Software Project Management: New Analysis of Specific Engineering and Management Processes in Modern Graphical Printing Industry Production

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Abstract: Proper and effective Software Project Management (SPM) is usually the most important factor in the outcome of a project for many companies in “modern graphical printing industry production” (MGPIP) and their project engineers and managers [7]. Article opens new analytical directions for proper management of the software project in MGPIP, which can be one of the important reasons for success. By using effective project management techniques a project manager can improve the chances of success in graphical printing production. Problem is how to analytically combine these techniques into a practical and best effective workable process? For effective solution one need a balanced process that covers the management and production of the entire project from inception to completion. This work proposes that only few simulation models (and stochastic simulations) can analytically (and on scientific research basis) solve specific management and engineering organisational, controlling and monitoring problems of SPM in MGPIP. Mentioned simulation models are bases for simulations of components of whole graphical production process, from digital records arrivals to finished printing plate. Why to simulate components of whole graphical production process, from digital records arrivals to finished printing plate? Possible important answer is that nowadays MGPIP is in a time of big changing of (especially “mass printing”) production technology in a way of to integration traditional printing with digital printing, and moving in the space of digital printing for internet, intranet and for wide web systems usage [5]. This research solve some practical problems of MGPIP in accordance with the stated before, and this paper shows the result of a scientific comparison of the existing practical systems that function in different ways in MGPIP of famous Croatian printing house “Vjesnik” Zagreb and largest Croatian (daily news) publishing house EPH (“Europapress Holding”) Zagreb, but whose main aim is offering solution contents, knowledge, information, etc., and to reach as many users as possible by means of this and similar solutions. This research was part of main Scientific research named “Analytical Model for Monitoring of New Education Technologies for Long Life Learning“ conducted by Ministry of Science, Education and Sports of the Republic of Croatia (Registered Number 227-2271694-1699).

Key-Words: Software Project Management, Stochastic Simulation, Modern Graphical Printing Industry Production

1 General Introduction

As Warren Buffett said: “It is better to be approximately right than precisely wrong”, but is that enough to say for specific problems of nowadays “modern graphical printing industry production” (MGPIP)? Let us see. From literature [7] it is well known that proper and effective “Software Project Management” (SPM) is usually the most important factor in the outcome of a project for many companies in MGPIP and their project engineers and managers. Also, effective SPM is mainly based on the models similar to SPM model of the Infosys Technologies Ltd., which has been assessed at level 5 (the highest level) of the widely adopted Capability Maturity Model® (CMM®), and whose project managers have successfully executed hundreds of projects.

The CMM for software is a framework that was originally developed by the Software Engineering Institute (SEI) at Carnegie Mellon University by observing the best practices. The CMM mainly reflects the collective process experience and expectations of many companies and it specifies desired characteristics of processes without precisely prescribing specific processes. Consequently, it can be used to evaluate the software process of an organization or company in MGPIP and to identify deficiencies. Like the CMM is one of the most popular frameworks for software process improvement in MGPIP and the other commonly used framework is ISO 9001 [7]. As main objective of the CMM for SPM in MGPIP is to distinguish mature processes from (ad hoc or) immature software processes, which imply that projects are executed without many guidelines and the outcome of a project depends largely on the capability of the team and the project leader in MGPIP.

2 MGPIP Environment

2.1 MGPIP Problems

Question is, why then does so many specific software projects in MGPIP fail? Improper management of the software project in MGPIP can be one of the important reasons for failure. By using effective project management techniques a project manager can improve the chances of success in MGPIP business. Usually each proposed SPM technique solves the problem it is designed to solve. But what are these effective SPM techniques in MGPIP? Usually, problem is how to combine these techniques into a practical and best effective workable process? For effective SPM in MGPIP we need a balanced process that covers the management and production of the entire project from inception to completion.

Today there are no so many published and scientific approaches illustrating how to integrate techniques in this way. For illustrative example of really rare research from this field, the goal of scientific work in article [10] was to accomplish closeness to optimal management of modern production and solving of dedicated problem in that production in relation with organised digital normative provisions described in relational database and XML (eXtensible Mark-up Language) data files. Developed model was based on relational database where all necessary normative provisions and prices were saved, and which have developed XML system with XML Schemes. Data acquisition in relational database and acquisition in XML data were accomplished throughout XSLT technology, as presenting and interfacing technology with goal to work throughout browser. There, on example with one concretely task to make optimally doubling of one PostPress machine in graphic production experimentally was researched and developed financial and time analysis of that decision. That method for improvement of PostPress planning speeds up production decisions and presentations of their financial consequences. Modern graphical production (as MGPIP is) today became one of the most profitable industry and lives artisans' fields. Complex systems of modern graphical industry introduce integration and automation because of necessity to reduce work execution time. Ending goal of that kind of development was continuing automatic production, financial work processing, work monitoring, and financial work analysis. The XML was recognized as new language of information description and transferring between applications and systems from various producers (manufacturers or makers). That provides creations of individual solutions in automation of modern graphical production. Only provision for these systems was that devices and applications know XML communication dictionary. That was way to make easy developments in future, because of various XML characteristics, like its possibility to adopt new dictionaries into existing ones. Why to develop new dictionary if exists developed one? Programming model "Webposkok" was developed by authors from Faculty of Graphic Engineering in Zagreb and has these premises. With that model it was then possible to create phases of graphical production on various devices and capacities. Only provision for that is to make normative provision description of all production process factors. The whole model was established on normative provision basis, where all operations and capacities were described in detail. The model was in fact one web application and that was its main characteristic. Interfaces for working with all normative provisions, before calculations, calculations, and digital working orders became reachable to various groups of users on that way. Normative provisions database was filling up almost one year and existing data provides complex analysis and conclusion making. Researching goal of that work was situation where we want to make decision about parallel usage of second machine for rolling. These machines have different characteristics, from velocity parameters to working hour price. Usually it is not clear for which editions to make best (adequate) decision, and it is not always clear even financial aspect of that decision. Goal was to accomplish graphs of execution velocities and of financial analysis of that decision. Normative provisions of graphical production were saving into relational database and in XML records. Decision about what to save into classical records, what into XML elements and attributes depends on application demands and on analyst requests which are using these data. For faster searches (query) by keys it was better to put variables of keys into separate fields of relational database. Variables for calculative processes that were used by application were better to save into XML technology. Normative provisions must be changeable during the whole period (of time). It was reachable with exploration of benefits given from relational databases technology and XML technology. These technologies don't exclude each other but they are extension of each other. Reliable and stable relational database was constructed with MSSQL Server Database and with XML interface throughout XML Scheme, into which requested communication dictionary can be defined and which was not with equal names and definitions of tables into its relational database. On that way different sorts of normative provisions were transformed into unambiguous record which have developed programming modules for production knot processing. XML Scheme provides us with definition possibilities of look up of XML documents, with establishment of table and field connections into relational database, and with definition possibilities of relations on the level of XML elements and attributes. Model of machine for rolling up sheet paper in "WebPoskok" was represented with tables XSLT technology from XML which holds all normative provisions of that machine. Normative provisions set of that machine consists from these variables: paper sort, format of sheet, type of rolling up, number of bends, time for machine preparation according to number of bends, time for exchanging the same set of panels, machine preparation working hour price, machine working hour price. These prices were in relation with daily developments of these machines.

Another fact is that the worldwide, approximately more than a million project managers execute about few million software projects each year, producing software worth more than $1000 billion. Many of these projects in MGPIP fail to fulfil customers' quality expectations or fail to deliver the software within budget and on schedule. One analysis suggests that about one-third of similar projects have cost and schedule overruns of more than 125% [7].

2.1.1 CMM Levels of SPM in MGPIP

With mature processes, a project is executed by well defined processes and the outcome of the project is less dependent on people and more on the processes. Consequently, the more mature the processes, the more predictable the results and the more well controlled the projects in MGPIP. The CMM framework describes the key elements of software processes at different levels of maturity, and it also specifies the path which includes five maturity levels (Fig.1), that a software process follows in moving from immature processes to highly mature processes. The path to higher maturity includes some well-defined plateaus referred to as maturity levels by the CMM.

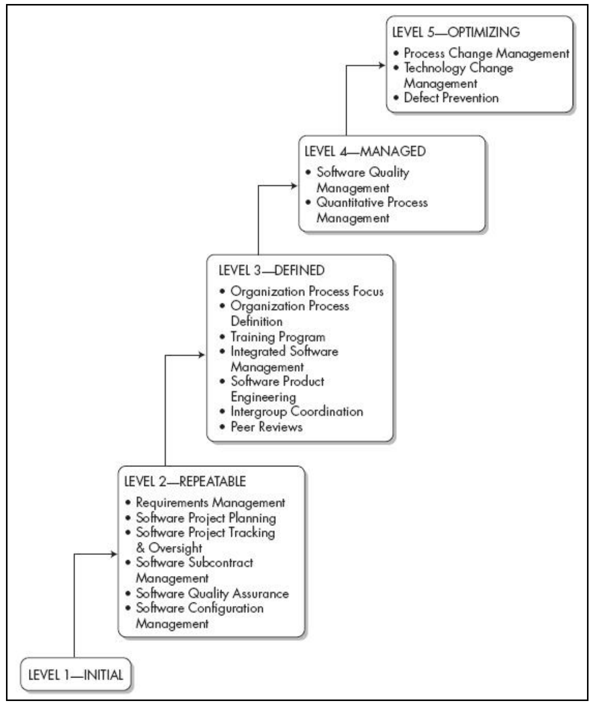

Fig.1 Maturity levels in the CMM [7]

Each maturity level specifies certain characteristics for processes, with higher maturity levels having more advanced characteristics that are found in more mature software processes of SPM in MGPIP. The range of results in MGPIP that can be expected in a project when it is executed using a process is its process capability and its process performance (the process performance depends on the process capability). To consistently improve process performance on projects in MGPIP, one must enhance the process capability and the process itself must become more mature. Maintaining processes at higher levels of maturity is a challenging task requiring commitment from the company and a proper work culture. Of the 900 assessments conducted between 1996 and June 2000 whose assessment results were provided to the SEI, only 3% of the companies were at level 5, and another 5% were at level 4. The rest were at level 3 or below, with 38% at level 2 and 18% at level 3 [7].

Each maturity level (except level 1) is characterized by "key process areas" (KPAs), which specify the areas on which the companies in MGPIP should focus. For a company in MGPIP to achieve a maturity level, it must satisfy all the KPAs at that maturity level as well as the KPAs at all lower maturity levels.

In level 1, the initial level, a project is executed in a manner that the team and project manager see fit.

The repeatable level (level 2) applies when established project management practices are employed, although organization-wide processes may not exist. Six KPAs at the level 2 focus is almost exclusively on SPM in MGPIP (one creates and documents a project plan, evaluate the ongoing project performance against the plan, and take actions when the actual performance significantly deviates from the plan). Requirements are properly documented, and changes to requirements are properly managed. All work products are controlled, and changes to products are properly managed through a planned configuration management plan. Reviews and audits are performed to ensure that planned processes and standards are being followed. If some parts of the project are subcontracted to other vendors, the subcontracted work is also monitored properly. For example, Information and Communication Technologies (ICT) and other printing technology used in MGIP is also part of controlling and planned processes that are proposed and followed by high MGPIP standards, and according to relevant literature see citation from [1] "… The platform assists, based on ICT, a set of processes specific to an enterprise, from the meat processing industry, to help decision makers to manage performances by implementing the concepts Business Performance Management (BPM) and Business Intelligence (BI). The platform transforms data into information and then into knowledge being focused on business, technological and economical aspects specific to the meat processing enterprises helping them to realise an efficient use of their business policies, financial, human and material resources. …"

At the defined level (level 3), company-wide processes have been defined and are regularly followed. Seven KPAs at the level 3 focus to company uses a tailored version of the standard process and reuses assets, data, and experience from past projects for planning. The various groups that contribute to the project cooperate smoothly through well-defined interfaces and mechanisms. Reviews are properly carried out to identify defects in work products, and sufficient support for conducting reviews and follow-up activities is provided, and the rest KPAs focus on organizational and process management issues of SPM in MGPIP.

At the managed level (level 4), quantitative understanding of the process capability makes it possible to quantitatively predict and control the process performance on a project. For two KPAs at level 4, the capability of the company's process is understood in quantitative terms. The process capability is used to set quantitative goals for a project. A key aspect of level 4 is the use of statistical process control techniques on an ongoing basis so that each activity can be evaluated and corrective action taken if needed.

At the optimizing level (level 5), the process capability is improved in a controlled manner and the improvement is evaluated quantitatively. The three KPAs at level 5 focus on improving the capability of the process. Of the three KPAs, the Defect Prevention KPA is the one that most directly affects project management. This KPA requires that defects be prevented proactively by systematically analyzing the causes of defects and then eliminating those causes. If defects can be prevented from entering the software, the effort spent in removing them can be reduced, thereby improving quality and productivity [7].

3 Specific Problems and Solutions

Usually in practice of SPM in MGPIP we have small and larger projects. A small project with a team of one or two persons working for a few weeks can be executed almost "informally", where the project plan specifies the delivery date with a few intermediate milestones by e-mail, and requirements might be communicated in a note or verbally, and intermediate work products, such as design documents, might be scribbles on personal note pads. To successfully execute larger projects in MGPIP, "formality" and rigor along dimensions tasks and personnel must increase.

Usual situation for most commercial software larger projects is that many people may work for many months, where each engineering task must be done carefully by following well-tried methodologies, and the work products must be properly documented so that others (managers, etc.) can review them. In fact the project tasks are carefully planned and allocated to project personnel and then tracked as the project executes. Also, briefly discussing the role of processes of SPM in MGPIP one must know that a larger software project has two main activity dimensions: engineering and project management. The engineering dimension deals with building the system and focuses on design, test, code, and similar issues. For example, the basic hypothesis of the conducted pilot research about design that was done in paper [2], and which was part of main Scientific research named “Analytical Model for Monitoring of New Education Technologies for Longlife Learning“ conducted by Ministry of Science, Education and Sports of the Republic of Croatia (Registered Number 227-2271694-1699), refers to the confirming or refuting the preliminary postulate that visual communication and its design along with the way the information and instruction design is structured have an influence on the persistence (stimulation and motivation) of the end users to use some of the researched systems more often, more easily and independently and that in general due to the organization of the stated elements they use the researched systems more than they use other systems. The project management dimension deals with properly planning and controlling the engineering activities to meet cost, schedule, and quality project goals of SPM in MGPIP. Formality requires that the outcome becomes more dependent on the capability of the well-defined processes that are used for performing the various tasks. Formality is further enhanced if quantitative approaches are employed in the processes through the use of suitable metrics. Well known fact is that nowadays MGPIP is in a time of big changing of mass and other parts of printing production technology in a way of to integration traditional printing with digital printing, and moving in the space of digital printing for internet, intranet and for wide web systems usage [5]. For example, according to relevant literature for the specific project management processes of SPM in MGPIP, management in practice precisely specify formality that is further enhanced if e-quantitative and usually e-quality approaches are employed in the processes through the use of suitable metrics, citation from [11] “… The e-quality metric needs continued development and validation when measuring customer’s satisfaction and loyalty in e-shopping environment. …”

Technically, a process for a task comprises a sequence of steps that should be followed to execute the task. For a company, the processes it recommends for use by its engineers and project managers are much more because they encapsulate what the engineers and project managers have learned about successfully executing projects. The benefits of experience are conferred to everyone and these processes help managers and engineers emulate past successes that avoid the pitfalls that lead to failures.

For a project, the engineering processes generally specify how to perform engineering activities such as requirement specification, design, testing, and so on. For example, in the paper [10] we can see the research of advanced methods for graphic production planning that were further development linked with new possibilities of interactive Web vector graphics such as Scalable Vector Graphics (SVG). The time matrix was shown in a completely different way, resembling a chess game of the planner against time on certain resources. The interactive manner of work and visual display through SVG Document Object Mode (DOM) frees the user completely of planner attribute input through table types of editing and setting of plans. The plan for unit resources was described in XML format, and later was recorded in the XML Data field of the relative database with the possibility of hybrid inquiries with SQL and Xquery types. As the SVG record was an XML derivate, these technologies fully complement one another with stressed content disengagement from its display. The paper work shows the method of creating resources with a standardization that later on makes possible semi-automatic planning in accordance with the phase type and resource. Three manners of importing jobs for planning were enabled: import from the WebPoskok work order base, loading from the planner template base and independent loading of a completely new job. Daily planning enables parallel display and work with all jobs and resources within one day with the possibility of resolving the bottlenecks created. In the Gant display the planner interactively and without strain builds in trap mechanisms for the job start and ending. The display was created dynamically from the software analysis of all the jobs in the database for the required time interval. These approaches were fully new in the planning process in general, and were developed primarily for the graphics industry where there are a great number of parallel workflows for completely different end products.

The project management processes, on the other hand, specify how to set milestones, organize personnel, manage risks, and monitor progress, and so on. As first example, in the paper [6] we can see what was done on publishing of final job order cost analysis results carried out in real life and modern graphic production. The goal was to obtain evaluations of defined standards for each production phase on basis of analysis. In that manner the standards acclaimed to machines and operators will in time be getting closer to their optimum values, in shorter periods of time. A special module has been developed for this task within our WebPoskok computing and simulation experimental system that deals with comparing the expected time and expected calculation time. The system was of great benefit as it instantly gives the compared relation between the deducted and required time, on basis of which standard optimization was started in case there has been under-standardization or over-standardization of certain phases or workflow chains in graphic production. Conclusion was that the system is of great benefit as it instantly gives the compared relation between the deducted and required time. The goal was to obtain evaluations of defined standards for each production phase on basis of analysis. Conclusions can be made on the set standards accuracy only after multiple parallel analyses of calculations based on standards from the database and actual life expenditures after closing certain job orders. This was base for development of proposals for upgrading the pricing rules in the bylaws, establishing of a uniform standardized accounting format, devising a uniform methodology for cost allocation per products and activities and devising a uniform methodology for determining technological costs. As second example, and according to relevant literature for the project management processes of SPM, management in practice precisely and with modern simulation methods specify how to practically organize personnel, manage important risks, and better monitor progress, citation from [8] "… The possibilities offered to Process and Manufacturing Industry by Monte-Carlo and System Dynamics simulation are many, in particular is possible to create a model for supporting the evaluation of an investments plan by identifying the more promising investment streams within a constrain of a limited budget, in this way the model will identify the most robust strategy able to maximize profits. …" Consequently this work and article focuses on the new simulation conducted analysis of the some project management process data of SPM in MGPIP.

This work proposes that only few simulation models (and stochastic simulations) can analytically (and on scientific research basis) solve specific management and engineering organisational, controlling and monitoring problems of SPM in MGPIP. As short example, experimenting in article [9] was done on basis of real-life processes in graphic products production with the goal being to determine cost-efficiency has never been allowed even as part of the process for gaining new knowledge or for the needs of verifying production standards. The costs of such experiments would be too high and there have never been evidenced cases where books had been printed only in order to study the production process bottlenecks. Digital production models allow experimenting with the tiniest setting details, with parameters of set thesis in printing borderline areas. Real-life printing systems are poorly known when it is necessary to translate them in the form of a computed model that will allow for that same real-life system to be simulated. That research work [9] shows the results of experimental research in respect to the cost-efficiency of producing a certain graphic product with a digital printing workflow compared to a workflow with traditional offset printing. Last years in Croatian and regional MGPIP market that has become the biggest dilemma in contemporary printing where digital printing has become an integral part of a printing plant's options. Experiments have been carried out with digital workflows within our WebPoskok program simulator. After analyzing experimental simulation results it may be concluded that digital book printing may be applied when the printing run does not exceed 600 copies with the number of pages being around 112. This borderline printing run could be more if the number of pages were to increase. Research done in same paper [9] has proven the thesis that printing high-quality books could have been carried out with digital printing machines up to the printing run quantities required by book market nowadays. The research work was based on the shown results, manner of modelling and parameters used in models could make a foundation for an increasing incorporation of digital printing in the area of producing those graphic products that are still considered as typical offset products.

Mentioned simulation models are bases for simulations of components of whole graphical production process, from digital records arrivals to finished printing plate. Why to simulate components of whole graphical production process, from digital records arrivals to finished printing plate? Possible important answer is that nowadays MGPIP is in a time of big changing of (especially "mass printing") production technology in a way of to integration traditional printing with digital printing, and moving in the space of digital printing for internet, intranet and for wide web systems usage [5].

Also, modelling of main production components of whole graphical production flow, with description of main activities involved by specific printing production were done, as needed. Time activities are from real printing production cycle, so that simulation results clearly show the "bottle necks" of printing production and to conclusion how to organise better planning of printing production. With simulation results of whole graphical production, with components that are modelled and tested, and which include number of stochastic variables, the reached level of SPM in MGPIP and management of printing production is much higher and modern oriented. Also, future improvements are promising. Simulation model working example includes parts of digital exposure of printing plates in MGPIP. Focus of research was one segment of daily news production. Fig.2 presents basic model for experimental testing. Note that in desktop publishing RIP is abbreviation of Raster Image Processing. Raster image processing (verb) or raster image processor (noun) is the process and the means of turning vector digital information such as a PostScript file into a high-resolution raster image. That is, the RIP takes the digital information about fonts and graphics that describes the appearance of your file and translates it into an image composed of individual dots that the imaging device (such as your desktop printer or an image setter) can output. In the Computer-to-Plate or CTP process the image of the page from a digital file is recorded directly from the file to the printing plate instead of creating film and making the plate from the film. Although CTP is a printing process, in order to insure the best possible output it is important that the designer discuss CTP with their printer. The printer's familiarity with the process, their equipment, the type of plates, and file format and preparation all play a role in the success of the CTP process.

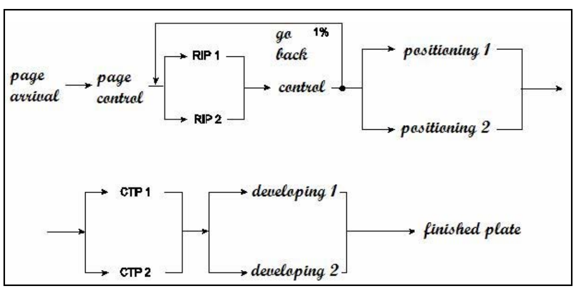

Fig.2 Basic model for experimental testing

Simulation starts with digital records (pages) arrivals from the redaction space for highlighting and ends with finished plate for printing. Digital records (pages) arrivals are generating from the redaction space of daily news edition. Depending of necessity they are generating in “ps” or “pdf” format. First point of model input is activity of controlling of digital records in arrival. Model was constructed with: 2 RIP places for digital records in arrival, 2 places for positioning of final assemble for highlighting, 2 CTP devices for highlighting of printing plates, and 2 places for developing of highlighted plates. Through few really different experiments testing was done with additional third RIP, with main idea to accelerate the whole system for plates highlighting. Also, different experiments testing were done with different times for page generating. All experiment was done with precisely specified data. Research work objective was to detect the “bottle necks” of printing production processes, to enable their numerical computation, to improve present model, and to make conclusion how to organise better planning and monitoring of printing production. Analysis and defining the space of accumulation in the production part of preparing of graphical production was research objective. Researches done before were fragmented, and consequently the goal was to develop the integral model. Focus of research was on digital system for highlighting of printing plates.

Activities were: digital records (pages) arrivals for printing, controlling of digital records (pages) in arrival, RIP process, positioning (of final assemble for highlighting) on ending printing sheet, highlighting of printing plate and its development. From real process of (daily news) productions was adopted information that 1% of RIP pages were incorrect and have to go back to RIP process. Workloads were measured on these working positions (Fig.2): controlling of digital pages in arrival - “page control” (PageContr); controlling of RIP pages - “control” (RIPPageContr); work of RIP processing - “RIP 1” or “RIP 2” (RIP); controlling of working place for positioning (of final assemble for highlighting) on ending printing sheet - “positioning” (Position); work of CTP system processing - “CTP 1” or “CTP 2” (CTP); controlling of working position of system for development of printing plates - “finished plate” (Develop).

3.1 Experimental GPSS simulation results

Testing with main model (Table 1) was done with varying in time of digital pages arrival (in seconds) from redaction system, and 7 experiments were one (from E1 to E7) with changing in arrival of digital pages in system of digital highlighting: E1=60,20; E2=60,30; E3=60,10; E4=50,20; E5=55,20; E6=45,20; E7=40,20.

Table 1 GPSS Simulation testing results of main model

	E1	E2	E3	E4	E5	E6	E7
PageContr	0.403	0.427	0.424	0.527	0.461	0.569	0.579
RIPPageContr	0.125	0.120	0.122	0.133	0.115	0.126	0.129
RIP	0.983	0.983	0.982	0.980	0.982	0.979	0.979
Position	0.187	0.190	0.187	0.194	0.187	0.185	0.187
CTP	0.548	0.555	0.550	0.531	0.547	0.543	0.534
Develop	0.894	0.892	0.891	0.858	0.878	0.841	0.828

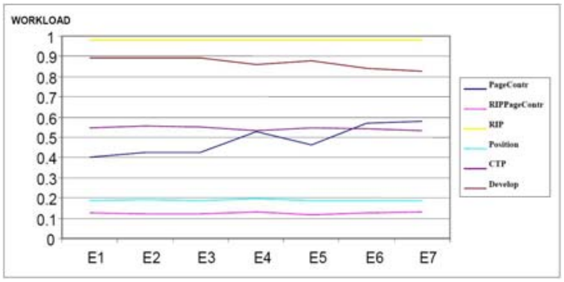

Fig.3 GPSS Simulation testing results of main model - graphic representation

Conclusion (Fig.3) is that workload of RIP working is constantly (from 0.979 to 0.983). RIP page controlling and page positioning were much closed in very closed interval. Resulting data significantly varies by acceleration and workload at place of “PageContr” from lowest (40.3%) in E1 to highest (57.9%) in E7. Opposite is at place of “Develop”, because there is highest workload at E1 (89.4%) when it is lowest acceleration of page arrival, and lowest workload at E7 (82.8%) when it is highest acceleration of page arrival.

Table 2 GPSS Simulation testing results of expanded main model by addition of active RIP

	E1	E2	E3	E4	E5	E6	E7
PageContr	0.443	0.431	0.414	0.495	0.468	0.516	0.601
RIPPageContr	0.192	0.196	0.193	0.189	0.192	0.184	0.183
RIP	0.978	0.979	0.977	0.978	0.977	0.976	0.974
Position	0.278	0.276	0.293	0.272	0.278	0.285	0.276
CTP	0.825	0.803	0.824	0.793	0.833	0.797	0.793
Develop	0.890	0.891	0.890	0.871	0.877	0.852	0.825

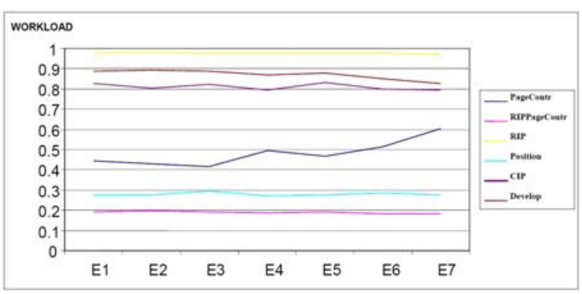

Fig.4 GPSS Simulation testing results of expanded main model by addition of active RIP - graphic representation

Then testing of expanded main model by addition of active RIP was done, but without past data changing because of future computations (Table 2). With additional active RIP largest difference in workload change is at (Fig.4) position CTP, average higher about 26.6%. Position PageContr significantly varies, but Position is with average higher improvement about 9.2%, RIPPageContr is with average higher improvement 6.6%.

Then testing of third model (Table 3) was done with 2 active RIP, but with same and constant page arrivals from redaction, defined from first test and first experiment E1. Variable element was time for RIP work, which was defined under discrete function: E1=3.300/6.320/1.290; E2=3.290/6.310/1.280; E3=3.280/6.300/1.270; E4=3.265/6.285/1.255; E5=3.220/6.240/1.230; E6=3.145/6.170/1.180; E7=3.120/6.140/1.150.

Table 3 GPSS Simulation testing results of third model with 2 active RIP

	E1	E2	E3	E4	E5	E6	E7
PageContr	0.403	0.422	0.424	0.400	0.417	0.429	0.424
RIPPageContr	0.125	0.128	0.134	0.142	0.174	0.231	0.284
RIP	0.983	0.982	0.982	0.983	0.983	0.982	0.981
Position	0.187	0.193	0.214	0.214	0.247	0.357	0.410
CTP	0.548	0.576	0.599	0.612	0.730	0.945	0.949
Develop	0.894	0.892	0.894	0.900	0.905	0.915	0.920

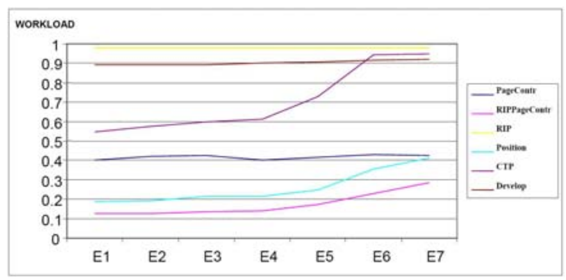

Fig.5 GPSS Simulation testing results of third model with 2 active RIP - graphic representation

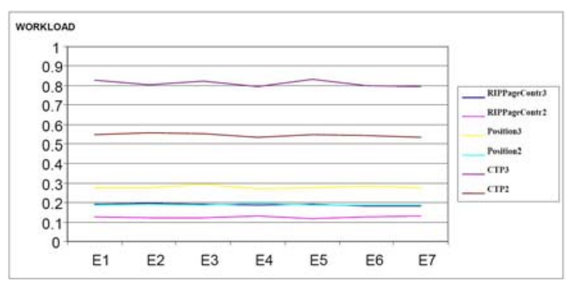

Fig.6 GPSS Simulation testing results of partial third model with 2 active RIP - graphic representation

With 2 active RIP (Table 3) larger difference in workload change is at (Fig.5) position RIPPageContr, average higher about 12.5% to 28.4%. Position PageContr was constantly with big workload about 40% to 42.9%, Position is without influence and in bigger interval, from 18.7% to 41%, but RIPPageContr is with average higher improvement 6.6%. The largest difference in workload change is at position highlighting of printing plates in E4, E5, and E6, and CTP was changed from 61.2% to 73% and at the end 94.5%. Conclusion (Fig.6) is that in third experiment the largest difference in workload change is at position digital highlighting of printing plates.

Then testing of fourth model but now with 3 active RIP was done (Table 4), and with exact same data from last (third) experiment.

Table 4 GPSS Simulation testing results of fourth model with 3 active RIP

	E1	E2	E3	E4	E5	E6	E7
PageContr	0.443	0.412	0.426	0.414	0.410	0.430	0.432
RIPPageContr	0.192	0.206	0.207	0.214	0.246	0.330	0.322
RIP	0.978	0.978	0.979	0.978	0.979	0.933	0.756
Position	0.278	0.288	0.304	0.316	0.365	0.489	0.493
CTP	0.825	0.848	0.897	0.917	0.933	0.945	0.949
Develop	0.890	0.892	0.894	0.896	0.905	0.916	0.920

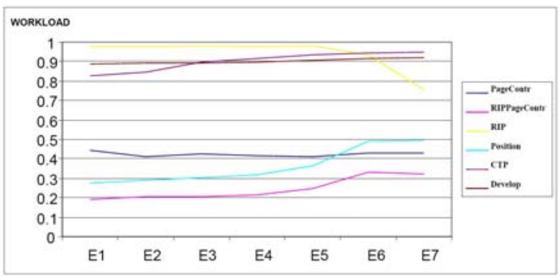

Fig.7 GPSS Simulation testing results of fourth model with 3 active RIP - graphic representation

With additional and now 3 active RIP (Table 4) largest difference from last experiment was in workload change at place of page positioning, with higher improvement about 10.2%. Position PageContr has not significantly changes, but RIPPageContr is with constant improvement higher in average 7.7% then before, from 19.2% in E1 to 33% in E6. Now (Fig.7) with 3 active RIP largest differences from last experiment was in workload change at place of CTP, with higher improvement average about 22.6%, from E1 to E6.

4 Conclusions

For a SPM in MGPIP, the engineering processes generally specify how to perform engineering activities such as requirement specification, design, testing, and so on. The project management processes, on the other hand, specify how to set milestones, organize personnel, manage risks, and monitor progress, and so on (similar to managerial best practice [3, 4]). As all simulation experiments done here starts with digital records (pages) arrivals from the redaction space for highlighting and ends with finished plate for printing, it is now clear that digital records (pages) arrivals are generating from the redaction space of daily news edition. Consequently this work and article focuses on the new simulation conducted analysis of the some project management process data of SPM in MGPIP. This work proposes that only few simulation models (and stochastic simulations) can analytically (and on scientific research basis) solve specific management and engineering organisational, controlling and monitoring problems of SPM in MGPIP.

Consequently this research solve some practical problems of MGPIP in accordance with the stated before, and this paper shows the result of a scientific comparison of the existing practical systems that function in different ways in MGPIP of famous Croatian printing house “Vjesnik” Zagreb and largest Croatian (daily news) publishing house EPH (“Europapress Holding”) Zagreb, but whose main aim is offering solution contents, knowledge, information, etc., and to reach as many users as possible by means of this and similar solutions.

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Now with these experiments it is clear that method of simulation (with appropriate ICT software package usage, like it is GPSS, or Vensim®, etc.) open significantly new approach in managerial and engineering problem solving during the SPM in MGPIP, where the big projects depends largely on the capability of the team and the project leader. With developed results of stochastic simulations of SPM in MGPIP wide range of open questions arises, and new directions in researching of SPM in MGPIP.

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