WORK FLOW AND SYSTEM PARAMETERS IN PREPRESS PRODUCTION

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Keywords: Integrated, Newspaper, Production, Simulation, Systems design.

Abstract: We have analysed the production processes and their needs for developing new concepts of future newspaper prepress production. When defining production systems, we emphasize the need for methods that relates to those supporting information systems design. The strategy is to define parameters and then, through the first analysis stages in systems design, be able to optimize overall process. All this is necessary before new organisations are proposed using new technology — such as modular software, groupware, databases, local area networks, servers and workstations. Future newspaper production systems offer a total integration of production, organisation, remote or distributed production sites, quality and production management. This paper maps the status of work flow and its possibilities in newspaper production. We also emphasize the use of production management systems (PMS) and describe the meaning and function of such systems and their relation to systems design. PMS is not a centralized system but a collection of standard applications put together in a customized way. Lastly we report the status of building a software simulator for newspaper production in NeXT environment. This subproject, called TidSim, will test PMS models in a simulated environment. The work is made by combining field studies including data and activity analysis with literature research.

INTRODUCTION

Production in newspapers has radically developed its technological and organisational profile during the last centuries. This evolution is referred to as the four major generations or waves starting with attempts to computerize text- and photo-composing in late 1960s. Development has gone from centralised and closed systems to fourth wave, decentralised systems that are build on standards, both real and *de-facto* standards. **The problem is** to get efficient and stable throughput in the process in respect to productivity, quality and economy. A central task will be the design and use of production management systems, PMS. These systems rest upon the infrastructure of computer networks and standards emerging today and future design of groupware, software packages and databases.

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Our **main goal** for the whole project is to **define production models** for future newspaper production. In a first step we have **chosen methods**, analysed case companies and emphasized the need of integration of standard systems. To define work flows and parameters of the user environment, there is need for analysis methods that take both information and material in concern. Our methods come from the science of information systems design and we have combined them to fill our needs. One **hypothesis** in this paper is that effective and productive newspaper production is not achieved until the process is understood, measured, planned and managed. Then the work with optimizing the process can start. With use of a collection of tools, most important are models for future newspaper production that will use production management systems (PMS), rethinking of the organisation and activities parallel to introducing new technology.

This paper maps the status of work flow and its possibilities in newspaper production. We also emphasize the use of **production management systems** (PMS) and describe the meaning and function of such systems and their relation to systems design. Lastly we report the status of building a software simulator for newspaper production in NeXT environment. This **subproject, called TidSim**, will test PMS models in a simulated environment.

We do not want to create ready designed systems or job specifications. **We believe in** an explosion of easy used modular software tools with the emerging of object oriented operation systems during the 1990s. There is a continued strive for the use of standards in communication (LAN, WAN), graphic user interfaces (GUI), operating system (OS), protocols (OSI model) and colour models (CIE, CMYK, YCC). We must go from the original goals defined together with the fourth wave. Now is the time to integrate the total page production in a productive manner, i.e. integration in multiple levels. We expect that the people in the organisation perform the most suitable tasks without our recommendation for job specifications.

This is the second paper produced within the framework of projects called "Future Newspaper Production" at KTH/GT. Stig Nordqvist is working on Part One which includes production models and methods, organisation, work flow and PMS in prepress environments, parts Two and Three being studied by two other doctoral students, Johan Stenberg and Mikael Sundmark in supervision of professor Dr. Simo Karttunen. The first paper was presented at the NORDLAB '92 Conference (Nordqvist 1992).

METHOD

In quality assurance systems the customer and his concrete needs are taken as the starting point for systems definition. On the other hand many mishandled projects have been reported to have forgotten the specification of need before the technical specifications. The emphasis is on thorough documentation of the needs and actual work flow in newspaper production. There must be documented problems and possibilities given by the analysis, it can not be based on guesses. For the problem stated in the introduction there is a need for methods that relates to those supporting **information systems development**. This science is relatively young and therefore full of models, methodolo-

gies and computerized tools. For example, computerized tools today are a jungle with software packages supporting one, none or several methodologies. Therefore it is very difficult if the approach to perform an analysis has to choose a method based on a software package (Andersen 1991, Boström 1988, Nilsson 1988).

The concept of methodology for information systems development is, that a methodology gives a set of guidelines for a systematic way of working with development tasks. Nilsson (1988) emphasized the importance that every methodology is built upon:

- A perspective including **principles and values** for the work (Appendix A).
- A set of more or less **defined concepts** which the development work is based upon.

The method supports structured rules to handle complex work tasks and divide the work into a number of perceivable phases. A methodology should therefore consist of:

- A **model** with a number of development phases.
- A number of **coherent work steps** (method steps) for each phase.
- A set of **description techniques** for the document types produced during the work.
- A set of **tools**, like computer support for document handling.

In this project the following methodologies have been studied for use in the analysis: **Business analysis** (Rock-Evans 1989), **Conceptual modelling** (Boman 1992); **ISAC-model** (Lundeberg 1977); **JSD**, Jackson System Development (Andersen 1991); **Gantt**, netplan and logic nets (Selin 1985); **SASD**, Structured Analysis and Structured Design (Andersen 1991); **SIV-model** (Andersen 1991) and **V-model** (Nilsson 1988). Of these studied methodologies ISAC, SASD and the V-model are the more need- and less design oriented. Business analysis defined by Rosemary Rock-Evans (1989) is an integrated analysis of data and activity analysis. It proves useful especially in specification and design of database related projects.

ISAC-model defines SDA

ISAC is a mature model for **information system design** in production, for example a newspaper. The system should **fulfil** the needs and demands of the users. It can be used to alter and enhance an existing system or to introduce a new system (Boström 1986). The model can also be used in development of organisations and to alter production techniques which this paper relates. The ISAC-model includes several stages in the process of designing information systems — analysis of changes, activity analysis, system design. Its strongest part is activity analysis which is used in the project described in this paper. Activity analysis is described by a description technique defined in ISAC called **Systematic Description of Activities** (SDA). SDA consists of (Lundeberg 1978) activity-graphs (A-graphs), verbal description (text-pages), and entity tables.

Activity graphs is a graphical description technique with a set of symbols and rules. Text-pages relates to the A-graphs and describes the graphs in detail. Use of A-graphs is defined in symbols, rules and interpretations. Graphs are hierarchical so that each level becomes interpretable and not jumbled with symbols. The symbols are few and easy to understand. One of the great advantages is that both material, information and composite

are mapped as sets between activities. A goal- and specification table must be set before the activity analysis can begin. This list limits the analysis so that flows and activities that do not affect the defined problem area are not being mapped. If this was not done, it would result in an immense A-graph. The work is supported by a computerized tool, called GraphDoc. See also figure 1 and appendix A.

There are similar methods to the ISAC that describe activity analysis. Andersen (1991) has given a survey of models for information system design. By his and our experiences ISAC is still one of the best models for this phase, compared to models like Conceptual modelling, JSP and SASD. SDA has advantages when it comes to analyse activities and organisations which are subjected for alteration and development.

Event analysis

This method is based on **analysis of the routines** in the activity. Event analysis is the second phase after SDA (A-graphs ad text-pages). Routines are mapped in graphs that are also supported by a computerized tool called RUTH. Compare A-graphs and event analysis with the following example. If A-graphs are the map of the tracks in a railroad station, the event analysis will describe the routine for a train to move from point A to B through the station. Mapped routines are often easier to understand than A-graphs for a person in the organisation. Event analysis is often trivial to perform after A-graphs have been made in the design process. A-graphs contain several routines and the entirety of the production.

Time-related models

Developments from the simple checklist via **Gantt charts** to netplan technique reflects the increasing demands on administrative planning tools. Gantt charts are mostly used for its ease of use and good overview layout. For newspaper production the demands are higher and complexity greater. Netplans are adapted to schedule larger and complex projects, especially in systems design. In this technique there are tools for **time, cost and resource planning**. The popularity of netplans has increased with the spreading of PCs and shrink-wrap software. Today netplans can be practicable with low-cost software, for example MacProject on any Macintosh computer or Microsoft Project on Macintosh or Windows-PC.

Activity and event analysis must have been performed prior to this phase. **Netplans** uses activities and time and their relation in routines (events). This results in time planning where each activity's earliest starting and finishing time are calculated and the total production/project time can be calculated in the critical path of the production, so called critical path analysis. This **critical path** is the line of activities that does not have any spare time, i.e. time gap. There can be several critical paths. After the time planning is executed resources should be calculated from the netplan. Resources can then affect the netplan. By replanning the activities in a way that resources are distributed over the process, resources can be used effectively. Time and resource plans give good data for cost planning.

How to map production

Production in newspapers is a mixture of many tasks, for example creative journalism, writing, text- and image editing, repro, composing, printing, scheduling, controlling and management. Analysis must cover both information and material flows. Time is another significant parameter that must be related to the production activities. To cover all parameters into one model is not possible. The study has been divided into three major phases. First phase is based on the SDA method defined in the ISAC-model which execute a **functional analysis**. Second phase maps routines in an **event analysis**. Final phase relates to routines and functions into **time based** diagrams (logic-nets).

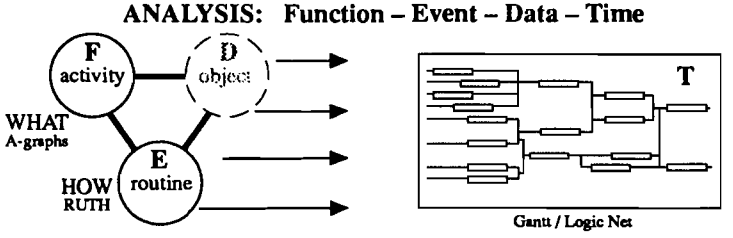

Figure 1. The connection of different analysis steps. In this project we do not aim to design or implement systems. Therefore Data analysis is not performed.

Method for the future

The situation of today is dangerous when new computerized tools are offered to the market at a rate which far exceeds the development of new methodologies in systems design. Boström (1988) established this in a survey over information systems development, specially those supporting methodologies with computerized tools. For the future there must be computerized tools that combine the knowledge of good methodologies and the ease of use from shrink-wrap software. There are also interesting developments done in the field of expert systems (ES) or s.c. **knowledge based systems** (KBS) — a field of computer science often referred to as artificial intelligence (AI) (Hart 1992). The use of ES or KBS could combine rules of the methodology with data and statistics (experience) from completed systems design projects. Another approach is to use KB-systems as production automation tools directly by combining rules extracted from routines to the rest of the production subsystems (Ahonen 1992). Another field is **CASE tools** (Computer Aided System/software Engineering) where support is given for design and development of systems. There are indications that CASE tools could integrate earlier phases like activity and event analysis.

The ideal tool, in respect to my own opinion and experience would be an open and **integrated approach**. Connect the company network management system (NMS) to an analyse and mapping tool. It could be an integrated task to update and alter mapped activities (A-graphs) simultaneously with the network reconfigurations. This could allow the design organisation to simulate alterations of the production flows and see effects of truly integrated systems. This is an early spin-off of the TidSim project (see later chapter).

WORK FLOW AND SYSTEM PARAMETERS

In the dawn of computerized production environments the dedicated and centralized system played a central role above the emerging DTP systems in 1988-1990 when the approach was strictly technological. First when DTP systems did not result in the promised productivity enhancements, organisational and work flow issues really became an issue. Work flow issues in newspaper production are seldom addressed in the sense of how the organisation handles work flows. Still there is a strong focus on technological issues. The question almost always relates to "how are we going to improve the production, with system A, B or C ?". There are few organisations that have made an activity and problem analysis that pinpoint the weakest work flow link. But there are promising ideas to relate organisational and work flow analysis with the introduction of new technology in the three Swedish case companies that we analysed (Nordqvist 1993) and in which the organisation is a big issue. Our case study and experience from several visits to newspapers in United States (Nordqvist 1991, 1992b), United Kingdom, Japan, Norway and Finland have resulted in deep understanding of newspaper production.

Publishers must view their total production organisation in a critical approach to improve the productivity and shorten the work flows. Analyse the production with respect to activities, events, time and last but not least, existing technology and trends. The set of methodologies we have chosen for our studies cover the needs for performing a thorough analysis. Combination of functional, event and time related analysis methodologies is a quite extensive task and is greatly helped by the use of computerized tools that strictly support the methodology.

We would like to address the following issues in this chapter: experiences and results from work flow studies at three newspapers, discuss the technology or the organisational work flow approach, and lastly the state of work flow application tools available at the market now and in the near future. In relation to work flow studies there are critical and essential parameters to be mapped and taken into account. An interesting study was performed in Finland (Juhola 1992) where four case companies were researched. Material and information flows were analysed. The goal was to define the CIM (Computer Integrated Production) concept in printing companies. The result in short was that CIM is applicable in the graphic arts industry. The attainable benefits from CIM are fewer mistakes, increased speed and reliable operations.

Work Flows in production

The study of work flow in newspaper production resulted in A-graphs that contained a lot of information that was directly used in the companies. Along with graphs there where verbal descriptions and notes of future possible alterations to summarize the key results of the first phase of the case survey (Nordqvist 1993). Case surveys have partly been performed within the project called Integrated Production Systems for the Graphic Arts Industry (Kihl 1993). The whole production chain was studied at two Swedish newspapers but the paper (Kihl 1993) primarily presents issues related to press and postpress. My part of the project was to define methods and to study and summarize prepress

issues. In addition to these two case newspapers there was a third study conducted in a gravure printing plant. Following general comments about prepress issues and the surrounding processes in this paper are:

- **Systems designed** for an official organisation and work flow result in duplication of work. Production process rather uses its inofficial work flows especially in prepress.
- **Lack of understanding** of the work flows and routines often lead to investment in wrong production technology. This results in detours in work flow and affects the organisation. Routines can be defined only in real **field studies.**
- **Technology affects organisation** in such a way that new work flows become possible with new systems over the whole production process. Enlund (1992) related this issue when discussing work and organisation in the editorial department.
- **Separate and** "closed" offices of groups and departments create wrong we-attitudes. All should work with the same goal in mind. For example, advertisement department have a policy and system approach that do not fit with the same kind of data formats, database approach, management system as the editorial department.
- No existing **plant wide PMS approach**, if any PMS approach exist at all.
- **Lack of communication** between prepress and press, postpress. This is one of the most interesting points where much time, quality and economy could be gained.
- Except the ad-department there is little support for real-time tracking of **economy information.** This could be used as a support for late decisions of changing format e.g. number of pages in a newspaper.
- Computer based **statistical log systems** could increase the precision of personal, format, process and material planning.

Parameters

In the case analysis there was a constant search for vital production parameters. A-graphs indicate information, composite and material sets as general parameters. **Time** is certainly an important but difficult parameter, especially in prepress. It is difficult in two senses. First it is hard to measure time related to productivity in creative work like journalists, artists and layout tasks. Secondly it is hard to accomplish time studies for complex and many routines. File formats and size (in bytes) are of great importance and can be measured quite easily. Some additional parameters critical to the production relate to the organisation. The size and stability of the staff, the familiarity of the group members with their tasks and the attitudes of the group leader are all important. Production **parameters with** increasing or decreasing **future importance** can be listed as follows:

Increasing: time, messages, information, composite, activities, colour, editions, process knowledge, page and product models.

Decreasing: material, file formats, file size (if processor and communication capacities still increase as they do).

Technology- or organisational work flow approach

In the 1970s and 1980s the technology approach was dominant. Today there is an additional approach — organisational. In conferences and articles on organisational issues, the new technology seems to be taken for granted. The two different angles of the problem are seldom discussed at the same time. We like to combine the two approaches. An example of this could be the emerging work flow application tools (see next chapter). Another general commercial term is groupware, i.e. software to support group work.

Work flow application tools

The 1980s were the breakthrough years for **electronic mail.** It is the first work flow tool that allows people to communicate and exchange files over long distances. The 1990s are witnessing the movement of work flow applications into the computing mainstream. First examples are found in administrative systems. There are developments of work flow and tracking devices for contracts, reports and mail. Secondly **groupware titles** emerge, e.g. the CopyDesk and Dispatch of Quark which contain functions for page layout and track of copy flow. There are almost no production control or management tools yet, except in dedicated system where software specially adjusted for the customer. Maybe we do not get shrink-wrapped work flow systems, but there will be tools that allow the company to **self-customize work flow systems.** These tools will use technologies such as Apple Computer's Publish and Subscribe and Microsoft Corp.'s Dynamic Data Exchange (DDE) and Object Linking Embedding (OLE). There are indications that work flow issues will be a part of how applications will be built in the future.

PRODUCTION MANAGEMENT SYSTEMS (PMS)

The relation between work flow and various management systems is quite obvious. To produce a newspaper or any other product, the work flows and production parameters must be defined. To support the staff in the organisation there must be an effective and stringent system to aid and enhance the production routines. Traditionally it has been job lists on paper and big boards where people update their status. Material and information flow in- and out from a point in the production has been done without the use of job descriptions. The knowledge of the prior or next task in the production is often absent. Therefore, the absence of understanding and respect for each work task can undermine the joint goals and result in delays and low quality. When the product becomes digital it will result in new problems. This new process needs new tools for control and management. The tools and techniques are:

- **Infrastructure**, of communication network (LAN and WAN), network management systems (NMS) and heterogeneous computer environments. This will also include databases that are open and communicable with SQL (structured query language) or similar techniques.
- **Document management** for workgroups, that rest upon robust multiuser database. Job tracking program that works with the databases, providing the staff with to-do list, job initiations, automatic routing of jobs, page models and summary statistics.

- **Monitoring system** for job flow i.e. product components and deadlines. This is related to the methods mentioned — Gantt charts, Logic nets and critical path analysis.
- **Production control systems** primarily in platemaking, press and postpress, i.e. the heavy production in the graphic arts industry.
- **Simulation** and **log** functions for each mentioned type of system. Log functions create enough data for process control and improvement. Simulation tools should use statistics from the log to predict bottlenecks and to utilize resources.
- **Administration** and **economy** system which allows complementary control methods. Personnel planning, budget control, material and stores control, statistics that can be used in forecasts and support for decisions related to economy are some of the areas that are addressed in these systems.

All these do we define as **production management systems** (PMS). It is not a centralized system but a collection of standard applications put together in a customized way. One part is still missing — the glue that easily tie all different systems together. Dyson (1992) referred to this as "...universal glue to join the pieces into a unified system — but such an universal solution may turn out to be a Holy Grail, never to be seen in our lifetimes". In his article there was also a good survey of managing the publishing process — how to build a system.

This is the object for our studies — the glue or rather which information, data and connections are essential for productivity and to share between different subsystems. Today it is almost impossible because the architecture of existing systems is definitely not based on open systems. Even if the subsystems are built on a semi-open system the software can be constructed in a closed way which causes trouble. Another complication that Karttunen (1992) discussed is the large split in computer architectures and basic system platforms between: client, editorial and other **prepress** systems which are more standardised and open, than **back-end production** systems i.e. page-transmission, plate processing, printing, packaging, palletizing, mailing, materials handling and inserting lines.

In the planning stage of introducing PMS the organisation must put some demands and questions. **Demands** on PMS are: open system approach, software coding that allows ad-hoc products and possibility to extract and give data to the subsystem, easy to maintain and update, fits the platform policy of the company, WIMP-based (windows, icons, menues and pointer) GUI and modular so the user can configure information essential to him. **Questions** to the organisation that shall use the PMS includes: what functions are supported, logged, automated and controlled. Which functions are strictly handled by man and what information can be better suitable for transmission by computer networks. This is more of an important policy matter that should be stated by the company management. Much of the work in newspaper, both editorial and advertisement are results of human contacts in a group context — a key factor that we engineers must not forget, especially when designing and modelling PMS. We want to create models and system that will be used and not ignored and disliked.

Department specific PMS approach

One of the greatest problems in the process towards a highly productive and integrated production within newspapers is the current sub-optimizing. Each department strives to be highly productive and controlled with the clear goal — total integration of text, graphics and images. In this competition there is a historical grouping in editorial, advertisement, composing / page transmission, press, postpress and economy. Each group has it own goals and workgroups that deal with developments within the department. Corresponding supplier in each group is equally focused on the needs and possibilities within the department. This has inevitably lead to **closed subsystems** and **sub-optimal solutions** especially in press and postpress.

When the goal is integrated production with high productivity there must be a **plant wide approach**. This is primarily an education problem for both users and suppliers. There must be solutions that are based on the knowledge of the whole production. Then it will be specialized persons with basic knowledge of the process that produce highly functional and productive tools in a niche. Another drawback with the separate PMS approach is if two separate systems should communicate — exchange data automatically. It is demanded that all subsystems are automated at the same level and store/log information important for each other. Today there are many redundant data collections in the processes. Data should be measured at the working point and distributed to those who need it.

If the development is unanimous and plant-wide it could lead to greater return on investment. Let us assume the following scenario. Attempts for total integration in editorial and advertisement departments often reach the goal at totally different times. The editorial department manages to produce digitally film-ready pages while ads must still be manually pasted. This situation does not utilize the resources in the editorial system. Six months later, routines to handle ads digitally have become a reality. During this time the editorial department has changed opinion about suitable system and decided to invest in a more productive DTP system. The result is obvious. During the life-cycle of one ad-system the editorial department used two. Who is to blame in such a situation? Firstly the management should have appointed inter-department groups to coordinate the work. Secondly each department must examine systems thoroughly with a documented demand- and problem list before investments are done.

The effect for the users that do not normally communicate between the departments is greater understanding for the process and the knowledge of how important her or his work is to the next person and the company. Typical answers like "I do not mind being late because they always manage anyway" must vanish. This is where education and information are significant. Borders between tasks must have support for their routines. Knowledge and information of responsibility and importance of every one's work in relation to other departments must be set from the management. Simple well defined routines, before any PMS can be implemented.
(See figure 2 on next side).

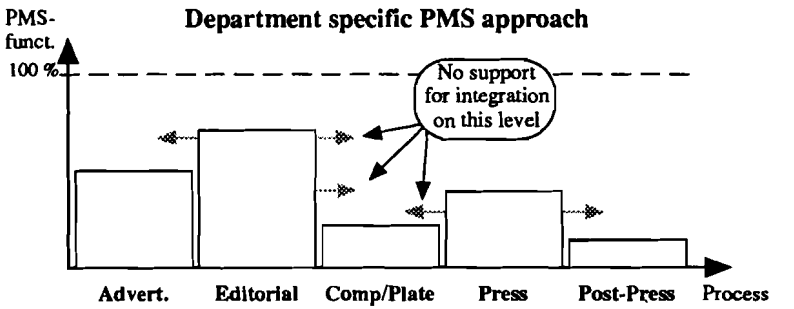

Figure 2. Each major area or department invest and install separate PMS. This result in difficulties when to integrate the process.

Ideas on new solutions — our approach

With the fourth wave came integration of text and images on standard platforms. Experience shows that new technology was placed in old organisations. Computers were used as typewriters instead of instruments for writing, editing and searching for information. This is still a problem in many organisations. This was proved when DTP systems **did not produce** assumed productivity to the users. On top of this there is limited knowledge of the entirety of the production and capabilities with the new technology — both in users and suppliers.

Our approach is, that more is needed than referred to in the s.c. fourth wave. Future newspaper production systems offer a total integration of production, organisation, remote or distributed production sites, quality and production management. This concept can be addressed to as the fifth wave (Karttunen 1992, Nordqvist 1992a). Now it is better to leave the classification of waves and ascend in something new. We have to forget and leave historical union conflicts and prejudices about who does what. Maybe this is an Utopia — but if the business shall compete with other media in the digital age, organisation and the use of new technologies must be reconsidered.

First we can define in what stage of the **PMS evolution** we are in. Following model can be of use. Parallel comparison are made in other industries, for example software engineering companies (Ralston 1993). The production process maturity level can be classified in five stages of evolution: initial, repeatable, define, managed and optimizing. Most newspaper organisations are in stage two or three, and none in stage five (figure 3).

Stage 1, initial: Unpredictable and poorly controlled, e.g. a brand new editorial unit (a new title) with a total DTP solution.

Stage 2, repeatable: Basic management control, previously mastered tasks can be repeated.

Stage 3, defined: Process definition, process characterized and fairly well understood.

Stage 4, managed: Process measurement, process measured and controlled.

Stage 5, optimizing: Process control, focus on process improvement.

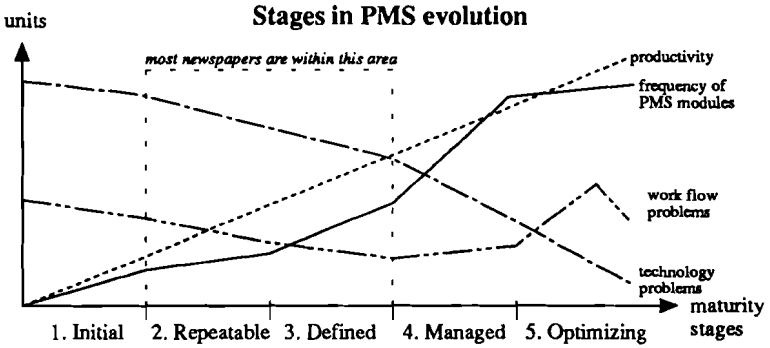

Figure 3. Production process maturity level is set as 5 stages.

The contribution from our research group is concentrated on methods of how PMSs could interact and communicate with each other. We do not attempt to create the glue software that could connect sub-PMSs to each other, as referred to in the previous chapter. The work includes: **use of methods** for mapping production in newspapers (or other companies in the graphic arts industry) with respect to activities, functions, events, routines and time analysis. **Define** work flow and production parameters.

This results in maps and models for how integrated production should be constructed. Direct results are the documentation of crucial connections that should be established between different subsystems with respect to productivity, time and economy. Parallel to this work we have a simulator for newspaper production under development. The simulator will give us a possibility to test product models, parameters, e.g. resolution, files, formats, and PMS ideas without disrupting the highly instable and sensitive production. The project is called TidSim.

SIMULATION FOR FUTURE NEWSPAPER PRODUCTION THE TIDSIM-PROJECT

The TidSim is developed in the division of Graphic Arts Technology at KTH (Royal Institute of Technology) in Stockholm. The project is in co-operation with two newspaper companies, Göteborgs-Posten and Östgöta Correspondenten, and with the Department of Numerical Analysis and Data Analysis (NADA) at KTH.

The overall goal is to demonstrate the effects of digital integrated PMS on newspaper production. There are no standard systems for this on the market. Systems that have some capabilities of PMS are primarily monitoring and control for a small part of the production and they are not very flexible or open. TidSim's approach is to connect different departments' subsystems to one information engine which in turn can extract and distribute data to the subsystems.

To be able to experiment without disturbing the daily production for our co-operating newspapers a simulator is constructed in an application program on running under Mach (NeXT) — called TidSim. The application has possibilities to simulate simplified production with real production data from Excel files that are generated from the data of the case companies. After the NeXT announcement of January, 1993 (to sell NeXT OS only as a software) we have established a new hardware platform (Intel, Compaq) suitable for running the TidSim.

Primary result for the case newspapers is knowledge. In the project they will experience with possibilities and traps with integrated PMS. This leads to the newspaper having a higher experience when such projects and investments become a reality. Beside this the project will touch PMS and organisational relations. Time schedule for the project is from October, 1992 to October, 1993.

There is an interesting project conducted within CEC (the Commission of the European Communities) called **DIMPE** (Distributed Integrated Multimedia Publishing Environment). The trial has evaluated how an advanced newspaper would manage the process of producing part of its material at a remote site (Phillips 1992). One central issue has been the development of a production monitoring system on a NeXT platform with an emphasize on tracking, monitoring and follow-up questionnaires. For our TidSim project, the results from DIMPE could be interesting and the other way around.

New possibilities

With the TidSim we will map information and material work flows between departments and activities. Examples of activities are editorial, advertisement, composing, page transmission, press and postpress with emphasis on prepress. Simulations should create a foundation for modelling and design of connecting local sub-PMSs in newspaper production. Goals in short include:

- **Simulate** newspaper production under a vast variation of parameters (not in real time).
- Indicate positive possibilities in the **connection** of local subsystems and their sub-PMSs to an imaginary global PMS, TidSim engine.
- **Simulator** tool and idea generator for management- and development groups.
- Enhance the **knowledge about PMS** and prepare for installations in production. Search possibilities and drawbacks that could be costly to do during production.
- Lead to **specifications** on future PMSs and their modules.
- Map **information, organisation,** and **educational** questions.
- Tool for **future** newspaper production with the assumption that pages are digital.
- Primary target group are **daily newspaper** production.

TidSim software simulator is being coded in Objective-C on Mach (NeXT). This makes it an easily modular and extendable system.

Design and development

The simulator is primary intended as an idea generator for management- and development groups in a company. Use of the tool should not demand more than one hour of training for a person acquainted to newspaper production. In the development of the simulator GUI design is very important — an user friendly environment. To be able to perform dynamic and realistic simulations we designed the application in a **client-server** architecture (Appendix B). **Excel files** contain the production, economy and press data of the newspaper which will be simulated. The first opened file acts as server for each consequently opened client. Simulation can be performed with two or several workstations at the same time. There can be a role-play where some act as editors that book space in the newspaper, ad-office book their ad-spaces, management decides economy issues, RIP or Fax transmission to the printing house, and a simulator co-ordinator that sets simulation speed and supervise the work.

Relation to SDA and PMS

The basis for designing the TidSim application is for the analysis of newspaper production both within this project and in cooperation with IGPS (Kihl 1993). Design is based upon the work flows that we believe affect productivity most. Different subsystems that do not communicate despite that there is a work flow between them are quite common. The systematic way of documenting a company with A-graphs, text-pages, routines and time based diagrams is very rewarding and effective.

The TidSim concept is a model for how local subsystems and departments could be more productive. To realize these connections there must be some sort of PMS that ties different subsystems together. Whether it is with manual routines, simple database approach, automated systems or clusters of PMS can be argued. Important issue for the moment is that the value of these connections are shown and can be tested. In appendix C. the factory-wide approach is shown— co-ordinated projects in PMS question. TidSim approach is by defining the productive routes of information that should be implemented.

CONCLUSIONS

Two approaches are of importance when we discuss systems development, especially with PMS in newspaper. The traditional approach is letting the technology dominate the development process. The process is not fully understood or documented so that no useful demand list can be set. The result is often that the system does not reach the expectations. The **systematic approach** is a hybrid of analysis of customer needs, organisation, existing systems and technology of open systems.

System dev. phases	**Traditional** technological approach	**Systematic** hybrid approach
Problem study	vague definition	well defined
Analysis:	no methodology	by method
• activities	not mapped	known and defined
• events	occasional mapped	continuously updated
• data	limited analysis	extensive
Design	supplier	supplier/ user
Construction	supplier	supplier / consult
Implementaion	supplier / consult	consult / user
Production	low in start	high from start
Maintenance	high	low

Figure 4. There is a clear linear connection between the success of introducing new technology and to analyse the production, needs and demands before any contact with suppliers is done.

Pros and cons for — **Traditional:** the lack of problem definition and analysis lead to an arbitrary system design. Implementation and support become heavy tasks.
Systematic: intensive project work in problem and analysis. Customer needs mapped. Rewards in smoother implementation, production and support.

By studies of **work flows** one gets an internal view of the existing activities, routines and functions. The organisation and groups can be involved more or less deeply in the analysis. **Production parameters with increasing future importance** can be listed as: time, messages, information, composite, activities, colour, editions, process knowledge, page and product models.

Future newspaper production needs new tools for control and management. These can be defined as **production management systems** (PMS). It is not a centralized system but a collection of standard applications put together in a customized way. Situation of today:

- No existing **plant wide PMS approach**, if any PMS approaches exist at all.
- **Lack of communication** between prepress and press, postpress. This is one of the most interesting points where much time, quality and economy could be gained.
- Many **redundant** data collections in the processes. Data should be measured at the working point and distributed to those who need it.
- Overlapping routines and uncoordinated activities.

The TidSim **simulator** gives a platform to test various alternatives in systems design for newspaper production.

CONTINUED WORK

This is the second paper published within our project "Future newspaper production" and more will come. These are some of the coming subprojects and reports:

TidSim project: The simulator will be ready by September 1993 and feedback to our case companies will be finished. Reports of the work will be published at the IARIGAI '93 in Munich. During the autumn the work will be compiled in a new interim report.

Deeper studies: Relation between different kind of production management systems (PMS) and the needs of inter-changing information between different groups. The work will continue in a research project at our institution and we hope to find cooperation with other groups to perform joint ventures in the field.

Spin off: Several practical effects have been shown within the case companies. Improved and exact definition of their activities and routines have brought up several immediate improvements.

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LITERATURE CITED

Ahonen, H., Veijonen, T., Niku-Paavola, J. and Ylä-Jääski, J.
1992 "Knowledge-based management of newspaper production" (Vancouver, Canada). 44th Annual TAGA Conference, pp 519-526.

Andersen, E. S.
1991 "Systemutveckling — principer, metoder och tekniker" (Studentlitteratur, Lund, Sweden). 1st ed., 487 pp.

Boman, M., Bubenko, jr., J., Johannesson
1992 "Conceptual modelling" (Dep. of Computer and Systems Science, Kista, Sweden). Stockholm University, 4th rev. ed., 208 pp

Boström, B.
1988. "Information systems development — supporting methodologies with computerized tools" (Stockholm, Sweden). Seminar paper, EPOC systems, 13 pp.

Boström, B., Nilsson, A. and Selldén, J.
1986. "Systemering med datorstöd" (Esselte Studium, Stockholm, Sweden). 1st ed., 156 pp.

Enlund, N.
1992. "The effects of technological change on work and organization in the editorial department" (Vienna, Austria). Paper at the IFRA-symposium, Mind over Matter: The Advanced Electronic Newsroom. 7 pp

Hart, A.
1992. "Knowledge acquisition for expert systems" (McGraw-Hill, Inc. UK). Lancashire Polytechnic. 2nd ed. 196 pp.

Juhola, H., Bäck, A., Korpiharju, P., Kuusisto, O. and Pesonen, J.
1992. "Computer integrated production in printing" (Vancouver, Canada). 44th Annual TAGA Conference, pp 508-518.

Karttunen, S.
1992. "Integrating organisation, quality and production concepts of newspapers: the fifth wave" (Rome, Italy). Paper at the IARIGAI Management Confer ence, 7 pp.

Kihl, L., Fekete, M., Nordqvist, S. and Stenberg, J.
1993 "Integrated production systems for the graphic arts industry" (Minneapolis, USA). 45th Annual TAGA Conference, 18 pp.

Nilsson, A. G.
1988 "Information systems development" (Stockholm, Sweden). Seminar paper, Institute V, 25 pp.

Nordqvist, S.
1993 "Project data documentation" (Stockholm, Sweden). Unpublished A-graphs, verbal descriptions, interview notes, for the case companies. TidSim documentation, including logic charts, s-codes, user manual and statistical data on case companies, KTH – Div. of Graphic Arts Technology.

Nordqvist, S. and Stenberg, J.
1992a "Ideas about organisation and production in the fifth wave " (Sandefjord, Norway). Paper at NORDLAB Tekst&Bild '92, KTH – Div. of Graphic Arts Technology, 40 pp.

Nordqvist, S. and Stenberg, J.
1992b "Seybold Seminars '92 och några väl valda studiebesök" (GFL report Stockholm, Sweden). KTH – Div. of Graphic Arts Technology, 34 pp.

Nordqvist, S.
1991 "ANPA/TEC '91 och sju dagstidningsbesök i USA" (Stockholm, Sweden). KTH – Div. of Graphic Arts Technology, 18 pp.

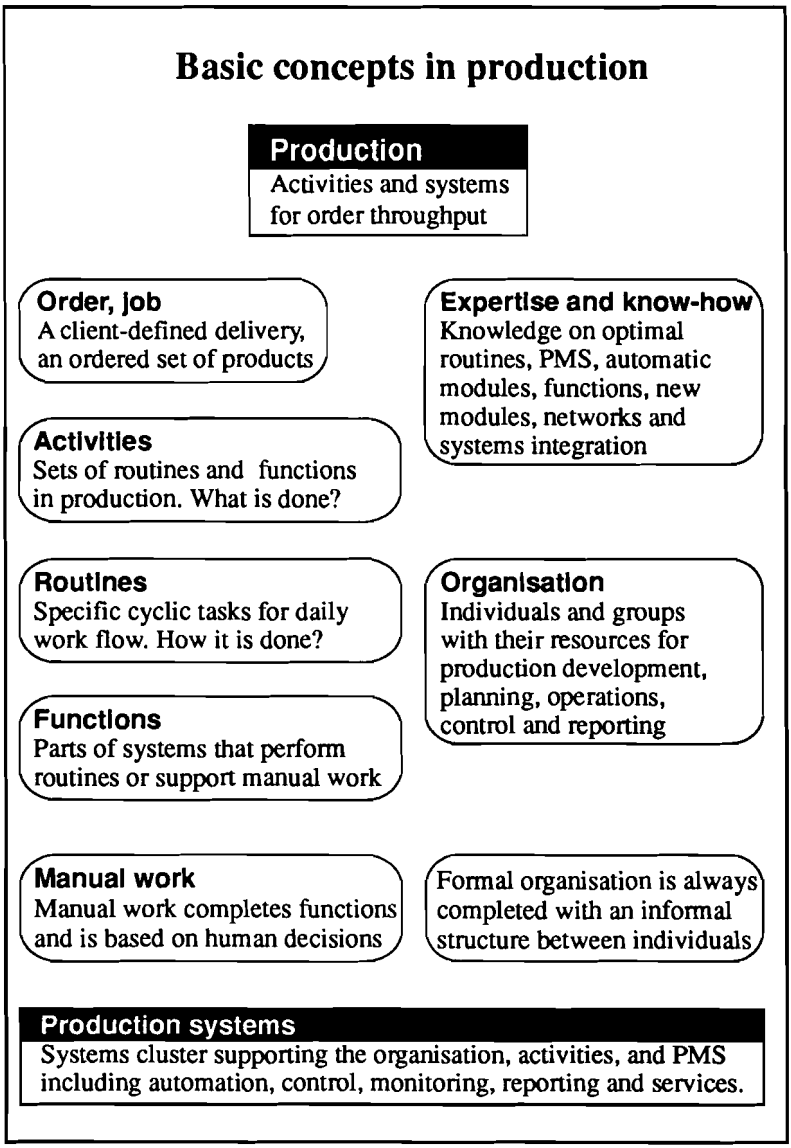
Phillips, M. and Sallery, B.
1992 "European multimedia distributed publishing trial evaluated" (IFRA newspaper techniques, Darmstadt, Germany). The DIMPE Project, Meta Generics Ltd. UK., September, pp 112-119.

Ralston, A. and Reilly, E. D.
1993. "Encyclopedia of computer science" (Chapman & Hall, London UK). 3rd ed., pp 1217-1222.

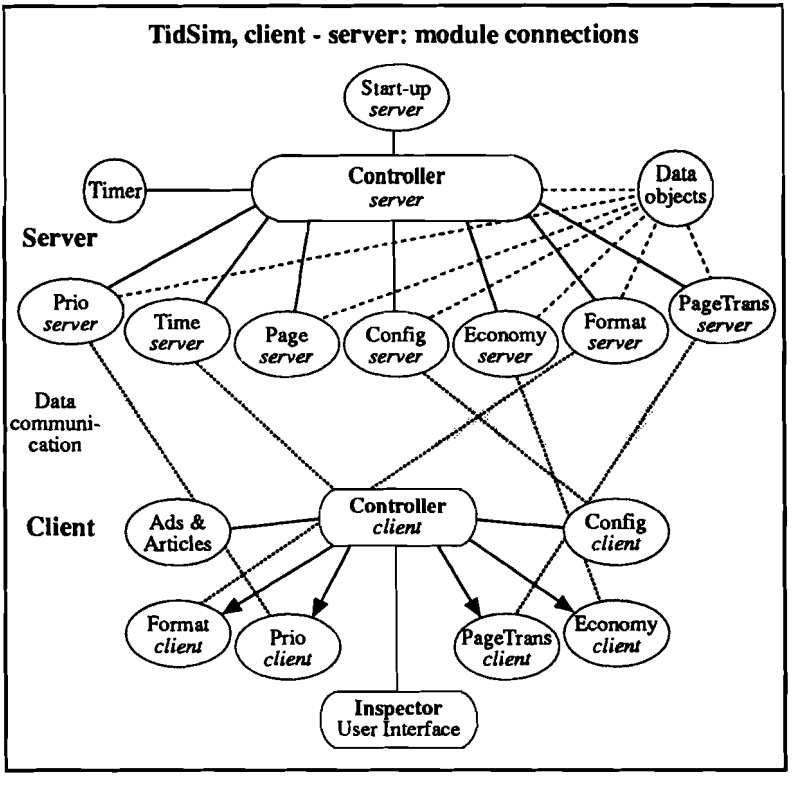
Rock-Evans, R.
1989. "An introduction to data and activity analysis" (QED Information Sciences, Inc. Reed Business Publishing, UK). 1st ed., 254 pp.

Selin, G.
1985 "Praktisk projektplanering" (Ingenjörsförlaget, Stockholm, Sweden). 3rd ed., 149 pp.

Appendix A.


Basic concepts in production
Production
Activities and systems for order throughput
Order, job
A client-defined delivery, an ordered set of products
Activities
Sets of routines and functions in production. What is done?
Routines
Specific cyclic tasks for daily work flow. How it is done?
Functions
Parts of systems that perform routines or support manual work
Manual work
Manual work completes functions and is based on human decisions
Expertise and know-how
Knowledge on optimal routines, PMS, automatic modules, functions, new modules, networks and systems integration
Organisation
Individuals and groups with their resources for production development, planning, operations, control and reporting
Formal organisation is always completed with an informal structure between individuals
Production systems
Systems cluster supporting the organisation, activities, and PMS including automation, control, monitoring, reporting and services.

Appendix B.



Appendix C.