing and has to be reinforced by double casting of roles or by engaging external service providers. The inner circle of the multimedia development team takes care of planning, controlling and project management and works on individual tasks as far as capacity is available. In this concept source editing and add-ons like data conversion, data compression and program transposition may be left to outside suppliers [see Fig. 2]. As long as the provider market is still developing its ability to its full, we had to improvise in the project by providing missing features by the inner development team.

The multimedia development process results in a vast data collection on a harddisk runable on Windows computers. These installable runtime versions will be transferred to a so called golden CD. Special providers multiply them and make them ready for distribution by printing labels and by packing in jewelcases.

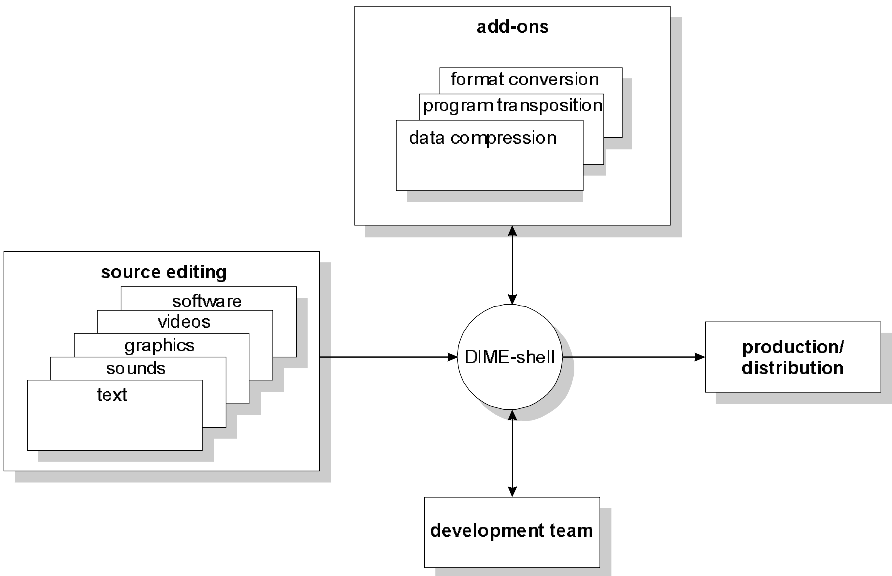

Figure 2: Function areas and activities in distributed development

1.4 Technical Environments

The initial premise of the MediaPublishing project was the intention to preserve the original development tools of the participating developers and as far as possible even their device platforms. Let us enhance on this requirement. The differences between a Mac and a Windows computer and an OS/2 computer and even a Unix computer are difficult to overcome. Therefore a common platform must be implemented on top of the inherent operating system which has to harmonize the different access levels and has to provide database as well as communication facilities. Lotus Notes is such a software tool usually utilized in office communication.

Furthermore Lotus Notes does not affect authoring tools or other developer's software such as text editors, graphic and picture processing programs as well as tools for sound and video manipulation. Thus a format independent data administration can be organized. Even file viewing is possible under restraints. Nevertheless developers are well-advised to prefer only standardized formats within a production. The choice of the authoring tool is significant too. It is the most important tool for the development team because it links all the individual elements in runable modules which on the other hand are bound together to a runtime version. An excellent authoring system is Authorware, but let me remark that no software without weaknesses exists; but there at least cross platform facilities are supported.

Within the MediaPublishing project the central tool system is named DIME, an artificial abbreviation of DIstributed Media Environment. It is based on Lotus Notes features and was developed by another project partner, a computer science institute at TU Berlin. DIME is a network consisting of servers and clients, which are used for distributed but integrated storage of process data for multimedia publications [see Fig. 3]. Therefore the most important component is represented by the DIME media storage. It is completed by administration facilities like a tender invitation system, an order management system, a development database and finally a workflow controlling system. The prototype is now being tested. Up to now experiences are full of promises, but speed and handling behaviour seem still to be improvable.

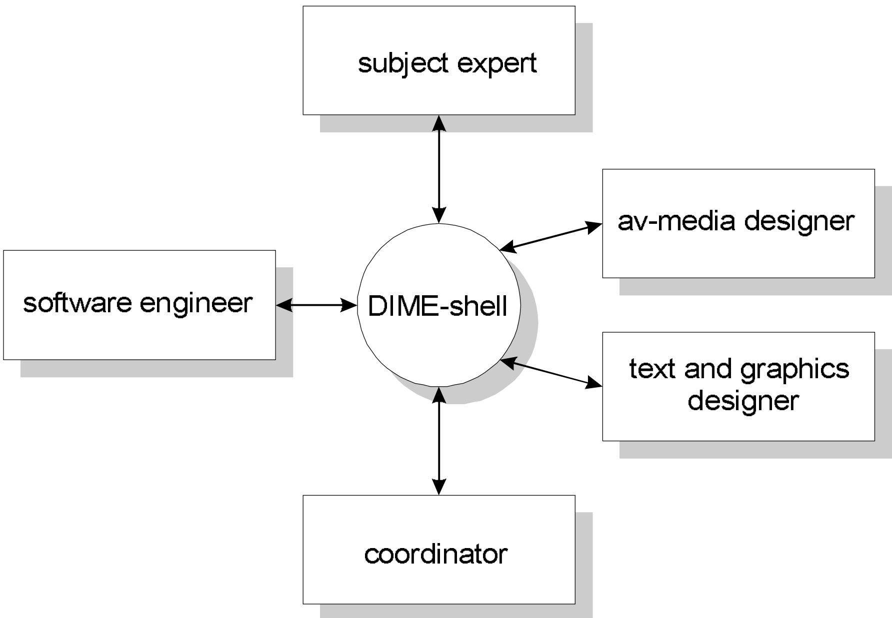

Figure 3: Different roles in MediaPublishing

Finally let me point out the real distance in space between the development partners [see Fig. 2]. All members of the inner circle work at different workstations scattered over various sites. They are all integrated by a local network system supported by facilities like file servers and DIME servers. Connection to external DIME users are established via ISDN-multprotocol-routers, the use of ATM switches is conceived. In each case the line to external stations works only on demand in order to limit line charges.

2 Multimedia Online Assignments

2.1 Organizational Environments for Assignments Yesterday and Tomorrow

Communication is an important component of teaching in every form. At university lectures there is often a professor talking to many students but, on the other hand, students are able to ask questions, to discuss the material and to do exercises.

Distance teaching is often restricted to a one-way-communication; a professor writes a more or less multimedia lecture that is handed out to students. At the FernUniversität students often work by themselves; they may not even have the possibility to talk about the material to each other.

The due form of communication is to offer exercises to students that are corrected automatically by computer or manually by teachers. At the FernUniversität in many cases the successful solution of these exercises is a precondition for admission to examinations. With the corrections students receive a master solution, which enables them to understand what they did wrong and what may be done in a more appropriate way.

Other possibilities of communication are:

- Questions about the material
- Discussions with other students or teachers
- Criticism and suggestions for improving the study materials.

At the FernUniversität assignments are sent to students by letter every two weeks. The students have about three weeks to solve the assignments and to send them back. Several students do this using a word processing program on a PC.

The solution attempts are corrected and sent back to the students with a copy of a master solution. This process often takes at least one month. Thus most of the students already forget the assignments when they finally get the corrections and the master solution.

Another problem is the money needed: The students are able to send their solution attempts concerning several courses together in one letter to the university; at the university these have to be sorted and sent to the teachers, who send their corrections and master solutions back to the students individually. So the university has large expenditure.

For the future we propose an online system for assignments. In multimedia courses students have to work with a computer anyway, so they can solve the assignments on their computer and send their solution attempts to the university in a simple and fast way directly to the responsible teacher.

2.2 Requirements for Students and Distance Teaching Institutions

The most important medium for online communication is text; but also pictures (pixel and vector based images) are needed to describe some contents in an appropriate way. It is not necessary to support all types of media; for example, we do not expect that students will be able to produce videos in which they explain their solution attempts. For reasons of flexibility it must be possible to attach files to a solution; this may for example be PASCAL source-code or executable files for programming exercises.

In the past and today modems with low data transfer rates are used for online communication. This solution is sufficient for transmission of ASCII-texts and small files. For the transmission of images, higher data transfer rates are necessary, so we recommend to use N-ISDN (Narrowband-Integrated Services Digital Network).

Lots of students do not have the equipment required for distance learning at home with online communication. For that purpose, they can use one of the about 60 study centres of the FernUniversität. These study centres are open usually from 4 p.m. to 8 p.m. on workdays and saturday afternoons, because lots of our students are fully employed.

For that reason the online system should be realised as a mailing-system. It does not matter whether the teacher is really working at the moment a student sends his solution attempts; if he is working, his attention will be called to the mail, otherwise he will be notified the next time he starts his computer. Teachers like this solution more than for example being called by telephone: they can have a chance to look at the material before they need to answer.

Every student should get his own account for this mailing system because it should not be possible that students have a look at the solution attempts of other students. The student should be able to decide whether his corrections are to be sent back the same way or by letter.

2.3 A Softwaretechnical Approach to an Online System

In the MediaPublishing project we established an online system for distance teaching. At the ZFE we installed a Lotus Notes server which holds databases for exercises and discussions to be accessed by students. The server can be reached by ISDN and INTERNET [see Fig. 4]; it is possible to connect the server to a modem; however this was not implemented due to the lower available bitrate compared to ISDN. In the study centre at Castrop-Rauxel we installed a multimedia PC with a Notes client and an ISDN connection to a multiprotocol router at the ZFE, so students without the appropriate technical equipment are able to work with the system.

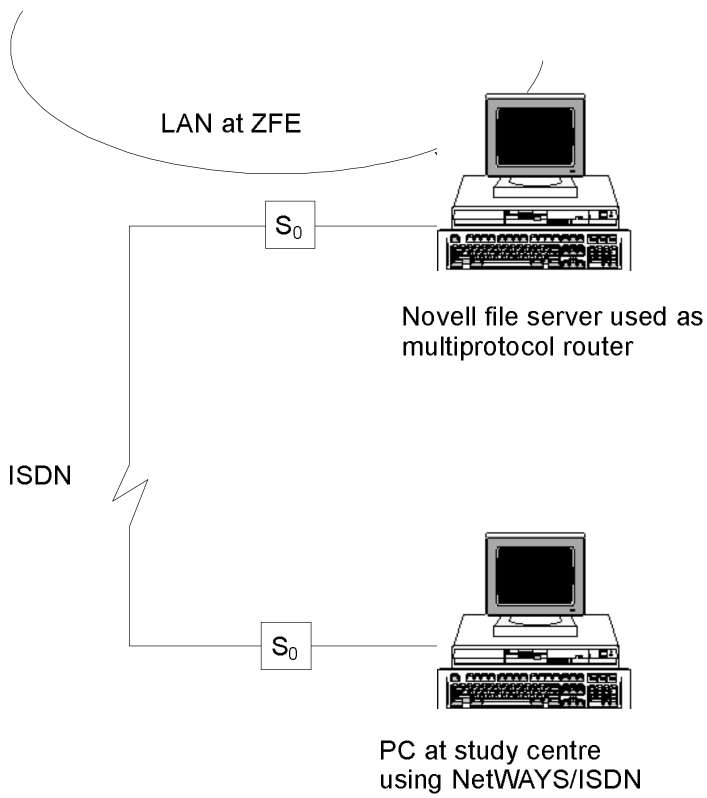

Figure 4: Network of the online system

There are two databases which can be accessed by students: The assignments and the discussion database. On opening the assignments database an overview of all assignments is presented to the user. Assignments seen so far are marked. By selecting a specific assignment the user is able to have a look at it; he may then go back or press the button "Solve".

Before solving an assignment, the user has to write down his name, registration number and address. He can decide whether the corrections should be sent back the same way or as a letter. When the user finds out that the assignment is too difficult for him and he wants to solve it later, he can go back; otherwise he can press the button "Send" to send his solution attempt to the teacher. A word processing program similar to WinWord is included in Notes; it is simple to insert objects like images into the text; files may also be inserted.

If there is only one teacher for a course, the solution attempts are sent to his mailbox; if there are more teachers, the mail is sent to the one who wrote the assignment. The attention of the teacher will be called to the mail immediately or the next time he starts his computer. He can have a look at all assignments he received and correct them and send them back after appending a master solution. If sent by network the student will receive the corrections immediately or the next time he connects to the Notes server.

Every student has a unique account to use the system; in our approach there is also an open account for students who have not yet registered. This open account may also be useful for anonymous criticism and questions.

The second database serves for discussions; in contrast to the assignments everyone can write to this database. Students and teachers may ask questions, may answer questions of other participants and so on. With every account it is recorded whether a specific entry in the database has already been read or not; the entries are sorted chronologically and may be deleted only by the author or the teacher.

There are two problems concerning the communication costs in our implementation: To save money the B-channel connection(s) in ISDN are switched off after a given time without communication, but the Notes client normally checks for new mail after a given period of time. For this check a B-channel connection has to be established.

In the study centre at Castrop-Rauxel we encountered another problem: although we had only installed Lotus Notes, the students realised that they had access to INTERNET via the ISDN connection. They installed FTP and other applications and used them for communication, resulting in a bill from DBP-Telekom much higher than expected. In the future we either have to separate the Notes server from INTERNET or we will only allow IPX-communication.

As an introduction, we presented the multimedia lecture and the online communication to the students; although the course in not relevant for examinations, a lot of students participated in the multimedia lecture and the online assignments.