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DEVELOPMENT OF A DESKTOP APPLICATION FOR ORDER AND PRODUCTION WORKFLOW MANAGEMENT IN A PRINTING COMPANY

DEZVOLTAREA UNEI APLICAȚII DESKTOP PENTRU GESTIONAREA COMENZILOR ȘI FLUXULUI DE PRODUCȚIE ÎNTR-O TIPOGRAFIE

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Abstract: *Prezenta cercetare vizează proiectarea și implementarea aplicației desktop ANVIstudioApp, un sistem informatic dedicat automatizării gestionării comenzilor și fluxului de producție în cadrul unei companii tipografice de talie mică și medie, exemplificată prin studioul ANVI Studio Group. Actualitatea temei este derivată din necesitatea stringentă de a depăși limitările sistemelor de evidență manuală, care generează fragmentarea informației și erori costisitoare în procesul de producție. Obiectivele principale includ centralizarea datelor clienților, automatizarea generării codurilor de identificare unice și implementarea unui sistem vizual de monitorizare cromatică a stadiilor de execuție. Metodologia utilizată se fundamentează pe principiile ingineriei software, utilizând un model de dezvoltare incremental și metode de analiză comparativă pentru selectarea stack-ului tehnologic optim. Rezultatele obținute demonstrează că utilizarea limbajului C# împreună cu platforma.NET și sistemul de gestiune a bazelor de date SQL Server asigură o infrastructură robustă pentru trasabilitatea completă a comenzilor. Implementarea bazei de date în forma normală 3 (3NF) și integrarea prin Entity Framework au permis reducerea redundanței datelor și creșterea vitezei de procesare a informațiilor. Concluziile evidențiază faptul că digitalizarea fluxurilor operaționale tipografice nu reprezintă doar o optimizare tehnică, ci o necesitate strategică pentru menținerea competitivității prin reducerea timpilor de execuție și eliminarea erorilor umane.*

Key words: *Automatizare tipografică, flux de producție, aplicație desktop, C#, SQL Server, managementul comenzilor, inginerie software, digitalizare*
JEL CLASSIFICATION: M15, L60, C88.

INTRODUCTION

The digital transformation of the modern economy has fundamentally reshaped how organizations manage internal operations, positioning information systems as the backbone of decision-making processes. In this context, the printing industry has evolved from traditional manual workflows to complex, information-driven systems (Kipphan, 2001).

The motivation for this research stems from operational challenges identified in printing companies, where reliance on manual order management methods leads to fragmented data, inconsistencies, and difficulties in monitoring production stages. According to established software engineering principles, manual systems become inefficient in complex environments, increasing the risk of errors and operational delays (Sommerville, 2016).

The purpose of this study is to design and develop a desktop application that automates order management and production workflows. The research objectives include analyzing operational processes, defining system requirements, selecting appropriate technologies, and implementing a functional software solution.

CORE CONTENT

Theoretical Foundations and Literature Review. The transition from traditional printing processes to digital workflows is primarily driven by the need for efficient information management. Modern typographic systems are defined by data flow and its coordination across production stages (Kipphan, 2001).

Management Information Systems play a crucial role in integrating organizational processes by transforming client requirements into structured production tasks (Laudon & Laudon, 2020). At the same time, usability principles are essential in ensuring efficient interaction between users and applications, reducing complexity and improving productivity (Nielsen, 1993).

From a technical perspective, relational database theory provides the foundation for structured data storage. The relational model ensures consistency and eliminates redundancy when normalization techniques such as the Third Normal Form (3NF) are applied (Connolly & Begg, 2014; Date, 2004).

Research Methodology and System Design Framework. The research methodology is based on a structured software development lifecycle, including requirement analysis, system design, implementation, and testing (Sommerville, 2016).

The process began with the analysis of the operational workflow within a printing company, identifying bottlenecks and data inconsistencies. These findings were translated into system requirements and logical models.

Table 1. Development Phases

Phase	Activities	Tools / Methods
Analysis	Workflow study, requirement definition	Process modeling
Design	Database schema (3NF), architecture	ER diagrams
Implementation	Coding and integration	C#, .NET
Testing	Validation and debugging	Testing methods

Source: Elaborated by the author based on Connolly & Begg (2014) and Sommerville (2016)

The technological stack was selected through comparative analysis. The application was developed using C# and the .NET platform, which provide a stable and scalable environment for desktop applications (Microsoft, 2023). The database was implemented using SQL Server, ensuring reliability and performance in data management (Microsoft, 2023).

System Implementation and Results Analysis. The result of this research is the development of ANVIstudioApp, a desktop application designed to automate workflow management in a printing company.

The system includes the following functionalities:

- user authentication and access control
- order management (CRUD operations)
- client database management
- automatic generation of unique order identifiers
- real-time workflow monitoring

A key feature of the system is the implementation of a color-coded monitoring mechanism that allows users to quickly identify the status of each order, improving visibility and decision-making.

Table 2. Operational Impact

Indicator	Before Implementation	After Implementation
Order processing time	5–10 minutes	1–2 minutes
Error rate	High	Low
Data consistency	Fragmented	Centralized
Workflow visibility	Manual	Real-time

Source: Elaborated by the author

The database structure follows the relational model and is normalized to the Third Normal Form (Codd, 1970), ensuring elimination of redundancy and maintaining data consistency (Connolly & Begg, 2014; Date, 2004).

The integration of Entity Framework as an Object-Relational Mapping (ORM) framework substantially simplifies data persistence operations between ANVIstudioApp and the normalized SQL Server database. By providing automated CRUD functionality, LINQ-based querying, change tracking, and migration support, it significantly reduces development complexity, minimizes the potential for manual errors, and enhances long-term code maintainability and scalability.

CONCLUSIONS / RECOMMENDATIONS

This research provides evidence that the systematic application of software engineering principles—through the design and implementation of ANVIstudioApp using C#/.NET and a normalized SQL Server database—significantly enhances key performance metrics of production workflows in the printing industry, including a marked reduction in processing time and error rates.

The developed application replaces manual processes with a structured digital system, ensuring better coordination, improved traceability, and reduced errors. The use of C#, .NET, and SQL Server provides a reliable technological foundation for scalable business applications.

Future development directions include:

integration with accounting and financial systems

development of mobile access solutions

implementation of advanced reporting functionalities

enhancement of security and data protection mechanisms

In conclusion, this research affirms that the integration of modern software engineering practices into printing workflows is not merely a technical improvement, but a strategic necessity for sustaining competitiveness in small- and medium-sized printing companies.

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