

## STUDIJE SLUČAJA: DOBRE PRAKSE UPRAVLJANJA KNJIGOVEŠKIM PROIZVODNIM PROCESIMA U PODUZETNIČKOM OKRUŽENJU

### *CASE STUDIES: AFFIRMATIVE MANAGING PRACTICES OF BOOK BINDING PROCESSES INNER THE ENTREPRENEURIAL ENVIRONMENT*

Suzana Pasanec Preprotić<sup>1</sup>, Anja Cetinjanin<sup>2</sup>, Diana Bratić<sup>1</sup>, Gorana Petković<sup>1</sup>

<sup>1</sup>University of Zagreb, Faculty of Graphic Arts, Getaldićeva 2, Zagreb, Croatia

<sup>2</sup>University of Zagreb, Faculty of Graphic Arts, Getaldićeva 2, Zagreb, Croatia, Student

#### SAŽETAK

Knjigoveštvo kao završni dio grafičke proizvodnje zahtjeva strogo planiranje kapaciteta proizvodnih resursa u skladu sa formalnim zahtjevom kupca odnosno tiskare. U nakladničkoj knjigoveškoj proizvodnji dinamično je proizvodno okruženje zbog opsluživanja različitih doradnih strojeva i/ili linija. Stoga su poduzetničke aktivnosti od strane vlasnika knjigovežnice konstantno usmjerene na unaprjeđenje radnih mjesta u cilju ispunjavanja potreba tržišta. Poduzetnik-knjigoveža konstantno je fokusiran na ostvarivanje proizvodnog učinka za različita radna mjestima tijekom realizacije određenog projekta. Planiranje, praćenje i koordiniranje knjigoveških proizvodnih procesa garancija su isporuke gotovih proizvoda po modelu „just in time“. U radu su analizirane četiri različite studije slučaja identičnog projektnog zadatka. Tlocrtni prikaz proizvodnog pogona, hodogrami proizvodnih puteva i proizvodni kapaciteti resursa za četiri različite studije slučaja se međusobno kompariraju u cilju utvrđivanja relevantnih indikatora promjene efikasnosti nakladničke proizvodnje knjiga.

**Ključne riječi:** poduzetništvo u knjigoveštvu, industrijski inženjering u knjigoveštvu, operativno planiranje knjigoveške proizvodnje, hodogram proizvodnog procesa

#### ABSTRACT

Bookbinding as the final part of graphic production requires strict capacity planning of production resources in accordance with the formal request of the customer (printing house). In publishing bookbinding production, the production environment is dynamic as a result of the serving different finishing machines and/or lines. Therefore, the entrepreneurial bindery activities are constantly focused on jobs improving and business adapting to the market needs. Entrepreneur-bookbinder is focused on achieving production performance for various workplaces during the project implementation. He strives to monitoring, planning and coordinating the delivery activities of finished bookbinding products according to „just in time model. The paper has analyzed four different case studies for identical bookbinding project task. The floor layout production facility plan, the production route charts, and its resource capacities are compared in order to determine the relevant indicators of changes in the efficiency of book publishing production.

**Keywords:** entrepreneurship in bookbinding, bookbinding industrial engineering, operational planning of bookbinding production, the bookbindery route production charts

## 1. UVOD

### 1. INTRODUCTION

The demand trend for printed book bindings has significantly decreased over the past two decades. Due to the invasion of digitization of books, the conversion of physical books into e-books, there is no longer a demand for printing books in large quantities [1]. Publishing houses now execute their advertising and/or promotion activities for target groups through digital marketing [2-3]. The presence of publishers on relevant digital channels ensures business conditions for supply and/or demand planning. Now, based on experience, the publisher assesses which relevant book titles should be digitally printed and bound in a small number of copies (30-100 copies). Due to the impossibility of radical changes in bookbinding production (a large number of different types of bookbinding machines), the bookbinder turns to alternative solutions [4], organizes different production processes in order to save money and maintain a positive business balance and openness to the entry of external stakeholders into the family business. Practicality, systematicity and proposing a schedule of work operations on different types of bookbinding machines and/or lines within the production plant are prerequisites for increasing work productivity and reducing operating costs [6]. The implementation of acquired competencies (knowledge and skills) are a prerequisite for the creation of timetables for bookbinding production. The model of industrial engineering in the bookbinding industry offers effective solutions in the field of collective management, economics, logistics and ergonomics. Moreover, this business approach improves productivity, product quality and work safety [7]. The implementation of a quality management system (ISO standardization), as a guarantee of continuous quality improvement, is not necessary because the business culture of a family business stems from the ethical principle "All for one, one for all". In a family business, the business mission is not to increase profits, but to continuously develop entrepreneurship based on tradition, respect and trust towards colleagues [8]. The aim of this paper is to determine the relevant influencing factors on the change in the efficiency of bookbinding production in correlation with different floor plans of production plants, in

which the flow charts of production routes and production resources are strictly defined.

## 2. OBITELJSKO PODUZETNIŠTVO I INDUSTRIJSKI INŽENJERING

### 2. FAMILY ENTREPRENEURSHIP AND INDUSTRIAL ENGINEERING

Family entrepreneurship plays an important role in the economy because it directly contributes to self-employment through the development of the local community. However, success of a family business may depend on other factors: clear roles and responsibilities of family members, good management of relationships within the family, adoption of modern business practices and strategies. Family entrepreneurship is a special type of business. It is based on family values, ownership and management of the company and/or trade within the family, where family members cooperate with each other in the management and development of the business. So, the family controls the business, ownership is passed from generation to generation through certain forms of inheritance and/or gifting. Family members participate in management processes, they make relevant decisions at informal family meetings. Loyalty, integrity, and care for employees are the fundamental values of the entrepreneurial business culture within the company [8]. The perspectives of entrepreneurial business are long-term, the tendency is to preserve inherited business and build "new foundations" for future generations. The positive features of a family business and/or trade are the flexibility in decision-making and adaptability to market changes. A greater degree of autonomy is possible due to the mix of business and family relationships, so there is no need for an organizational structure. The business model is the source of strength, support and challenge of being the leader of the company and/or trade. Unfortunately, this type of business model cannot be organized in the middle and high management structures [8].

Industrial engineering guidelines provide recommendations for achieving efficiency, productivity and competitiveness within the industrial environment. Innovative entrepreneurs follow their guidelines because they are not

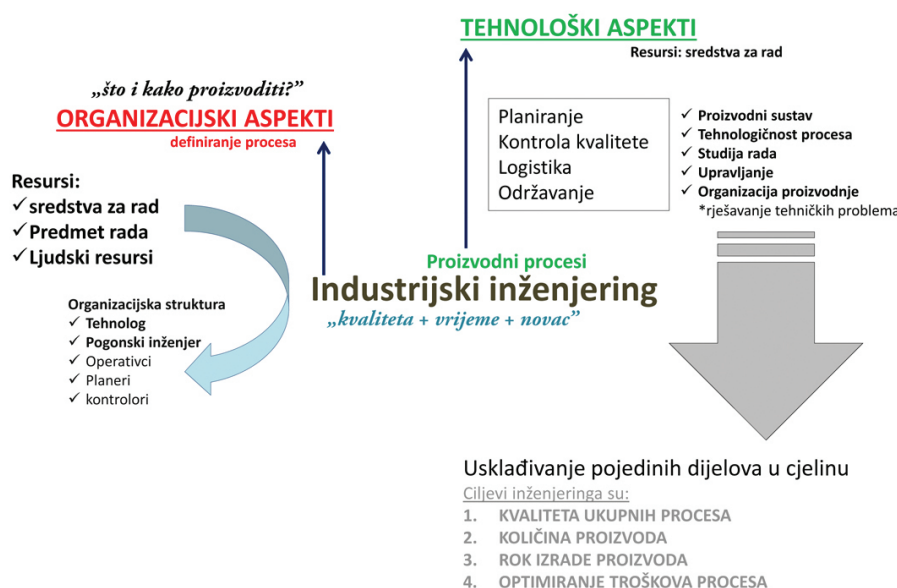
only oriented towards achieving technical production goals (craftsmanship) but, on the contrary, implement a wide range of technological solutions within the production system (innovative materials, tools and/or machines, software, methods for using technological solutions). They are aware of the challenges of identifying potential problems or opportunities for improvement from continuous analysis of overall technical and technological processes. The production process optimization stems from the traceability of each technical-technological operation, the entrepreneur simultaneously reduces production costs while increasing product quality [9]. Implementing various advanced technologies in existing workplaces is a challenge for entrepreneurs. Therefore, they effectively manage and dispose of production resources within the production facility. Moreover, planning, monitoring and coordination of the activities of procurement of supplies of raw materials and shipping finished products are carried out in line with the "just in time" production management concept [10]. Entrepreneurs constantly collect relevant feedback from raw material suppliers and customers. Data analysis, identification of potential problems and implementation of technical and technological solutions in production resources are the business policies of entrepreneurial activities. Commitment to high quality products and services is the motto of an innovative entrepreneur. Moreover,

operational excellence is achieved at every workplace through the optimal utilization of production resources, sustainable business is realized [11]. The technological waste now becomes a production resource, it does not end up in a landfill but is reused in the execution of other projects. Risk management results from emergency intervention planning activities, prompt coordination and mutual trust with service providers. Flexibility and adaptability to changes in a dynamic business environment, on different markets for goods and services, are indicators of the success of a family business based on the industrial engineering model.

### 3. PLANIRANJE I ORGANIZIRANJE KNJIGOVEŠKE PROIZVODNJE

#### 3. PLANNING AND ORGANISING BOOKBINDING PRODUCTION

In bookbinding, planning and organizing book publishing production requires careful management of production processes and resources. Key strategies for planning, organizing and ensuring the quality of bookbinding production begin with the analysis of the *Request for a Quote* (types/forms of binding, number of copies, quantity of bookbinding material, delivery deadlines for semi-finished products and raw materials, specific customer requirements). The efficiency of the realization of the project, a determined



Slika 1 Aspekti industrijskog inženjeringa [8]

Figure 1 Industrial engineering aspects [8]

number of copies of a book, is achieved by planning and estimating the capacity of the production resources. The analysis of the availability of workforce and the choice of a certain bookkeeping technology (operations and processes) are relevant indicators in achieving operational excellence in the business environment. In bookbinding in general, the schedule of execution of technical-technological operations is strictly determined, moreover, production resources and their capacities should be compatible with the requirements of the project (*Request for a Quote*) [12]. Stock management ensures the optimal inventory of necessary bookbinding raw materials. It prevents interrupting the sequence of work operations for different operations, that is, the accumulation of excessive inventory of raw materials that increases the cost of their storage is prevented. Therefore, innovative entrepreneurship strives for the concept of bookbinding production management, uses segments within the "just in time" model, such as control of inventory of graphic raw materials, continuous improvement of bookbinding processes, reduction of production time within defined work operations, provision of a flexible workforce, and especially improvement of business relations with suppliers of bookbinding materials.

Quality control of technical-technological operations and/or processes is continuously carried out by employees. Testing samples for specific jobs implies monitoring feedback from the end customer, the printer. Communicating with suppliers requires managing raw material delivery deadlines according to the "just in time" model, when employees competently propose technological solutions for connecting work operations and/or processes for different workplaces. In an entrepreneurial environment, in a bookbindery, it is imperative to develop flexible production systems. Employees need to respond promptly to market changes and customer demands. In such situations, the entrepreneur meets market expectations because he follows the guidelines of industrial engineering. Moreover, a balance was achieved between available production resources and customer requirements, i.e., the planned business goals were achieved [12].

#### **4. OPERATIVNO PLANIRANJE KNJIGOVEŠKE PROIZVODNJE**

#### **4. OPERATIONAL PLANNING OF BOOKBINDING PRODUCTION**

Production technical-technological processes, within the bookbindery, are carried out in a specific order of joining printing products/bookmaking semi-products (printing sheets) and bookbinding raw materials (thread, wire, glues, flat cardboard, paper, cardboard, covers) into a finished bookbinding product [13]. The use of bookbinding technologies, different lines and/or machines and/or tools, enables the execution of production processes and operations (cutting, trimming, cutting, folding, folding, drilling, perforating, sewing, gluing, gluing, drilling, sawing, etc.). By planning daily and weekly activities in the use of production resources, greater efficiency is achieved because the excessive creation of scraps of printing products (printing sheets for the book block and printing sheets for the cover jacket) and bookbinding semi-products (book sheet, book stack, book block, semi-finished book) is minimized. The resources allocation (manpower, machines, tools, raw materials, semi-finished products) should be precisely planned according to the established production schedule. Determination of priorities and identification of tasks should be coordinated with the technical-technological parameters from the *Request for a Quote* document. Setting the start time and the end time of the operation, for each given task, is optimized according to the order of its execution. Inventory management involves monitoring the quantities of raw materials, monitoring the demand for raw materials and ordering them as needed. Production performance is monitored with the aim of identifying potential problems and possible opportunities for improvement [14,15]. The integration of operational planning of production resources in the bookbindery enables the entrepreneur to effectively respond to market changes and achieve a competitive advantage with high quality bookbindery production [12].

## 5. TEHNOLOŠKA DOKUMENTACIJA – RADNI NALOG

### 5. TECHNOLOGICAL DOCUMENTATION – JOB ORDER

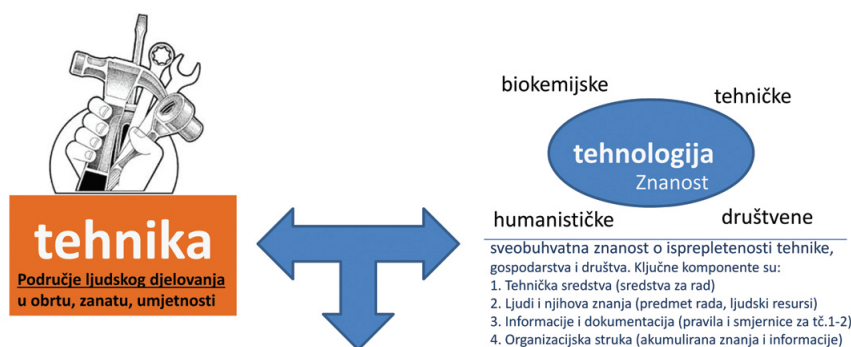
A job order is a clear, precise and easy-to-understand technological document available to everyone who participates in the creation of a finished graphic product. A document that provides detailed guidelines and instructions for the execution of production operations [12]. It describes the specific steps and procedures that should be carried out in order to produce a certain book form (seamless, sewn, mechanical) or type of binding (hard, soft, mechanical). It contains important information with detailed product descriptions, according to the specification from the Request for Offer document; describes each step of the production process of binding realization; lists additional work operations; lists the technical data of the technologies, machines and tools to be used, including working capacities and characteristics; safety instructions on handling technologies, machines and tools; plans operation schedules with times, start and end times for each step of the production process; provides guidelines for conducting quality control (possible testing, documented acceptance criteria); notes and comments during production.

Bookbinder entrepreneurs determine the necessary quantities of raw materials for the production of book editions by experience.

Also, they can estimate the necessary duration of bookbinding production and can estimate the total production costs. Although entrepreneurs have the tendency to promptly adapt to a dynamic business environment, they record relevant production data and analyse them in order to maintain competitiveness in the target markets (*Request for a Quote – Job order*). Moreover, the entrepreneur tries to motivate all members of the team to follow him, he is focused on personal and professional development, which increases the productivity of work and the quality of performing work tasks in different workplaces, in fact he creates a stimulating environment for progress. Entrepreneurial endeavours for successful growth and development of the company/craft derive from fundamental development principles, namely market orientation, sustainability, strategic planning, flexibility, human resource management, partnership and cooperation, and financial sustainability. The entrepreneur uses them carefully and systematically adapts to them (Figure 2) [12].

## 6. ANALIZA STUDIJE SLUČAJA 6. CASE STUDY ANALYSIS

The case study represents a concrete example of bookbinding publishing production for soft seamless binding (mark KP for 4\_MUK). The technical specification of paper consumption (printing sheets) for the book block and



*Slika 2* Razvojni principi poduzetništva [8]

*Figure 2* Developmental principles of entrepreneurship [8]

## inženjerstvo

Profesija primjene znanstvenih načela pri projektiranju proizvoda

DOPRINOSI:

1. produktivnosti (redukcija rada, sigurniji rad)
2. redukcija zagađivanja okoliša
3. razvijanje poželjnih tehnologija na društvo\*\*\* (primjena u graf. djelatnosti)
4. reduciranje utroška materijala, radne snage i energije
5. temeljenost na znanstveno-istraživačkom i razvojnom radu

**Problemi:** kratak životni vijek proizvoda i proizvodnog procesa\*\*\* (graf. struka)

Visoki riziku u investiranju\*\*\*

Tablica 1 Tehnička specifikacija o knjigoveškom proizvodu (4\_MUK) iz dokumenta Upit za ponudu [6]

Table 1 Technical specification of perfect bound book product (4\_MUK) from the RFQ document [6]

Specifikacija PP dopremljena u knjigovežnicu (iz tiskare)					
	TA (papir)_B2	TA (korice)_B2	Naklada (kom)	Format KP	Opseg KP (str.)
KP za 4_MUK	55416 (1551,60kg)	1625 (113,80 kg)	6000	A5	144

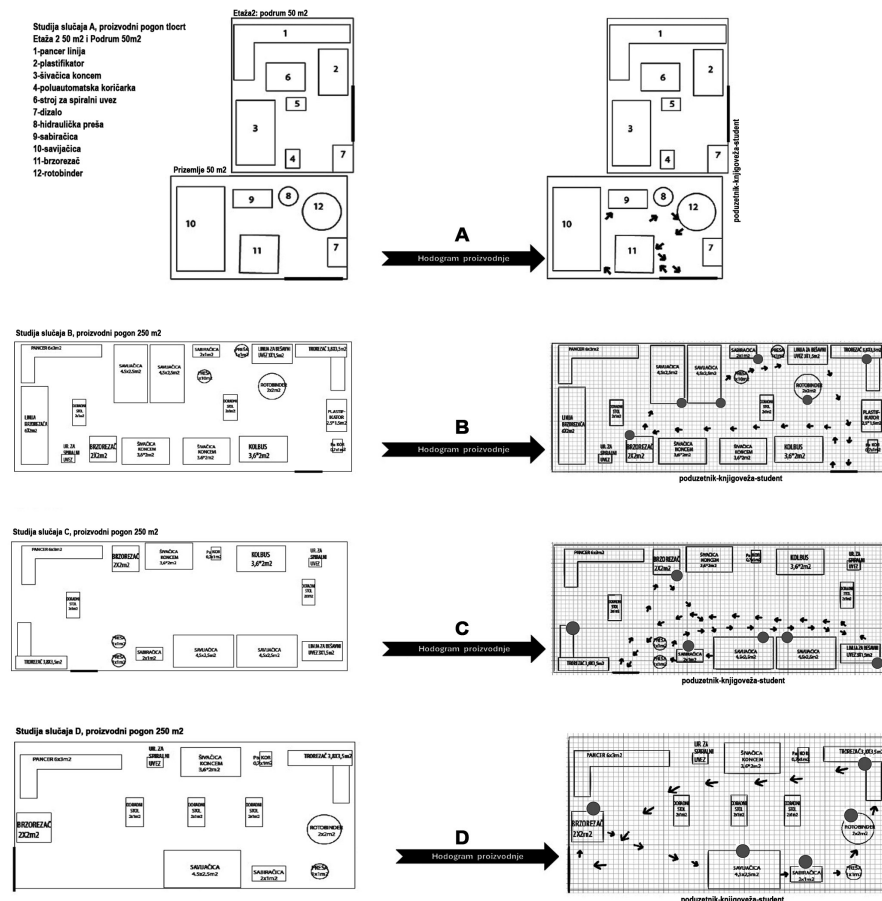
  

Utrošak grafičkog repromaterijala (HM adheziv)									
	Š_TA	V_TA	Naklada (kom)	Br.KS_u_KB	UK_TA u nakladl	DZT_knjlgov.	UK_TA	GP_g/m <sup>2</sup>	UKUP (kg)
4_MUK	0,70	0,50	6000	9	54000	1416	55416	80	Iz tiskare
	Š_TA	V_TA	Naklada	JKK_Br Jed. Po TA	UK_TA u nakladl	DZT_knjlgov.	UK_TA	GP_g/m <sup>2</sup>	UKUP (kg)
4_MUK	0,70	0,50	6000	4	1500	125	1625	200	Iz tiskare
	HM_Cp (g/cm <sup>2</sup> )	dn (mm)	Naklada	*	*	*	*	*	UKU_HM (kg)
4_MUK	0,95	0,30	6000	*	*	*	*	*	3,23

cover jacket and the technical-technological specification of the parameters of the bookbinding product 4\_MUK are shown in Table 1.

The floor plan of the bookbinding plant with the flow chart of the production process, for four different layouts of bookbinding equipment A to D, are shown in Figure 3. Case studies A, B, C and D are focused on defining the working hours of bookbinding machines served by an equal number of employees as follows:

- **Case study A (two floors):** high-speed guillotine cutter -> folding machine -> gathering machine -> rotobinder (perfect) machine -> high-speed guillotine cutter (Bookbinding entrepreneur + Bookbinder + Student)
- **Case study B (one floor):** high-speed guillotine cutter -> folding machine I + folding machine II -> gathering machine -> rotobinder (perfect) machine -> three-knife cutter (Bookbinding entrepreneur + Bookbinder + Student)



Slika 3 Tlocrt knjigovežnice s hodogramom proizvodnog procesa za četiri studije slučaja A-D [6]

Figure 3 The bookbinding floor plan and its production process flowchart for four case studies A-D [6]

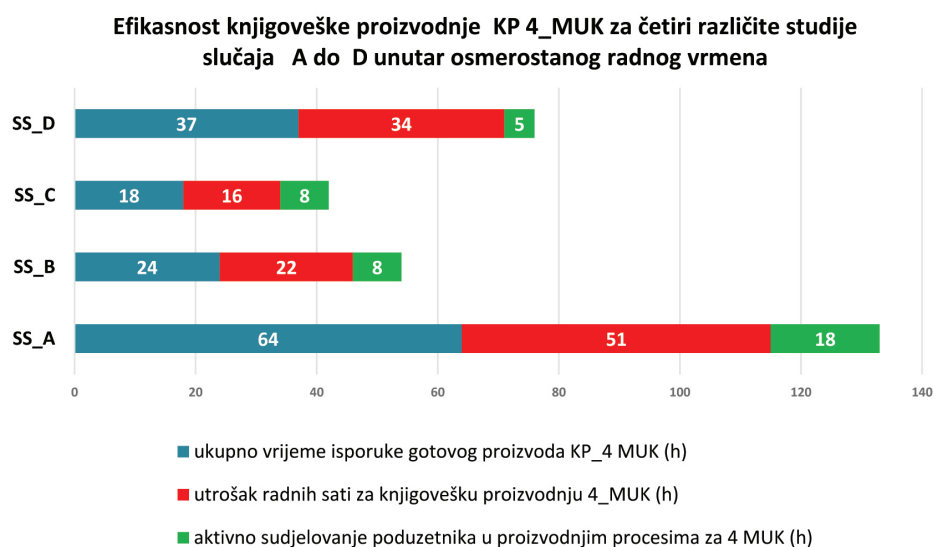
• **Case study C (one floor):** high-speed guillotine cutter -> folding machine I + folding machine II -> gathering machine -> automative perfect binding machine -> three-knife cutter (Bookbinding entrepreneur + Bookbinder + Student)

• **Case study D (one floor):** high-speed guillotine cutter -> folding machine -> gathering machine -> rotobinder (perfect) machine -> three-knife cutter (Bookbinding entrepreneur + Bookbinder + Student)

For each production run A to D, the total time spent performing each technological operation is defined as follows: cutting, folding, gathering, tying and trimming. The performance of all technical-technological operations by the bookbinding entrepreneur is recorded, and the working time consumption for the preparation of workplaces is harmonized according to the norms from the job order. The efficiency of bookbinding production, for four different case studies A to D, is shown in Figure 4. The sum of the total time of performing technical-technological operations for each workplace is shown in Figure 5.

After the analysis of the *Request for a Quote* document, the necessary quantities of printing sheets for the technical-technological operations of making the book block (54,000 TA) and one-part cover of brochure (15,000 TA) were identified. Effective production planning involves five independent processes: (1) cutting the printed

sheets and forming the cover jacket, (2) folding the printed sheets into a book stack, (3) gathering the signatures into a book block, (4) roughening the spine of the book block, bending and gluing one-part brochure cover of the book block and glue drying, (5) three-side trimming of the book. Planning the consumption of raw materials implies defining the optimal amount of glue (3.23 kg) for the production of a defined edition of books (4\_MUK, 6000 copies) according to the specification from Table 1. The production route schedule in SS\_A is performed on two levels, in the basement and on the ground floor. Its floor plan is divided into two equal parts, with a total area of 100 m<sup>2</sup>. Considering the specifics of the floor plan SS\_A (ground floor 50m<sup>2</sup> and basement 50 m<sup>2</sup>), it is not possible to increase the production capacity (Figure 3). Efficient use of machines, without interrupting production, requires the creation of a work schedule with defined workplaces. The bookmaking machines (folding machine, rotobinder (perfect) machine and three-knife cutter) are operated by two employees, while one employee operates the folder or the high-speed cutter. The floor plans of the production facilities are identical for SS\_B, SS\_C and SS\_D, each facility has an area of 250 m<sup>2</sup>, which is 2.5 times larger than SS\_A. Roadmaps of bookbinding production are performed on a single level for SS\_B, SS\_C and SS\_D, and work operations and/or processes are interconnected. Transport routes for moving pallets with semi-finished products are flexibly planned (printed/



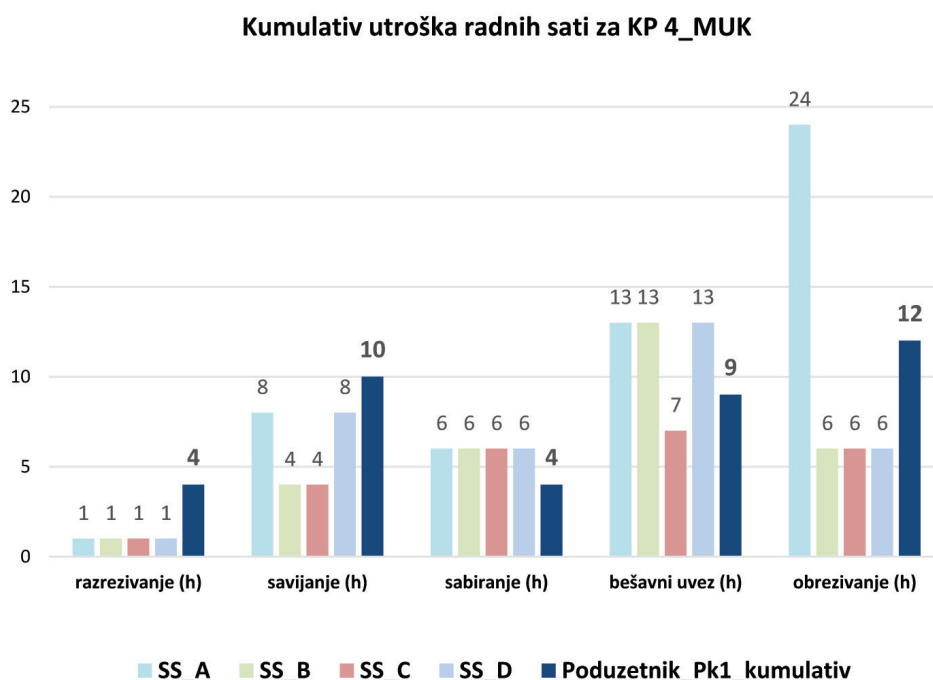
*Slika 4 Učinkovitost knjigoveške proizvodnje (4\_MUK) obzirom na raspored strojeva [6]*

*Figure 4 Bound book production efficiency of (4\_MUK) with regards to machines arrangement [6]*

book sheets -> 54,000 KA, signatures -> 54,000 KS, book blocks -> 6,000 KS, semi-finished book product -> 6,000 KS). Servicing of five (5) different bookbinding machines, on short production distances, is carried out without stopping production, as shown in Figure 3. Bookbinding production is realized within eight-hour working hours (07:00-15:00 hours), and entrepreneurial activities are organized according to business priorities and needs. Therefore, business opportunities are brought during and/or after the eight-hour working time. The efficiency of bookbinding production is observed from three different aspects: (1) the total time required for the delivery of the 4\_MUK edition according to the "just in time" model, (2) the total time required for the bookbinding production of KP 4\_MUK and (3) the total time spent by the entrepreneur for the need to carry out different production processes and/or operations for different workplaces (Figure 4). By comparing SS\_B and SS\_C, the efficiency of delivery of the print run is reduced by 25% (24h -> 18h) because no seamless binding line is used. Moreover, when comparing SS\_D with SS\_B, the efficiency of circulation delivery is reduced by 35% (37h -> 24h) or even by 51% (37h -> 18h) compared to SS\_C. The relevant percentage changes were due to the non-use of another adder of the same performance, that is, a line for seamless binding.

Due to floor plan restrictions in the arrangement of equipment, it is not possible to use the SS\_A tri-cutter, the efficiency of circulation delivery is reduced by 42% (64h -> 37h) compared to SS\_D. Entrepreneurial activities within the production plant include the preparation of workplaces for various bookbinding machines. His total time spent on activities is the same for SS\_C (8h) and SS\_B (8h). In these production facilities, the entrepreneur serves one of the bending machines, according to the job description in the work order. The entrepreneur has the shortest engagement in the production process for SS\_D, and the longest engagement in the two-story production plant SS\_A. The entrepreneur does not have the possibility to use a three-knife cutter in the production plant (Figure 3). The relevant percentage change of 260% (5h -> 18h) in favour of SS\_A gives an idea of how dynamic the production environment is, the entrepreneur is constantly focused on achieving the production effect by performing different work operations at different workplaces.

The entrepreneur's involvement is greatest in performing technological operations: cutting (12h), folding (10h), perfect binding (9h), cutting (4h), gathering (4h) as shown in Figure 5. The entrepreneur has the role of creator of how to plan and implement production



Slika 5 Kumulativ utroška radnih sati u obavljanju aktivnosti proizvodnje KP 4\_MUK [6]

Figure 5 Cumulative consumption of working hours in performing production activities KP 4\_MUK [6]

resources in bookbinding production. Taking into account the floor plan characteristics of the SS\_A production plant, the highest cumulative expenditure of working hours for various technological operations is shown: three-sided trimming of books on a high-speed cutter (24h), followed by perfect binding form on a rotobinder (13h), folding of printed sheets on a folder (8h), gathering of signatures on the gathering machine (6h) and cutting the one-part cover on the high-speed guillotine cutter (1h). Due to the favourable floor plan characteristics for SS\_B, SS\_C and SS\_D, the cumulative consumption of working hours for performing two technological operations: cutting the one-part cover (1h) and gathering the signatures in book block (6h) remains unchanged (Figure 5). Parallel operation of two folding machines of the same performance for SS\_B and SS\_C reduces the total working time for the process of folding printed sheets into signatures. The relevant percentage of change in the consumption of working hours is as much as 50% (8h -> 4h). Moreover, a significant time saving was achieved for SS\_C, the change percentage is a high 46% (13h -> 7h) because an automative perfect binding machine is used instead of a rotobinder.

## 7. ZAKLJUČAK

### 7. CONCLUSION

Successful family entrepreneurship stems from quality relationships between all family members. The roles and responsibilities of each member are clearly defined through indirect and/or direct participation in business activities. The commitment to work and accessibility of entrepreneurs is recognized through the adoption of modern business practices and strategies to improve business culture and relations with partners and employees. The application of the business model in bookbinding production follows the guidelines of industrial engineering. The bookbinder entrepreneur is aware of the fact that technical and technological operations should be continuously analysed and improved, and any potential problems and opportunities for production improvements should be identified. Its obligation is to provide employees with a

dynamic working environment, with available production resources, which is continuously adapted to the needs of the market. The entrepreneur should identify threats and opportunities in the business environment (PEST analysis and SWOT analysis) in order to maintain competitiveness in the target markets [16]. The obligation of every entrepreneur is to achieve strategic business goals in such a dynamic environment. Management of production resources and capacities, as well as delivery deadlines for finished bookbinding products, in a dynamic work environment, is achieved by creating a high-quality floor plan of the production plant and analysing the technical documentation of the given project (Request for offer and Work order). After the analysis of the floor plan of the production plant and the production route workflow, including production resources and their capacity for four different case studies (SS\_A, SS\_B, SS\_C and SS\_D), it is concluded that in the two-story production plant (SS\_A) it is a big challenge to maintain efficient bookbinding production. The specific work schedule of production routes makes it impossible to use and serve production resources in an optimal way, without interrupting work operations for certain workplaces. On the contrary, in a single-story production facility (SS\_B, SS\_C and SS\_D) it is possible to maintain efficient bookbinding production, use and service production resources within the production routes and on short distances. It is possible to serve production resources in an optimal way, without interrupting work operations for each workplace. Flexible planning of transport paths and moving pallets with bookbinding semi-products is realized in single-level production plants (SS\_B, SS\_C and SS\_D). The two-story production plant (SS\_A) is not suitable for bookbinding production with a small number of employees. At short production distances (SS\_B, SS\_C and SS\_D), different bookbinding machines are serviced without interrupting work operations and at different workstations. In the one-story production facility (SS\_B, SS\_C and SS\_D), entrepreneurial business opportunities are realized within eight-hour working hours (07:00-15:00). The entrepreneur is able to leave production after the execution of the planned

activity. In the two-story production facility (SS\_A), entrepreneurial business opportunities are not realized within eight-hour working hours (07:00-15:00 hours), the entrepreneur makes additional efforts to organize priority production activities after working hours (15:00-22:00 hours) with additional help from family members. The existing infrastructure does not provide conditions for the implementation of industrial engineering. The efficiency of using the line for perfect binding 4\_MUK, in the publishing production of books, is significantly increased when two gathering machines of the same performance are operated in parallel (SS\_C). Efficient production, for large editions of books (4\_MUK), cannot be achieved by servicing bookbinding machines: (1) rotobinder and (2) high-speed guillotine cutter, which are characteristic for small and medium editions of books. Thus, two-level bookbinding production systems (SS\_A) create a dynamic production environment. The focus is on achieving production performance only for defined workplaces. In general, in the single-level production system (SS\_B, SS\_C and SS\_D), a significant saving of production resources is realized. A structured dynamic work environment provides new opportunities for growth and development of entrepreneurial capacities according to the "just in time" business model. The implementation of industrial engineering is achievable within the existing SS\_B, SS\_C and SS\_D infrastructure.

## 8. REFERENCE

### 8. REFERENCES

- [1.] I. Majnarić „Osnove digitalnog tiska, Grafički fakultet Sveučilišta u Zagrebu“, 2015, ISBN: 978-953-7644-13-0
- [2.] S. Gašparić, G. Petković, S. Pasanec Preprotić, „Critical analysis of marketing in Croatian publishing“, *Acta Graphica*, Vol. 28, No. 3; 2018, doi:10.25027/acta%20graphica.v28i3.142
- [3.] E. Dasović, G. Petković, S. Pasanec Preprotić, „Oblikovanje i budućnost knjižnog uveza u svijetu e-knjige“, *Tehnički glasnik*, Vol. 9, No. 4, 2015, 440-445., <https://hrcak.srce.hr/149763>, 14.06.2024.
- [4.] S. Pasanec Preprotić, M. Vukoje, G. Petković, M. Rožić, „Sustainable approach to book designing concepts in bindery sector: An overview“, *Proceedings na 11th International Symposium on Graphic Engineering and Design GRID 2022*, University of Novi Sad, Faculty of Technical Science, Department of Graphic Engineering and Design, 2022, doi: 10.24867/GRID-2022-p69
- [5.] D. Stančin „Optimiranje sustava u nakladničkom uvezu knjiga-studija slučaja“, *Diplomski rad*, Grafički fakultet Sveučilišta u Zagrebu, 2018., <https://eprints.grf.unizg.hr/2963/>, 07.06.2024.
- [6.] A. Cetinjanin „Planiranje poslovanja proizvodnih procesa u malom i srednjem poduzetništvu - Studija slučaja“, *Diplomski rad*, Grafički fakultet, Sveučilište u Zagreb, 2020., <https://eprints.grf.unizg.hr/3259/>, 10.06.2024.
- [7.] S. Pasanec Preprotić „Knjigoveštvo 2 nastavni materijali“, Zagreb, Grafički fakultet, Sveučilište u Zagrebu, 2017.
- [8.] P. Čovo „Održivo poduzetništvo- nastavni materijali“, Sveučilište u Zadru, Zadar, 2007., [https://www.unizd.hr/Portals/4/nastavni\\_mat/2\\_godina/poduzetnistvo/poduzetnistvo\\_01.pdf](https://www.unizd.hr/Portals/4/nastavni_mat/2_godina/poduzetnistvo/poduzetnistvo_01.pdf), 28.05.2024.
- [9.] D. Blažević, T. Mikac, „Planiranje i upravljanje proizvodnjom“, *Tehnički fakultet, Sveučilište u Rijeci*, 2007., [https://kupdf.net/download/planiranje-i-upravljanje-proizvodnjom-2007\\_59f445c9e2b6f53a5c9f327d\\_pdf](https://kupdf.net/download/planiranje-i-upravljanje-proizvodnjom-2007_59f445c9e2b6f53a5c9f327d_pdf), 18.05.2024.
- [10.] M. Perinić „Definiranje (planiranje) tehnološkog procesa“, *Tehnološki procesi, Tehnički fakultet, Sveučilište u Rijeci*, 2007.
- [11.] S. Pasanec Preprotić, M. Vukoje, G. Petković, M. Rožić, „Novel Approaches to Enhancing Sustainable Adhesive System Solutions in Contemporary Book Binding: An Overview“, *Heritage*, Vol. 6, No. 1, 2023, doi: 10.3390/heritage6010033
- [12.] B. Juri „Osnove planiranja i organizacije grafičke proizvodnje“, *Acta Graphica*, Zagreb, 2001. ISBN: 953-96276-4-8
- [13.] S. Pasanec Preprotić, G. Petković, M. Bracić, A. Marošević Dolovski,

- „Comprehensive Principles for Enhancing the Adhesive Bound Book Performances“, Tehnički glasnik, Vol. 17, No. 4, 2023, doi: 10.31803/tg-20230127170218
- [14.] S. Pasanec Preprotić, D. Stančin, G. Petković, „Projektiranje procesa u nakladničkom uvezu knjiga - Analiza radnog procesa“, Polytechnic and design, Vol. 10, No. 4, 2022, doi: 10.19279/TVZ.PD.2022-10-4-01
- [15.] D. Bratić „Optimization of the Operations and Planning in Bookbinding Production“ u Zborniku radova Hrvatsko društvo grafičara, Zagreb, 2012, 366-374., [https://scholar.google.cz/citations?view\\_op=view\\_citation&hl=hr&user=cNMG Ez0AAAAJ&start=20&pagesize=80&citation\\_for\\_view=cNMG Ez0AAAAJ: R3hNpaxXU hUC](https://scholar.google.cz/citations?view_op=view_citation&hl=hr&user=cNMG Ez0AAAAJ&start=20&pagesize=80&citation_for_view=cNMG Ez0AAAAJ: R3hNpaxXU hUC), 19.03.2024.
- [16.] [16] I. Skani „Okruženje poduzetništva u Hrvatskoj“, Završni rad, Ekonomski fakultet, Sveučilište u Zagrebu, 2021., <https://urn.nsk.hr/urn:nbn:hr:148:661724>, 15.06.2024.

## AUTORI • AUTHORS

• **Suzana Pasanec Preprotić** - She was born in Zagreb in 1972. She graduated in 2001 and received her doctorate in 2012 at the Faculty of Graphic Arts of the University of Zagreb with the topic of her doctoral dissertation "The Strength of the Book Block Depending on Aging" under the mentorship of prof. Ph.D. sc. Darko Babić. She is currently an associate professor at the Department of Bookbinding and Packaging at the Faculty of Graphic Arts, University of Zagreb. The fundamental area of research is related to the interactions of graphic materials characteristic of finishing processes (bookmaking, packaging), primarily the quality of the binding - the interaction of paper and adhesive. She teaches several undergraduate, graduate and doctoral courses at her home faculty. She has been a member of the Croatian Institute for Standards – The Technical Committee 130 - for graphic technology since 2014 and the president of the Quality Assurance Committee of the Faculty of Graphic Arts, University of Zagreb.

### Korespondencija • Correspondence

suzana.pasanec.preprotic@grf.unizg.hr

• **Anja Cetinjanin** - She was born in Ogulin, in 1991, where she graduated from Bernardin Frankopan High School in Ogulin. After completing her undergraduate university studies at the Faculty of Graphic Arts of the University of Zagreb in 2018, she enrolled in a technical-technological bachelor's degree in graphic technology at the same Faculty, which she completed in 2020. She was employed in the Natural juice j.d.o.o. company (2021-2023). Since November 2023, she has been employed at Velprom d.o.o. on jobs: monitoring of production work, data analysis and statistical information processing, monitoring of errors in work and the influence of the human factor, workplace organization and work ergonomics, implementation of continuous education of employees in the production process.

### Korespondencija • Correspondence

acetinjanin@gmail.com

• **Diana Bratić** - She was born in Zagreb in 1973. She graduated in 2004 from the Faculty of Graphic Arts of the University of Zagreb, received her master's degree in 2008 from the Faculty of Economics of the University of Zagreb (majoring in Organization and Management), and received her doctorate in 2015 from the Faculty of Graphic Arts of the University of Zagreb with a thesis in the field of optimization of the offset printing process. She is currently an associate professor at the Department of Printing Processes at the Faculty of Graphic Arts, University of Zagreb. The area of scientific research interest includes organization and optimization of graphic production, quality management, digital publishing, multimedia tools, and optimization and personalization of multimedia content. She teaches one undergraduate course and one graduate course at her alma mater. She is a member of numerous international associations and the Quality Assurance Committee of the Faculty of Graphic Arts, University of Zagreb.

### Korespondencija • Correspondence

diana.bratice@grf.unizg.hr

• **Gorana Petković** - Born in 1989 in Split. After graduating from general high school in Omiš, in 2007, she entered the Faculty of Graphic Arts at the University of Zagreb. In 2012, she obtained her master's degree in graphic technology engineering. After completing her graduate studies, she started working in graphic design, and then in a comprehensive marketing agency as a graphic designer and event organizer. After a few months, she moved to a company that conceptualises, designs and produces informative and promotional solutions for labelling objects, and since February 2015 she has been employed as an assistant at the Faculty of Graphic Arts, University of Zagreb, Department of Bookbinding and Packaging. She is an assistant in the courses Hand binding of books, Bookbinding 1, Handmade box making and Bookkeeping 2. She received her doctorate in June 2020 with the topic of her doctoral dissertation "Influence of Modified Polyvinyl Acetate Adhesive with Nanoparticles on the Quality of Finished Graphic Products". In the same year, she was elected to the scientific title of scientific associate in the scientific field of technical sciences - the field of graphic technology. As a researcher, she participates in international scientific meetings and short-term financial support for research. She received professional training as part of the Erasmus+ program in 2017, and attended a professional training course for teachers in the field of graphic preparation, printing and finishing, under the auspices of Print Promotion from Germany, in 2018.

**Korespondencija • Correspondence**

gorana.petkovic@grf.unizg.hr