

Innovation and Digital Transformation in the Business Environment: A Case Study on Analyzing the Impact on Organizational Performance in a CAD Company

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Abstract. This article makes an exploratory attempt to study the impact of implementing a computer-aided design (CAD) system on a Romanian company. The firm has been established in 1998 and it is based on Baia Mare (Maramures), Romania. It is the commercial administrator of the CAD/CAM Technology Support Center. This center was a project initiated within the Maramureș Center for the Development of Small and Medium Enterprises (SMEs), and it received funding from the PHARE FIDEL program, an European Funded program that supported at that time the development of SMEs). Using a multifaced approach encompassing semi-structural interviews and financial analysis data, the results show integration of innovative CAD technologies yields substantial gains for operational efficiency. For instance, most of the KPIs associated with production have improved: the time required to complete one cycle of production has decreased by 15%, from an average of 20 hours to 17 hours per unit and the efficient use of materials has increased by 10% resulting in cost savings. This research shows how Romanian companies can adopt CAD technologies and improve their activities.

Keywords: CAD (Computer-Aided Design) Innovation, Organizational Digital Transformation, Operational Efficiency, Customer Satisfaction, Organizational Culture.

Introduction

Innovation mixed with future technologies helps companies to extend the range of their operations using a range of software applications facilitating the process of management and constructing different leadership dynamics. Nowadays, we see an increasing use of collaborative design systems that are used across teams and across disciplines. These systems started to be developed and implemented more than two decades ago (Huifen et al., 2003; Zhenbo et al. 2016; Eriyeti et al. 2017). Nowadays, if you blink, you might miss the latest digital advancements that are redefining business practices. Computer-aiding by professional teams illustrates just how much innovative tech can alter standard industry procedures and expectations. Thus, the motivation of our article is the exploratory study of a Romanian Computer Aided Design (CAD) based in Baia Mare, Maramures. This firm has been established in 1998 and it is the commercial administrator of the CAD/CAM Technology Support Center. This center was a project initiated within the Maramureș Center for the Development of Small and Medium Enterprises (SMEs), and it received funding from the PHARE FIDEL program, an European Funded program that supported at that time the development of SMEs).

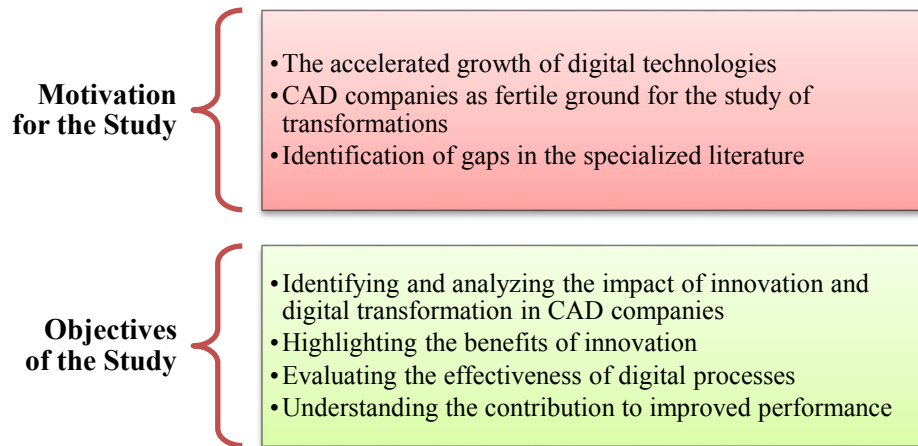


Figure 1. Study motivation and objectives

Source: Own contribution.

We initiated this analysis due to evident omissions that had been left unaddressed in prior work. Understanding the specific ways that CAD technology boosts or bogs down organizational performance is essential, yet often overlooked, especially in Romania. Central and Eastern Europe countries have to cope with several macroeconomic pressures and the use of digital technologies is one of them. Computer-Aided Design and Computer-Aided Manufacturing have revolutionized the design and development of mechanical products resulting into a large variety of models available in Web repositories. In essence we're here to spotlight why adopting new technologies can be game-changing for us; gauge if these advancements genuinely make processing smoother; and grasp their overall contribution towards fine-tuning firm-wide outcomes.

Literature review

Innovation is defined as the process of introducing new ideas happens when the market competition imposes constraints on a specific player to find alternative solutions for improving its activity and costs while make use efficiently of the production time. The literature discussed up to now different dimensions of CAD focusing on character modelling of data, comparison between existing CAD models that facilitate adoption within a specific budget and the computation of costs when adopting a CAD technology (Kuss et al. 2017; Zhenbo et al. 2016; Choi et al. 2001). The key to keeping a business dynamic lies with injecting original thoughts alongside contemporary products or systems which escalates operational prowess making firms more competitive as well as adaptable during transitions. Imagine transforming your business from top to bottom; this is what happens when companies integrate innovative digital tech, creating profound changes in how they work and improving client satisfaction significantly. An organization's success hinges on several factors including operational efficiency, customer satisfaction levels as well as their capacity for innovation which ultimately reflect in their financial outcomes - these elements collectively measure if they're hitting targets or accomplishing what they set out to do effectively. Studies before now point out the significant effects of technological advances on traditional businesses and market landscapes. Although theoretically compelling, there's a persistent haze of doubt clouding our understanding of how it applies practically. For instance, Steven & Hu (2020) proposed a theoretical model to make sense of how disruptive technologies produce changes, but a general framework is still not available as standardization requires societal changes. Kivimaa et al. (2021)

conducted an insightful analysis of the concept of "disruption" within the context of sustainability transition studies. They emphasize that the cultural dimension of disruption influences behavioral practices with a direct impact on changes across organizations. The cultural dimension maybe be relevant in a large set of settings especially in Romania and other Eastern European countries as the communist regime produced social dynamics based on fear and the ownership structures of companies were non-existent.

There are two main parts of the literature related to our work. On the one side, there is literature discussing the integration of digital technologies into the production function. In a seminal study, Aghion and Howitt (2005) introduced a versatile and empirically robust model for the analysis of long-term economic growth and convergence. The approach of this particular model stands out as it crafts unique forecasts for economics from two angles—micro and macro—and smartly counters the usual knocks against comparable theories. A recent study by Hameed, Nisar, and Wu in 2020 shows that Pakistani hotels that embrace both new ideas from outside sources as well as internal innovations tend to perform better in terms of services they provide and business outcomes. When companies adopt open innovation, they often see not just better services but improved business outcomes as well. Bouncken, Kraus, and Roig-Tierno (2021) draw attention to the difficulties companies face when integrating digital technologies into new business models aimed at fostering growth offering up both detailed plans about structuring firms' technological upgrades—complete with vital takeaways—and fueling conversations around adapting workplace cultures along with internet-based corporate reputations is central to their work's relevance. Lestari et al. (2020) aim to develop empirical research models for achieving superior competitive advantage and optimal performance. Exploring various dimensions such as innovativeness in technology or processes alongside entrepreneurship characteristics against a backdrop of dynamic marketing landscapes coupled with interdepartmental cooperation makes up the core focus of their investigation. Focusing on interactions within the dynamic field of gastronomy, this survey involved interaction studies amongst over four-hundred ninety-seven distinct SMEs located throughout coastal town that is famous for its diverse cuisine options. Snihur and Bocken (2022) emphasize the growing importance of business model innovation (BMI) for strategic management and sustainability initiatives. Nadkarni and Prügl (2021) underscore that successful digital transformation goes beyond mere technology adoption; it hinges on how organizations integrate technology into their overall global strategy. Kraus et al. (2021) identify three distinct groups of literature based on technological, business, and social impact. Gong and Ribiere (2021) highlight based on 134 existing studies the need for a unified definition of Digital Transformation (DT) due to its widespread use and the resulting confusion in the literature.

Research Methodology

To gain a holistic understanding of the impact of innovation and digital transformation on organizational performance within the selected CAD firm, we will employ a robust methodology that integrates both qualitative and quantitative approaches. The methodology is presented in Figure 2.

Qualitative approach	• Tool: Semi-structured interviews • Participants: Key members of the management team, CAD specialists, other relevant employees • Focus: Innovative initiatives and digital transformation processes
Quantitative approach	• Tool: Quantitative analyzes of financial and operational data • Purpose: Objective indicators for evaluating organizational performance
Company Selection	• Criteria: History in CAD technology, adoption of innovations, industry impact • Process: Extensive interviews, analysis of innovative projects, examination of internal documents
Reason for Choosing the Company	• History in CAD technology • The level of adoption of innovations • The impact on the industry
Mixed Methodology	• Combining interviews and quantitative analyses • Purpose: Comprehensive overview of the impact of innovation and digital transformation on organizational performance
The purpose of the Methodology	• Highlighting the significant impact of innovation and digital transformation • Context: CAD industry from Baia Mare, Maramureș

Figure 2. Research methodology

Source: Own contribution.

To delve into the intricacies of how innovation and digital transformation impact organizational performance within the selected CAD firm in Baia Mare, Maramureș, this multifaceted approach will be employed. This approach will be complemented in further research through qualitative semi-structures interviews that will provide insights into the financial and operational data. The semi-structured interviews will engage key members of the management team, CAD specialists, and other relevant personnel. These talks will illuminate how specific innovation drives and digital upgrades are reshaping the way our firm operates, offering fresh insights into their impact. While juggling various initiatives, examining in-depth financials alongside daily operations will allow us clearly measure organizational success through unbiased lenses. When picking a CAD firm, we looked closely at their track record with advanced technology and how much impact they've had on their field. To pick our favorites efficiently involved sitting down with major decision-makers for revealing chats. Additionally checking out fresh ventures up close added clarity to their potentials. All these moves were backed by a solid look-through relevant company records as well. Organizations boost performance by deeply understanding technology advancements along with the sweeping changes brought about by digital transformation. By employing this multifaceted methodology, we aim to illuminate the significant impact of innovation and digital transformation on organizational performance within the CAD sector in Baia Mare, Maramureș.

Results

The focus of this research is a privately held Romanian firm that has established itself as a prominent player in the Computer Aided Design (CAD) sector. Established in 1998, the firm's origins trace back to its role as the commercial administrator of the CAD/CAM Technology Support Center. This center was a project initiated within the Maramureş Center for the Development of Small and Medium Enterprises, and it received funding from the PHARE FIDEL program (Figure 3).

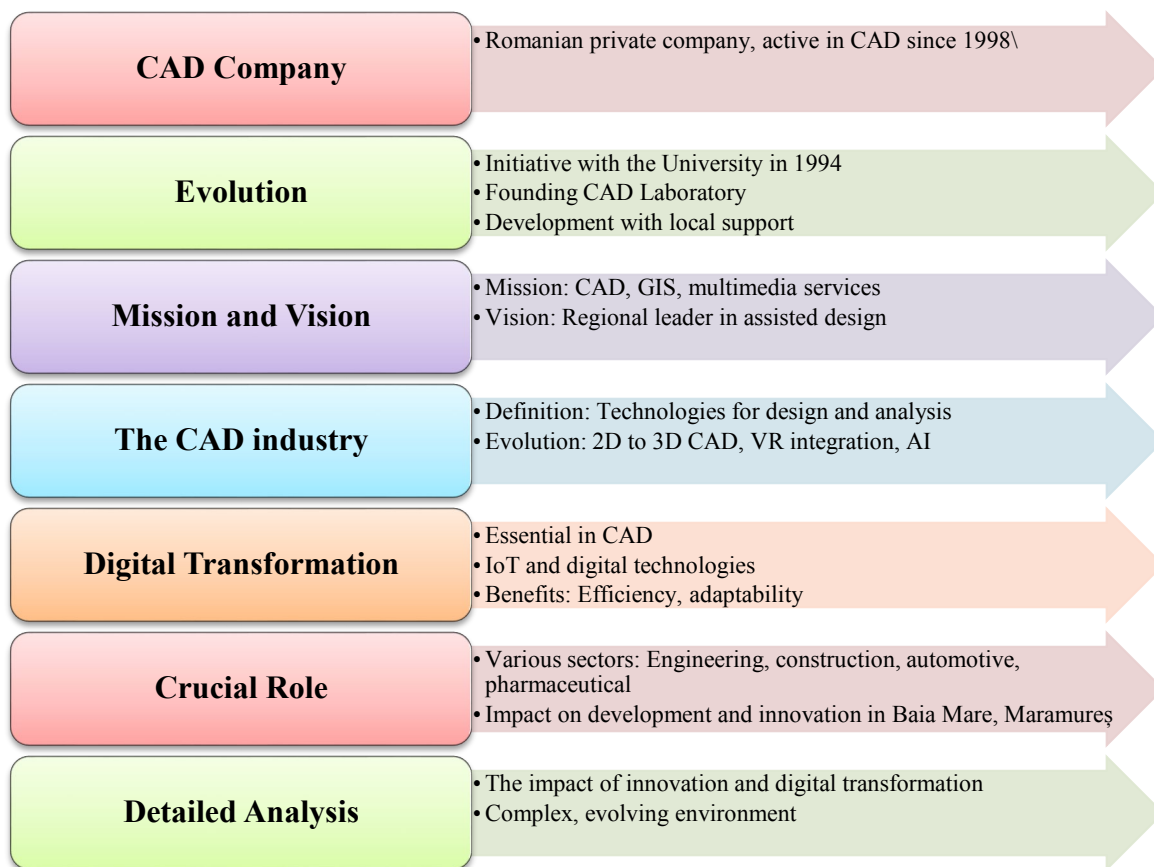


Figure 3. CAD Company Background

Source: Own contribution.

Back in 1994, the firm began its pioneering journey by partnering with the University of North Baia Mare to set up the Computer Aided Design Laboratory. Thanks to robust backing locally, what started as just another tech firm has flourished into an important entity shaping landscaping technologies today. Pushing boundaries in technical creativity; whether it's building precise models with CAD for engineers or mapping landscapes using GIS alongside generating exciting multimedia - this is what drives us every day. The goal here is clear – lead the way in assisted design technologies while nurturing future talents at its bustling school of design. At its core, the CAD field is about transformation; here professionals leverage powerful software not just for drawing up new ideas but also altering them meticulously until every detail aligns perfectly. With CAD in play, drawing boards are becoming obsolete; it's revolutionizing how we create a vast array of items and infrastructures swiftly and accurately. Imagine transforming flat drawings

into vivid three-dimensional models—that’s what recent advances in technology have brought to the world of CAD. Now add a splash of artificial intelligence and virtual good old VR; you’ve got yourself an unbeatable formula for precision and speed in designing. Right now, upgrading technology in the CAD sector is absolutely crucial. Incorporating advanced tech like IoT into design practices enhances workflow speed significantly while minimizing errors — it’s all about staying agile to meet shifting demands efficiently. Whether it's laying down plans for a new skyscraper or modeling parts for next-generation vehicles in your garage at home; when you think about innovation in any field—be it engineering or drugs—you’re likely thinking about what experts do with their powerful CAD tools. In the specific context of Baia Mare, Maramureș, where the firm operates, the CAD sector has the potential to significantly influence regional economic growth and innovation. Through our study on one noteworthy enterprise alongside general trends in computer-aided design, we aim to pinpoint exactly what makes or breaks successful organizations when they harness innovation as part of their core operations.

This company is constantly pushing boundaries with innovative efforts clearly seen through several impactful ventures detailed beautifully in Figure 4. Some notable examples include, first, pushing boundaries with advanced CAD projects. At this firm, they don’t just follow tech trends—they set them by advancing their CAD tools regularly to fulfill growing market needs effectively. From revamping designs to streamlining operations and integrating modern technologies—our projects continue adapting at every step. Second, merging novel tech effectively to efficiency make use of all data activity. Advanced tech tools are now at the heart of every new project this company tackles. By focusing on user satisfaction, team cooperation enhancement opportunities arise alongside simplified methods in handling designs which directly elevates both speed and quality of outputs. Third, the development of customized solutions is the focus of addressing client needs head-on, the team at our firm crafts personalized project solutions designed with precision. Customers are at the heart of every project. We dive into their world, pinpoint their necessities, and develop CAD solutions that hit the mark every time. Fourth, there is a need for a fresh approach to education.

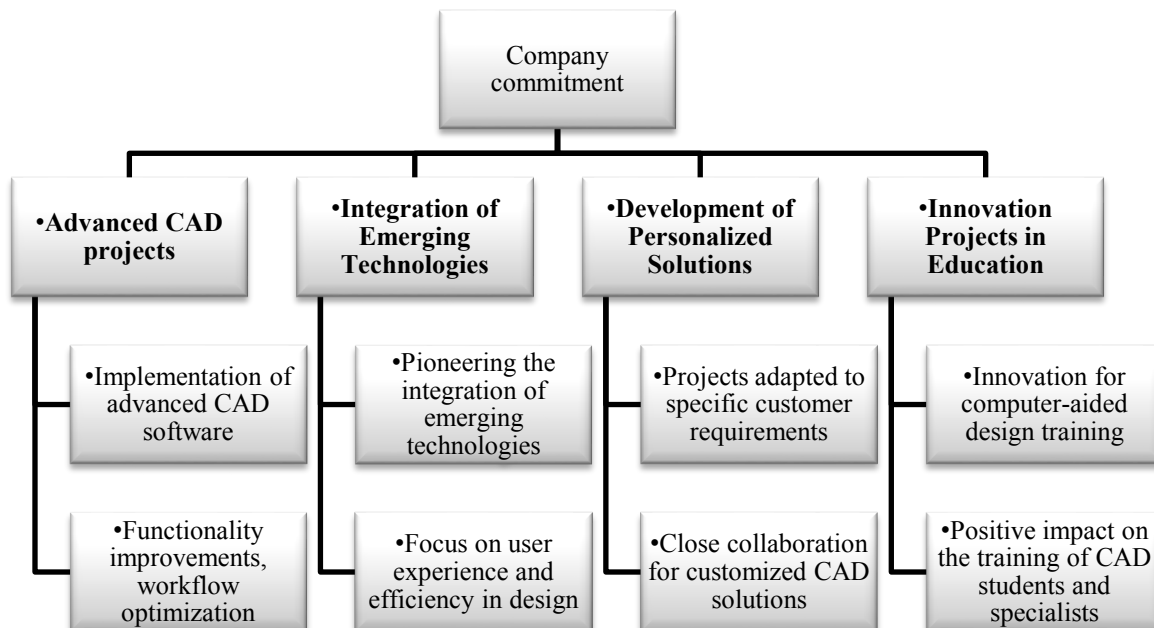


Figure 4. The company's commitment to innovation

Source: Own contribution.

Within the company, a meticulously structured process (Figure 5) guides the careful and effective management of new initiatives:

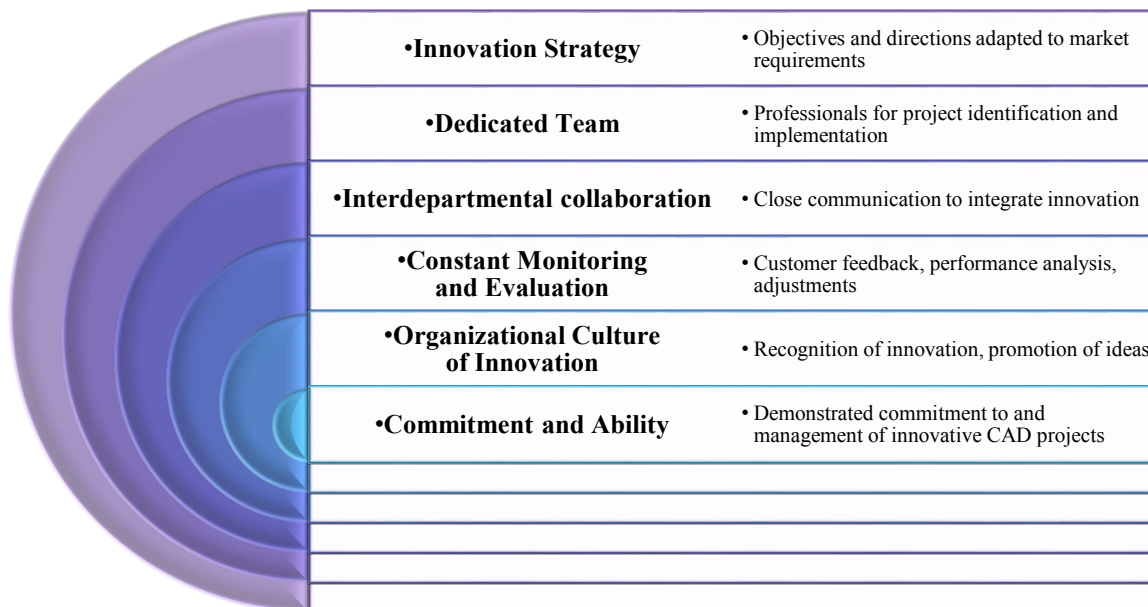


Figure 5. Management of Innovative Projects

Source: Own contribution.

Here, innovative tactics are sharply tuned to resonate with what the market wants and technological progress. By setting solid goals, recognizing new possibilities for advancement in the market today's reader can relate to through more simplified reading material compared to your college professor talking about exciting concepts you might be interested in if considering investment into innovation. An inventive crew steadfast in creativity forms the backbone of our corporate triumphs. In every successful project you'll find these professionals at work—they identify emerging opportunities, create novel ideas and push ambitious endeavors ahead. Innovation thrives here because we make cross-department teamwork a top priority in our company culture. When teams share ideas effectively and communicate well, innovation naturally flows into every corner of a company's operations. Constantly watching over and critiquing their cutting-edge endeavors is what this business does best. We regularly review all projects to confirm they're moving forward as planned and hitting the targets set out from the start. Listening is just the beginning; after that comes rigorous analysis of data followed by strategic adjustments aimed at perfecting how things work around here. Innovation starts with our team. That's why we nurture an office atmosphere that invites every employee to offer up new concepts freely. Cultivating a workplace where creativity is rewarded ensures that innovative thinking is not just encouraged but celebrated. A strategic approach filled with cutting-edge ideas keeps this business ahead as they manage challenging projects effortlessly within their niche in CAD technology.

The organization has positioned itself as a leader in digital transformation, harnessing the power of innovative CAD technology to optimize design processes and effectively address the demands of an evolving digital landscape (Figure 6).

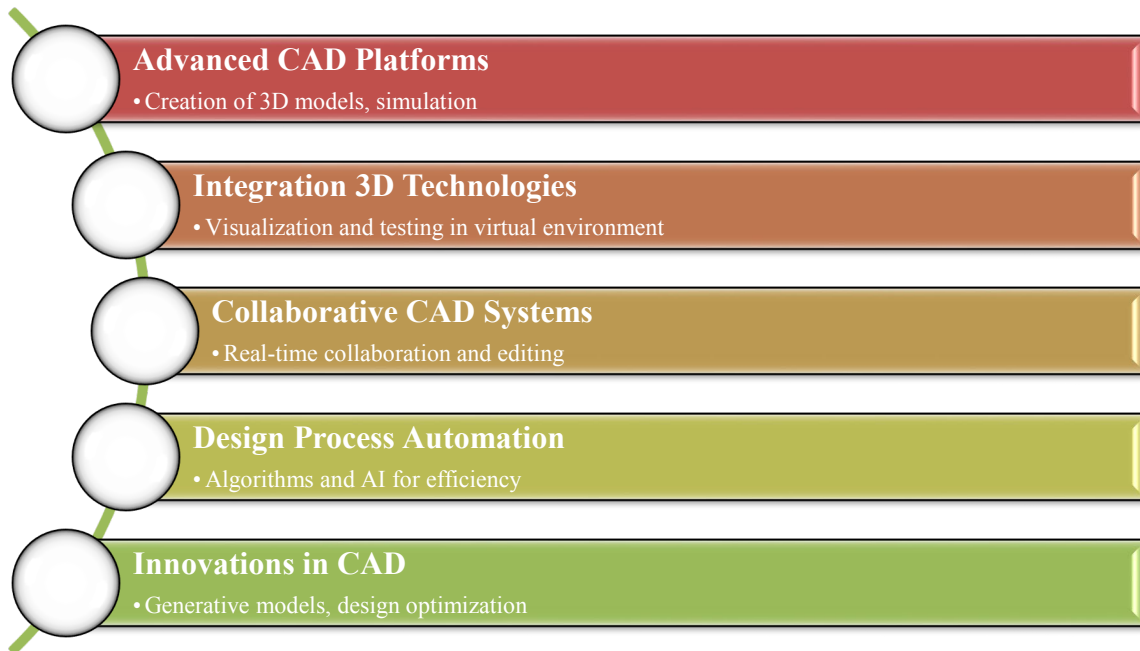


Figure 6. Digital Transformation in Design

Source: Own contribution.

Innovative CAD platforms are now at the heart of our organizational workflow; these tools bring sophistication and real-time interaction right into our daily design tasks. With these platforms at their disposal, our designers can easily craft intricate 3D models, put them through simulations that mimic real conditions, and refine designs swiftly. Pushing boundaries in innovation, this enterprise has added sophisticated third-dimension technology right at heart of their creation workflows. By using this tool, teams can simulate project outcomes virtually which helps streamline decision-making processes and highlight necessary adjustments before they become costly. Collaborative CAD systems are now in place at our organization, enhancing how we work together and communicate with clients. Imagine a workspace where changes happen instantly across multiple screens — this technology makes it possible, speeding up projects and improving interactions among key players. Various design tasks have become more efficient with automation spurred by digital transformation. Here's how it works – leveraging cutting-edge technology like artificial intelligence not only accelerates repetitive work but also substantially drops the risk of slip-ups made by humans. By adopting novel approaches such as advanced algorithmic solutions and generating model techniques within our CAD practices we're redefining precision. Thanks to innovative thinking, creating designs that don't break the bank yet perform brilliantly has become a reality.

The presentation of the case study analysis results offers a comprehensive perspective, highlighting their implications and facilitating generalization for both the scientific community and practitioners. Although the research has not been performed, the initial analysis suggests that the company implemented CAD technologies with success. Further research will uncover how CAD targeted different subparts of the production process and characteristics linked with different geometric locations (Tao et al. 2012). The preliminary results show that the CAD model was based on gradient flows that use adjacency graphs to match the problem with the solution. The company developed its own model based on local regional decomposition.

The implementation of CAD fostered a culture of innovation and adaptability. The traditional approach for production was not producing sufficiently robust pipelines and back in 1998 did not result in meeting growth expectations. One particular dynamic that was observed was the occurrence of new public private partnerships and new collaborations agreements. Through this, - Workflows underwent significant transformations, leading to reduced project completion times and optimized resource utilization.

Conclusions

Our investigation into technological adoption within firms highlighted something special. By bringing in state-of-the-art CAD tech, one enterprise saw outstanding outcomes—truly leveraging modern advancements for growth. We dissected the research results thoroughly followed by deep dialogues which led to uncovering significant patterns; these give us clarity on transforming influences impacting company efficiency. First, the importance of innovation in countries from Central and Eastern Europe as CAD technology seems to be well implemented. With every new project seamlessly supporting our main business strategies, it's obvious we have both the vision and roadmap necessary for moving ahead confidently. Innovating at every turn, we managed to elevate the standard of our client deliverables substantially. We've noticed an uptick in happiness from our clients that's also brought us closer together than before. Although these findings are preliminary, we expect that future research will embark on and study local knowledge spillover transferred to other companies. These knowledge spillovers are positive externalities for CAD adoption and their measurements. The appropriation of these spillovers is linked, however, to proximity to the source of new knowledge; and this proximity becomes even more important the more 'tacit knowledge' is also used in the innovation (Gertler, 2010).

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