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Artificial Intelligence and Agility-Based Model for Successful Project Implementation and Company Competitiveness

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Abstract: The purpose of the paper is to present a model of factors affecting the successful project implementation by introducing agility and artificial intelligence to increase the company's competitiveness. In the model, the multidimensional constructs describing the implementation of an agile work environment and artificial intelligence technologies and tools were developed. These multidimensional constructs are agile work environment, agile leadership, agile team skills and capabilities, improving the work of the leader in the project, adopting AI technologies in the project, and using AI solutions in a project. Their impact on successful project implementation and on the company competitiveness was tested. The fundamental reason for conducting this research and developing the model is to enhance the understanding of factors that contribute to the successful implementation of projects and to increase a company's competitiveness. Our developed model encompasses multidimensional constructs that describe the agile work environment and the utilization of AI technologies. By examining the impact of these constructs on both successful project implementation and company competitiveness, we aimed to establish a comprehensive framework that captures the relationship between agility, AI, and successful project implementation. This model serves as a valuable tool for companies seeking to improve their project implementation processes and gain a competitive edge in the market. The research was based on a sample of 473 managers/owners in medium-sized and large companies. Structural equation modeling was used to test the hypotheses. In today's turbulent environment, the results will help develop guidelines for a successful combination of agile business practices and artificial intelligence to achieve successful project implementation, increasing a company's competitiveness.

Keywords: artificial intelligence; agile work environment; company competitiveness; project management

1. Introduction

A turbulent environment requires a modern company to constantly adapt if it wants to stay in the market [1]. Every company must strive for growth and development, which it can achieve when it operates successfully and efficiently [2]. Companies need to have clear goals and follow them. A company must be successful and efficient to achieve the set goals [3]. Thus, it is necessary to introduce continuous improvements that help to make the company competitive. For a company to remain competitive, it must look for best practices, adapt them to itself and implement them [1]. Adapting to constant change requires constant learning from the company [4]. Therefore, learning organization has become a necessity in the modern business world. Employees who are ready for new challenges and accept change and learning are needed to ensure a learning organization [5]. Improvements must be introduced in all parts of the company, from business processes, products, and services to the company as a whole [6]. Agile project management guides people to achieve a common goal and enables this group to act as a successful and productive team [2].

Companies are constantly seeking novel approaches to enhance their products or services [7]. Moreover, companies are adopting diverse digital technologies to redefine consumer value creation and decision-making [8]. Businesses worldwide are realizing the potential benefits of emerging technologies such as artificial intelligence (AI), cloud computing, the Internet of Things, and big data [9]. These technologies are enabling companies to reshape their traditional businesses, strategies, and operations [1]. Digital transformation is the foundation on which companies must build if they are to be successful in the future [3]. As artificial intelligence increasingly pervades people's daily lives and affects the economy [10], Slovenia must take a stride forward in leveraging its potential across the economy to bolster business and production processes as well as upgrade products and services [11]. Artificial intelligence technologies can rapidly provide new insights into events, shorten development cycles, enable quality control by machines, and enhance overall quality of life [8]. With its unparalleled ability to detect and predict patterns from massive amounts of data, artificial intelligence holds immense promise in diverse domains such as forecasting, decision support, operations automation, product optimization, new business models, targeted services, user experience, and even environmental protection and public health [7,8,10]. The way we interact with computer systems is already being transformed by artificial intelligence [12]. A major obstacle to implementing artificial intelligence in business operations is the lack of appropriate staff and limited financial resources, as well as management staff who do not know enough about the capabilities of digital technologies or are not ready for change [13].

Market conditions require ever-increasing responsiveness of the entire company. The gaps between the different levels of the company are no longer sustainable in the long run [10]. New technologies are accelerating convergence in information and operational technologies. Artificial intelligence tools, which are becoming increasingly accessible, are only increasing the pressure as they enable the processing of larger amounts of data and automated learning [14]. Companies that know how to use artificial intelligence tools are more innovative and competitive. Artificial intelligence and the environment require companies to be more committed, have a better culture, and have new ways of managing and modernizing organizational structures and processes [15]. Digital transformation projects take place at all levels of the company and require the involvement of different departments [1,16]. Digital transformation can start in several ways, so it is important that a digital strategy is set first at the level of company management [12]. With the introduction of artificial intelligence in the company, an agile work environment is also crucial [16].

Recently, companies have faced many challenges in delivering the project successfully and responding to customers' requirements because of the intensifying dynamism [6]. A successful project that enhances company competitiveness is contingent on an agile and digitalized work environment [17]. As the environment shifts, the company must adapt correspondingly to ensure efficient and successful operations [18]. The integration of advanced digital technologies allows for modifications to current business models and the creation of novel ones, as well as the development of new products and services, ultimately leading to improved efficiency and competitiveness of the economy and contributing to broader socio-economic progress [19]. The need to promote the digital and technological transformation of the economy became even clearer during the COVID-19 pandemic [20]. The technologies encompassed by AI—such as machine learning, deep learning, chatbots, neural networks, and virtual assistants—are significantly transforming the business and organizational processes of companies [16]. Already, AI has restructured the fundamental makeup of companies and their relationship with the surrounding environment [8]. With AI comes a novel approach to managing information, which presents both a challenge and an immense opportunity for companies. However, harnessing the potential of AI necessitates a shift in culture, mentality, and skillset [13].

Many companies in Slovenia have already started digitalizing their operations, but the number is still too low [11]. The multitude of different and sometimes overlapping approaches to project management can make it challenging to determine the most effective

method for achieving success [1,9,13]. However, the field of project management is starting to integrate artificial intelligence, leading to growing interest among professionals in the field [1,4,21]. In fact, artificial intelligence is becoming a major tool in the practice of project management [1]. As per research by Niederman [22] and Wamba-Taguimdje et al. [13], project managers can obtain several advantages by utilizing AI, which pertains to the intelligence demonstrated by machines.

Machines are capable of imitating cognitive functions relevant to a project manager's decision-making and problem-solving processes within the domain of project management [23]. Research conducted by Ransbotham et al. [24] on over 3000 executives across multiple industries, as well as in-depth interviews with over 30 technology experts and executives, revealed that over 80% of organizations view AI as a strategic opportunity, and almost 85% recognize AI's potential for achieving competitive advantage. Despite this, only one in five companies has implemented AI in some capacity within their offerings or processes, with even fewer having done so extensively. Additionally, less than 39% of all companies have an AI strategy in place, with the largest companies being the most likely to have such a strategy, though only half have actually implemented one. Despite the potential benefits, there has been limited research conducted on the integration of agile project management and artificial intelligence and how the interaction of these two domains can impact successful project management and enhance a company's competitiveness in a rapidly evolving business landscape. Thus, in this paper, we want to present the importance of agility and artificial intelligence for companies to achieve successful project implementation with which companies can increase their competitiveness. Therefore, we designed a multidimensional model with constructs (1) agile work environment, (2) agile leadership, (3) agile team skills and capabilities, (4) improving the work of the leader in the project, (5) adopting AI technologies in a project, and (6) using AI solutions in a project, which have a positive effect on successful project implementation, and this leads to increased company competitiveness.

2. Literature Review

2.1. Agile Work Environment for Successful Project Implementation

Marnewick and Marnewick [25] identified that current project management practices do not focus on the new way of functioning of project management bodies and emphasize the need for agility and implementation of 4th Industrial Revolution technologies (artificial intelligence, Internet of Things). Agility is the ability of an individual, system, or organization to anticipate, recognize, and respond to change [26]. The characteristics of agility are flexibility, responsiveness, speed, efficiency, effectiveness, organization, and focus on results [27]. A flexible and dynamic work environment, known as agile, possesses the capability to respond promptly to unforeseen challenges and opportunities by operating with procedures and rules that foster rapid adaptation and secure a competitive edge [16,28].

The fast-paced and ever-evolving business landscape necessitates that companies respond with agility [6]. Many experts consider the emergence of agile work environments to be among the most effective approaches for anticipating and adapting to change, enabling businesses to respond rapidly and efficiently [29]. The flexibility of an agile workplace is crucial, allowing employees to utilize office spaces as necessary and for specific purposes [10]. This approach provides certainty and control in what could otherwise be a chaotic process and creates the ability to address immediate and long-term demands [30]. In addition, an agile workplace accommodates the diverse ways people work today, including the growing trend of hybrid work. Employees are no longer confined to a single desk but are instead free to work from home or outside traditional nine-to-five hours [6]. The workplace facilitates this approach, making time spent in the office more productive and enjoyable for employees [4]. An agile work environment is characterized by its dynamic and flexible nature, which enables it to respond rapidly to unexpected challenges and opportunities [6]. It operates with procedures and rules that facilitate quick adaptation and provide a competitive edge [30]. Most activities are carried out in the form of project

work using a combination of classical and agile project management methods. Classic project management methods represent a framework within which we can increase our chances of success with an agile approach [31]. According to Serrador and Pinto [32], the use of agile methodologies in projects has a significant positive impact on their success. The researchers investigated the impact of applying agile approaches in companies and measured project success based on two dimensions: efficiency and overall stakeholder satisfaction. The results indicated that the level of agility employed in the project had a statistically significant influence on both efficiency and satisfaction, including team satisfaction. Similarly, Gemino et al. [4] found that agile and hybrid approaches outperformed traditional methods in terms of their impact on stakeholder success measures.

Agile project management is widely recognized as an effective project delivery approach that enhances responsiveness, productivity, quality, and customer satisfaction in modern project management [27]. The agility inherent in agile project management, which allows for managing and adapting to changes, plays a vital role in achieving project success [16,28]. Agile project management emphasizes an iterative work cycle, continuous assessment and reflection, and constant learning [17]. According to the perspective of Balashova and Gromova [27], agile project management is a process for developing products incrementally. This involves utilizing short, iterative cycles of updates and rapid learning to effectively adapt to evolving customer requirements. This project management approach is characterized by a simpler, more flexible, iterative, and less management-intensive process that results in superior innovation and customer value [16].

Based on this, we propose a hypothesis:

Hypothesis 1 (H1). *A work environment that embraces agility, characterized by flexible processes, collaborative teams, and adaptive practices, positively affects the achievement of successful project implementation.*

2.2. Agile Project Leadership

Responsive and innovative leadership is a crucial aspect of effective management, particularly in light of the unprecedented volatility, uncertainty, complexity, and ambiguity that have arisen during and after the COVID-19 pandemic [33]. Agile leadership, a leadership approach that prioritizes employee empowerment and fosters organizational adaptability in the face of unpredictable working conditions, is a key strategy for promoting long-term development and success [34]. Effective leadership by project managers is a critical success factor in delivering high-quality projects [33,34]. The skills of the team members in handling unexpected situations and challenges are crucial to project success [35]. In an agile environment, leaders prioritize collaboration over individual authority. Managing a project team in an agile setting is more demanding than leading teams in traditional organizations [36]. This is due to the project's unique characteristics, including a more flexible work environment, frequent changes, pressure to meet deadlines, staying within budget, and limited resources. Due to the temporary nature of the project and the interpersonal relationships involved, the project manager must take a unique approach to building and maintaining relationships within the team [5].

Agile leadership plays a crucial role in guiding the team towards success by creating, sharing, and sustaining a common vision [37]. By engaging in regular discussions with the team, an agile leader fosters a sense of shared ownership of the vision [36,37]. This, in turn, enables the team to make tough decisions related to business values and priorities while remaining committed and motivated to achieving the ultimate goal [33]. Agile leadership also fosters team interactions and dynamics that promote performance and engagement [36]. The agile approach emphasizes daily face-to-face communication, short product turnaround, and frequent team reflexivity, allowing members to review their performance daily and make necessary adjustments [26]. This approach also encourages experimentation, feedback, and open discussion of errors, which enables the team to learn and improve its effectiveness. Overall, the agile approach can enhance team efficiency and

effectiveness, making agile leadership a key driver of business and project success [37]. Successful leadership is important through all phases of the project and crucial in the initial stages of the project, where the emphasis is on presenting the vision and motivating project participants to achieve high performance [5]. The project manager is responsible for establishing the project's vision and strategy, forming the project team and communication between the project participants, and building trust [38]. They are also responsible for guiding and supervising the project participants and evaluating the effectiveness of the project participants as well as the course of the entire project [5,39]. Therefore, we propose the following hypothesis:

Hypothesis 2 (H2). *Effective application of agile leadership principles and practices contributes positively to the successful implementation of projects.*

2.3. Agile Team Skills and Capabilities

The shift from traditional project management to a modern, agile approach has become prevalent [2]. In the past, traditional project management relied on strict methodologies, hierarchical structures, delegation, bureaucracy, and rigorous oversight and reporting. However, the agile way of working places emphasis on team member trust and competency, customer engagement, results, and adaptability to change [39,40]. The ever-changing nature of work demands constant innovation and smaller teams that are more flexible, efficient, and capable of making daily decisions [36]. With an agile approach, project team members are expected to constantly develop and upgrade their knowledge, talents and abilities, self-organization, and the ability to develop a product without outside help [38]. The key task of project managers is to improve the work environment and thus greater openness to their team's feedback [37]. Team and communication with the team are essential for the success of an agile approach. Agile teams are typically characterized as small, democratic, and cross-functional units that allow members to make collective decisions without strict hierarchies [36,39]. Grass et al.'s research [41] has shown that as agile teams become more self-managing, they gain a better understanding of what it takes to satisfy a customer's needs. Agile project management encourages cross-functional teams to work independently with reduced structural hierarchy and communication overhead, allowing them to make timely decisions about organizational strategies and actions [40]. Agile project management aims to streamline decision-making by minimizing communication layers through a flatter hierarchy [40,41]. Emphasizing communication, trust, and collective learning, the agile approach fosters teamwork and team building [18]. As companies shift to a project-based approach and reduce rigid, vertical departmental structures, they are building structures around customers to respond to their needs, creating cross-functional teams [27]. By agreeing on specific goals for a given time frame, team members can focus on relevant tasks to achieve those goals [36]. With frequent face-to-face communication allowing for discussion of obstacles and requests for help, the agile way of working can improve team efficiency [35]. Therefore, we propose:

Hypothesis 3 (H3). *The presence of proficient agile team skills and capabilities significantly enhances the likelihood of successful project implementation.*

By combining agile practices with AI technology, companies can leverage the iterative and adaptive nature of agile methodologies to effectively implement AI-driven solutions [23]. Agile principles such as flexibility, continuous learning, and collaboration are key enablers for successful AI implementation. Agile approaches allow companies to embrace the evolving nature of AI projects, iterate on AI algorithms and models, and adapt to changing requirements and data dynamics. Additionally, the integration of AI technology within agile projects can bring significant benefits [42]. AI technologies can augment decision-making processes, automate repetitive tasks, and enable data-driven insights and predictions [31]. These capabilities enhance the agility of companies by en-

abling faster and more informed decision-making, optimizing resource allocation, and improving overall project performance. Moreover, by combining agile and AI, companies can create a framework that fosters innovation, responsiveness, and adaptability while harnessing the transformative potential of AI technology [43,44]. This unified approach empowers companies to overcome challenges and capitalize on opportunities in an increasingly dynamic and data-driven business landscape [22,45]. Thus, agility and AI are not disjoint areas but rather interconnected concepts that can mutually reinforce each other. By integrating AI technology into agile project management practices, companies can leverage the iterative, adaptive, and data-driven nature of agile methodologies to effectively implement AI solutions [34,46,47]. Agile approaches provide a framework for embracing the evolving nature of AI projects, while AI technologies augment decision-making processes and enable automation and data-driven insights. The benefit of combining these two areas lies in the potential for increased project success rates, improved efficiency, and enhanced competitive advantage. The convergence of agility and AI enables companies to respond more effectively to changing market dynamics, make data-informed decisions, and achieve project objectives with greater efficiency and innovation [35,37,43]. From this point of view, below we present the subsection Adopting AI Technologies in the Project.

2.4. Adopting AI Technologies in the Project

The widespread use of information technologies has impacted all aspects of professional work and processes [13]. In order to increase productivity and create innovative services, companies are increasingly turning to AI to enhance their performance [48]. As a result of globalization and international market integration, companies have incorporated information technologies into their management approach to meet customer demands and improve product/service quality [1,2,4,6]. Furthermore, digital technologies offer new opportunities for entrepreneurial projects and ventures to emerge [8]. AI-powered tools aid project managers in executing diverse tasks throughout each stage of the project planning process. They enable project managers to analyze intricate project data and identify patterns that could impact project delivery [24]. AI also automates repetitive tasks, leading to increased employee engagement and productivity [8]. Project management is a crucial area that has been positively impacted by the changing landscape of artificial intelligence [13]. AI's applications in project management are extensive, providing project managers with improved accuracy, strategy, and support [1]. Moreover, the use of AI in project management has led to an improvement in emotional intelligence and creativity among project managers by eliminating biases that could affect individual decision-making [42]. Another significant advantage of AI tools for project management team members is the ability to save time on administrative tasks. Employees often spend a considerable amount of time on tasks such as record-keeping, reporting, and other remedial tasks. One way to save time for employees to focus on their deliverables is by delegating certain processes to AI systems [3]. This increases overall efficiency and can result in significant time and budget savings [4]. AI can also observe team members and projects closely, picking up on habits and nuances that might be overlooked [4,5]. This enables AI to detect potential scheduling conflicts and suggest alternate completion dates [22]. Additionally, AI systems can offer personalized coaching based on learned habits [5] and adjust for remote employees working in different time zones [13,49]. Furthermore, AI can identify non-compliant behavior, potentially flagging instances of fraud and other issues [38]. Based on this, we propose hypotheses:

Hypothesis 4 (H4). *The incorporation of AI technologies in a project positively affects the utilization and effectiveness of AI solutions within the project.*

Hypothesis 5 (H5). *The use of AI solutions within a project positively affects the achievement of successful project outcomes, enhancing overall project implementation effectiveness.*

With the development of new technologies, products and services on the market are developing rapidly. A company needs to be responsive and accurate if it wants to keep up with this pace. What the company will offer in the market and when must also be established [21,22]. Due to the changing business environment, projects have been introduced that allow the company a better overview of the production of a new product and greater efficiency [29]. With new products, a company needs to be competitive with its competitors. Agile project management is one of the key factors in increasing a company's competitive advantage [4]. Agile practices need to be used combined with project management [6]. The manager has the task of ensuring the efficient and successful implementation of the project. This means that all project objectives must be achieved within the planned costs and deadlines for achieving individual project activities [16]. Creating an agile work environment significantly impacts the success of the entire project [10]. How the people will work in a team and whether the project will be successfully implemented depends on how the project is managed [6]. To measure the success of the project, it is not enough to consider only whether all project objectives have been achieved within the planned costs and deadlines and in accordance with the expected quality; it is also necessary to consider the effectiveness of management and meeting the expectations of all project stakeholders [26].

More than 50% of a project manager's time is dedicated to administrative tasks, such as managing updates and check-ins [29]. However, AI bots can take over these less intensive tasks, reducing the time spent on such busywork by half with current systems [18]. This significant timesaving allows project managers to concentrate on the complex processes involved in their management strategy [4]. Furthermore, AI-enabled project management systems empower managers to spend more time supporting and empowering their employees, resulting in greater efficiency gains [37,45]. By utilizing these tools, managers can focus on essential tasks that require their expertise, rather than spending significant amounts of time on administrative duties [18,26,27]. This increase in available time not only promotes project efficiency but can also create a more comfortable work environment, where employees feel supported and have the necessary resources available to them [20]. AI is a valuable asset from a business efficiency perspective due to its ability to handle complex analytics, enabling a system to monitor a project's progress and make educated predictions about its future [19,34]. AI offers distinct advantages over humans in project management. While humans may miss important changes or shifts in a project due to being focused on their own tasks, AI can monitor all aspects of a project and make valuable predictions based on what it observes. Additionally, the implementation of AI can assist management in comprehending the distinct nuances associated with individuals working according to their unique patterns. Just as these systems can identify a user profile for a shopper and offer personalized recommendations, they can also provide customized support to employees and project managers. Overall, bringing AI into project management has the potential to offer significant benefits [36,38]. Thus, we propose the following hypotheses:

Hypothesis 6 (H6). *The integration of AI technologies in a project positively affects the effectiveness and efficiency of project leaders, leading to improved project management and outcomes.*

Hypothesis 7 (H7). *The competent and impactful leadership exhibited by project leaders significantly enhances the likelihood of successful project implementation, resulting in favorable project outcomes and overall success.*

Project management AI refers to a system that can assist in project administration and day-to-day management without human intervention. It automates simple tasks and provides a better understanding of project performance [10,22]. Subsequently, project management AI utilizes this knowledge to uncover insights, perform more complex tasks, offer recommendations, and make decisions that are increasingly challenging for humans [50]. Ultimately, an AI system can improve project outcomes and save time, making project

work more efficient [43]. With AI-enabled project management tools, organizations can gain deeper insights into potential project outcomes, enhancing the quality and agility of critical decision-making [31,42]. Furthermore, machine learning algorithms can optimize project schedules to minimize total costs based on resource constraints [48]. For instance, through predictive forecasting, potential excess or shortage of resources at specific points during the project lifecycle can be identified. Additionally, machine learning algorithms can estimate the duration and resource requirements for project activities based on expert knowledge and past projects [7,34,48]. AI can also keep project managers informed of new trends and standards in any field, ensuring that they are always up to date with global trends and best practices [8]. Virtual assistants can help find relevant content and experts to enrich project content by registering for associations, online communities, publications, etc. [14,15]. Furthermore, these assistants can approach those experts and discuss their potential involvement in the project [13,15]. The issue of low quality and limited availability of data in existing project management tools can be resolved using machine learning algorithms to determine possible values for missing data. The resulting AI system can then provide recommendations for accurately entering the missing data [42], thus providing the system with complete data sets to learn from and improve decision-making [40]. AI can also optimize resource allocation by identifying the appropriate employees for different jobs based on their skills and availability [13] as well as advising when and in which skills a particular employee needs training [49]. This leads to the following hypothesis:

Hypothesis 8 (H8). *The adoption and integration of AI technologies in a project positively contribute to the successful implementation of the project, leading to improved project outcomes and increased likelihood of project success.*

2.5. Successful Project Implementation and Company Competitiveness

The ability of organizations to anticipate and respond quickly to market changes, known as organizational agility, is crucial for achieving superior financial performance [36,39]. By being responsive to switching suppliers, firms can lower costs, improve quality, and enhance delivery times, ultimately leading to higher profitability and revenue [6]. Organizational agility allows organizations to identify and capture business opportunities, effectively respond to operational changes, and achieve superior performance [51]. It also enables organizations to pursue valuable knowledge, develop innovative products and services, and respond to competitors' maneuvers appropriately, resulting in higher organizational performance [13,21,52]. The adoption of agility as a philosophy inspires organizations to create and deliver innovative products and enhance customer satisfaction and competitiveness and is widely regarded as a catalyst for improving overall organizational performance [31]. The ability of an organization to be agile is an essential competitive advantage in achieving superior performance by enabling the organization to respond effectively to unpredictable changes [51]. With the rapid evolution of artificial intelligence technology, many companies are adopting agile methodologies to manage projects, while analytics plays a crucial role in estimating costs and schedules. These three elements, artificial intelligence, agility, and analytics, are transforming project management practices in the 21st century [10].

Hypothesis 9 (H9). *The achievement of successful project implementation positively affects the overall competitiveness of the company, enhancing its ability to thrive and excel in the market.*

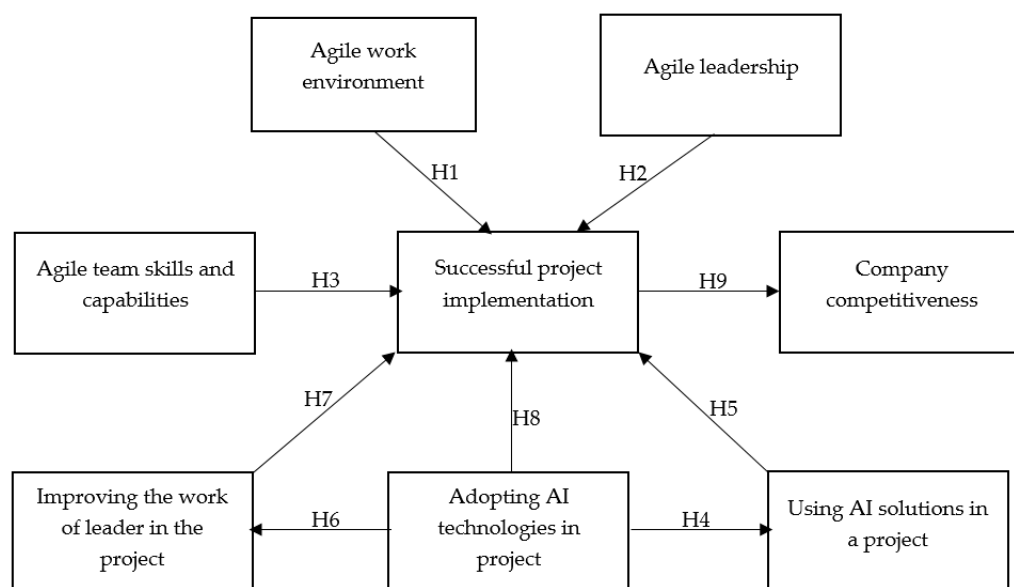Figure 1 presents a conceptual model with hypotheses.

Figure 1. Conceptual model with hypotheses.

3. Materials and Methods

3.1. Data and Sample

The primary survey randomly selected 473 medium-sized and large Slovenian companies, with participation from owners or managers of each company. The gender distribution of respondents was 59.8% male and 40.2% female. The companies were classified according to standard industry categories, including manufacturing (27.1%); wholesale and retail trade; repair of motor vehicles and motorcycles (23.5%); financial and insurance activities (16.5%); information and communication activities (13.3%); real estate activities (9.5%); professional, scientific, and technical activities (6.8%); human health and social work activities (2.3%); and administrative and support service activities (1.0%). Of the sample, 53.7% represented large companies, while medium-sized companies accounted for 46.3%.

3.2. Research Instrument

We employed a closed-type questionnaire as our research instrument, where respondents used a 5-point Likert-type scale to indicate their level of agreement with the listed statements, with 1 indicating "strongly disagree" and 5 indicating "strongly agree".

Items for construct agile work environment were adopted from Golgeci et al. [29] and Mani and Mishra [39], and items for construct agile leadership were adopted from Hall and Rowland [53] and Lindskog and Netz [38]. Items for construct improving the work of leader in the project were adopted from Podgórska and Pichlak [5], items for construct agile team skills and capabilities were adopted from Peeters et al. [36], items for construct adopting AI technologies in a project were adopted from Wamba-Taguimdje et al. [13], items for construct using AI solutions in a project were adopted from Niederman [22], items for construct successful project implementation were adopted from Wijayati et al. [49], and items for construct company competitiveness were adopted from Mikalef and Gupta [21]. All items are presented in the Appendix A.

3.3. Statistical Analysis

In our study, we employed structural equation modeling (SEM), a statistical analysis technique that examines structural relationships [54]. Firstly, we assessed the suitability of exploratory factor analysis using the Kaiser–Meyer–Olkin measure of sampling adequacy (KMO $\geq$ 0.5) and Bartlett's test of sphericity ($p < 0.05$). Following the exploratory factor analysis, we assessed the communalities to ensure that their values exceeded 0.40 [55]. To assess the reliability of the measurement scales, we used Cronbach's alpha coefficient to

measure internal consistency [54]. As part of our validity analysis, we evaluated the average variance extracted (AVE) and composite reliability (CR) coefficients using the criteria of AVE > 0.5 and CR > 0.7 and the criterion CR > AVE [55]. We used the variance inflation factor (VIF) criterion to assess multicollinearity, where VIF < 5.0 was deemed acceptable [55]. We evaluated the quality of the structural model by examining the R-squared and adjusted R-squared coefficients, which represent the percentage of explained variance of latent variables in the structural model, as well as the Stone–Geisser Q-squared coefficient to evaluate the model's predictability. A Q^2 value greater than 0 was considered indicative of acceptable predictive validity for an endogenous latent variable [54,55]. In addition, we used quality indicators, as listed in Table 2, to test the model's quality and fit. To test our hypotheses, we used the path coefficient (γ) associated with a causal link in the model and the Cohen effect indicator (f^2), where effect sizes of 0.02, 0.15, and 0.35 represented small, medium, and large effects, respectively [55].

4. Results

First, Table 1 presents descriptive statistics for each construct. Through the use of descriptive statistics, we assessed the average level of agreement among respondents regarding items pertaining to individual constructs. Additionally, we have included the median, standard deviation, and variance for each item associated with an individual construct in the Table 1.

Regarding the construct of agile work environment, the results in Table 1 show that, on average, owners or managers in medium-sized and large Slovenian companies mostly agree that they have created a working environment in which individuals and teams can work optimally. Additionally, they emphasize the importance of employee development and rapid learning, ensuring that employees are well-informed about the agile culture and the company's goals. The results demonstrate that, in terms of the construct of Agile leadership in Slovenian companies, owners or managers, on average, mostly agree that they have transformed their management style to foster agile thinking within their company. They also ensure that project teams are well-informed about the company's goals. The companies organize internal training, seminars, and meetings to facilitate knowledge exchange and the utilization of artificial intelligence solutions among employees, project groups, and managers. The results demonstrate that, in terms of the construct that pertains to the skills and abilities of an agile team in Slovenian companies, the owners or managers, on average, most agree that they have highly qualified and competent team members who constantly adapt to changing needs, team members strive to ensure that they use best practice methods, and team members continuously strive to improve cycle time, speed to market, customer responsiveness, or other key performance indicators. Moreover, regarding the construct of adopting AI technologies in a project, the results in Table 1 show that, on average, owners or managers in medium-sized and large Slovenian companies mostly agree that, in their company, they have a digital transformation strategy, including AI adoption, and that they use program and portfolio structures for managing projects. Regarding the construct of improving the work of a leader in the project, the results show that, on average, owners or managers mostly agree that AI allows a leader to work effectively on a project, AI allows that leader to be released of routine managerial tasks, allocate more time for leading the project team, and focus on complex managerial tasks. Regarding the construct of using AI solutions in a project, the results show that, on average, owners or managers mostly agree that they use project scheduling software (which helps in planning, tracking, analysis of projects), predictive analytics tools and chatbots (digital assistants) to improve the work on the project. Regarding the construct of successful project implementation, the results show that, on average, owners or managers mostly agree that AI technologies increase productivity by freeing up project managers to focus on more important decisions, improve project performance and reporting, improve decision-making regarding project work/tasks, and provide accurate data and information related to project work. The results demonstrate that, in terms of the construct of company competitiveness, owners

or managers in Slovenian companies, on average, mostly agree that AI accelerates and improves decision-making to achieve successful implementation and, compared to key competitors, their company is more profitable, more innovative, and the risk of employee error is reduced by AI.

Table 1. Descriptive statistics for each construct.

Construct	Item	Mean	Median	Standard Deviation	Variance
Agile work environment	AWE1	3.71	4.00	1.031	1.064
	AWE2	4.02	4.00	0.868	0.754
	AWE3	3.62	4.00	1.092	1.192
	AWE4	3.83	4.00	0.950	0.903
	AWE5	3.94	4.00	0.873	0.762
	AWE6	3.67	4.00	0.914	0.835
	AWE7	3.59	4.00	0.989	0.978
Agile leadership	AL1	4.24	4.00	0.777	0.604
	AL2	3.52	4.00	1.195	1.428
	AL3	3.63	4.00	1.010	1.021
	AL4	3.83	4.00	1.161	1.349
	AL5	4.10	4.00	0.889	0.791
	AL6	3.61	4.00	0.985	0.970
	AL7	3.74	4.00	0.897	0.805
	AL8	3.65	4.00	1.005	1.010
Agile team skills and capabilities	ATSC1	3.92	4.00	0.736	0.541
	ATSC2	4.28	4.00	0.615	0.379
	ATSC3	3.99	4.00	1.015	1.030
	ATSC4	3.97	4.00	0.768	0.590
	ATSC5	3.59	4.00	0.955	0.912
	ATSC6	3.64	4.00	1.020	1.040
	ATSC7	3.70	4.00	0.963	0.928
	ATSC8	3.76	4.00	0.777	0.604
	ATSC9	3.89	4.00	0.887	0.786
Adopting AI technologies in project	AITP1	4.13	4.00	0.883	0.779
	AITP2	4.26	4.00	0.775	0.601
	AITP3	3.68	4.00	1.102	1.215
	AITP4	3.54	4.00	0.804	0.646
	AITP5	3.67	4.00	1.033	1.066
Improving the work of leader in the project	IWLP1	4.01	4.00	0.867	0.752
	IWLP2	4.00	4.00	0.937	0.878
	IWLP3	3.96	4.00	0.884	0.782
	IWLP4	3.94	4.00	0.968	0.936
	IWLP5	3.86	4.00	0.963	0.926
	IWLP6	3.80	4.00	0.900	0.810

Table 1. *Cont.*

Construct	Item	Mean	Median	Standard Deviation	Variance
Using AI solutions in a project	UAIS1	3.99	4.00	0.837	0.701
	UAIS2	4.10	4.00	0.776	0.602
	UAIS3	3.94	4.00	0.813	0.661
	UAIS4	4.40	4.00	0.618	0.382
	UAIS5	3.83	4.00	1.031	1.062
Successful project implementation	SPI1	3.82	4.00	0.896	0.803
	SPI2	3.83	4.00	0.874	0.763
	SPI3	3.86	4.00	0.930	0.864
	SPI4	3.85	4.00	0.889	0.791
	SPI5	3.81	4.00	0.904	0.817
	SPI6	3.84	4.00	0.989	0.978
	SPI7	3.92	4.00	0.956	0.913
	SPI8	3.80	4.00	0.888	0.789
Company competitiveness	CC1	3.84	4.00	1.176	1.383
	CC2	4.24	4.00	0.791	0.626
	CC3	3.75	4.00	1.027	1.055
	CC4	4.23	4.00	0.833	0.693
	CC5	4.10	4.00	0.912	0.831
	CC6	3.74	4.00	1.137	1.292

Figure 2 provides a graphical presentation of the items with the highest average values for each individual construct.
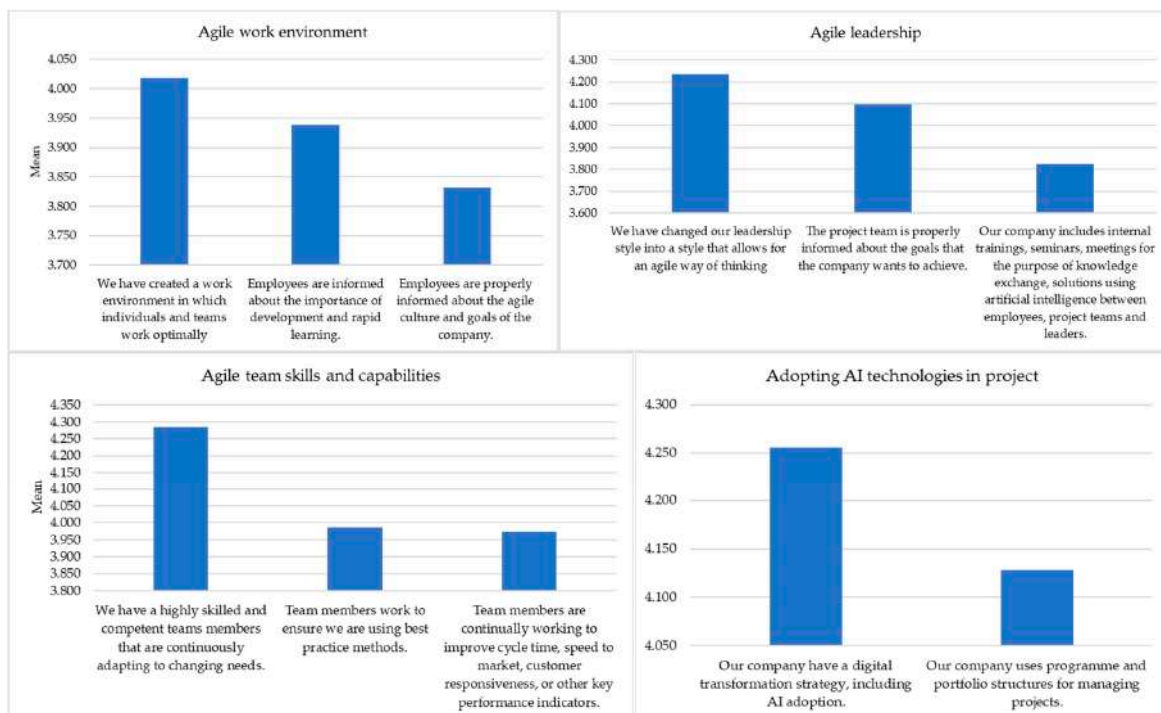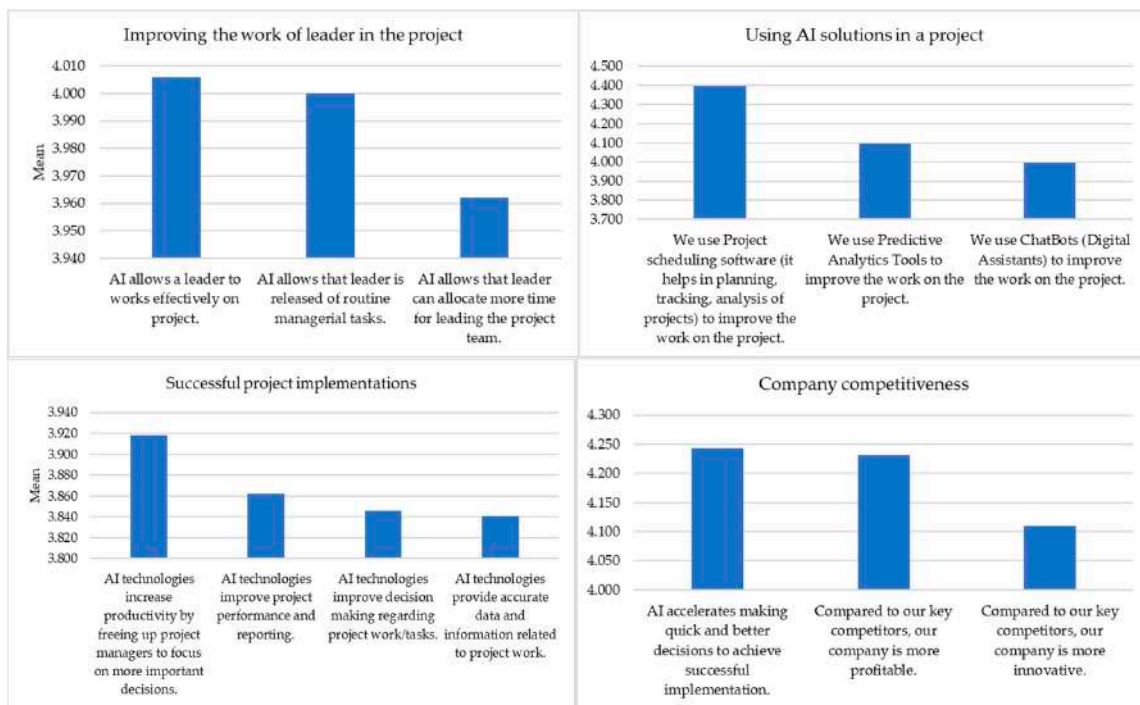

Figure 2. *Cont.*

Figure 2. The items with the highest average values for each construct.

In the next step, Table 2 confirms the appropriateness of factor analysis, as all communalities for the measured variables in each construct were above 0.40 [54,55], and no variables were eliminated. Furthermore, all factor loadings were significant ($p < 0.001$) and greater than 0.80. The reliability of all measurement scales was high (Cronbach's alpha > 0.80). Additionally, the variance explained for each construct was substantial: 78.7% for agile work environment, 72.9% for agile leadership, 73.3% for agile team skills and capabilities, 71.5% for adopting AI technologies in a project, 70.9% for using AI solutions in a project, 79.7% for successful project implementation, and 82.4% for company competitiveness.

Table 2. Factor analysis results.

Construct	Item	Communalities	Loadings	Cronbach's Alpha
Agile work environment	AWE1	0.836	0.914	0.923
	AWE2	0.865	0.930	
	AWE3	0.797	0.893	
	AWE4	0.860	0.924	
	AWE5	0.829	0.910	
	AWE6	0.762	0.879	
	AWE7	0.786	0.887	
Agile leadership	AL1	0.806	0.898	0.942
	AL2	0.739	0.853	
	AL3	0.746	0.865	
	AL4	0.786	0.887	
	AL5	0.804	0.895	
	AL6	0.741	0.860	
	AL7	0.781	0.883	
	AL8	0.763	0.874	

Table 2. *Cont.*

Construct	Item	Communalities	Loadings	Cronbach's Alpha
Agile team skills and capabilities	ATSC1	0.775	0.882	0.878
	ATSC2	0.792	0.893	
	ATSC3	0.788	0.890	
	ATSC4	0.781	0.886	
	ATSC5	0.665	0.815	
	ATSC6	0.731	0.855	
	ATSC7	0.713	0.836	
	ATSC8	0.651	0.807	
	ATSC9	0.740	0.861	
Adopting AI technologies in project	AITP1	0.732	0.857	0.907
	AITP2	0.738	0.860	
	AITP3	0.729	0.854	
	AITP4	0.653	0.827	
	AITP5	0.721	0.849	
Improving the work of leader in the project	IWLP1	0.785	0.886	0.915
	IWLP2	0.772	0.879	
	IWLP3	0.747	0.866	
	IWLP4	0.760	0.872	
	IWLP5	0.729	0.851	
	IWLP6	0.699	0.834	
Using AI solutions in a project	UAIS1	0.712	0.847	0.886
	UAIS2	0.733	0.856	
	UAIS3	0.682	0.826	
	UAIS4	0.738	0.859	
	UAIS5	0.648	0.805	
Successful project implementation	SPI1	0.794	0.891	0.932
	SPI2	0.800	0.894	
	SPI3	0.817	0.904	
	SPI4	0.808	0.899	
	SPI5	0.789	0.888	
	SPI6	0.803	0.896	
	SPI7	0.842	0.918	
	SPI8	0.724	0.851	
Company competitiveness	CC1	0.722	0.849	0.956
	CC2	0.881	0.939	
	CC3	0.808	0.899	
	CC4	0.880	0.938	
	CC5	0.848	0.921	
	CC6	0.804	0.897	

Table 3 presents crucial quality assessment indicators of the research model. These indicators serve as essential benchmarks for evaluating the reliability and validity of the

model. They provide valuable insights into the overall robustness and credibility of the research findings.

Table 3. Model fit and quality indicators.

Quality Indicators	Criterion of Quality Indicators	Calculated Values of Indicators of Model
Average path coefficient (APC)	$p < 0.05$	0.340, $p < 0.001$
Average R-squared (ARS)	$p < 0.05$	0.527, $p < 0.001$
Average adjusted R-squared (AARS)	$p < 0.05$	0.525, $p < 0.001$
Average block variance inflation factor (AVIF)	AVIF < 5.0	1.269
Average full collinearity VIF (AFVIF)	AFVIF < 5.0	3.482
Goodness-of-fit (GoF)	GoF $\geq$ 0.1 (low) GoF $\geq$ 0.25 (medium) GoF $\geq$ 0.36 (high)	0.609
Simpson's paradox ratio (SPR)	SPR $\geq$ 0.7, ideally = 1	1.000
R-squared contribution ratio (RSCR)	RSCR $\geq$ 0.9, ideally = 1	1.000
Statistical suppression ratio (SSR)	SSR $\geq$ 0.7	1.000
Nonlinear causality direction ratio (NLBCD)	NLBCD $\geq$ 0.7	1.000

Table 3 displays the indicators APC, ARS, and AARS, which are statistically significant ($p < 0.001$), while AVIF and AFVIF are below the threshold of 5.0, indicating their appropriateness. GoF, which measures the strength of the conceptual model, shows high suitability. Moreover, the indicators SPR, RSCR, SSR, and NLBCD exceed the minimum recommended values, indicating their suitability. Table 4 shows the quality indicators for the structural model. Thus, Table 4 displays the quality indicators for the structural model, which are instrumental in evaluating its overall effectiveness and reliability. These indicators shed light on the relationships, paths, and significance levels of the variables within the model. Analyzing these quality indicators allows for a comprehensive assessment of the model's validity and provides valuable insights into the structural relationships among the variables under investigation [55].

Table 4. Indicators of quality of the structural model.

Constructs	CR	AVE	R^2	Adj. R^2	Q^2	VIF
Agile work environment	0.963	0.784	(-)	(-)	(-)	2.756
Agile leadership	0.978	0.793	(-)	(-)	(-)	1.930
Agile team skills and capabilities	0.846	0.747	(-)	(-)	(-)	1.142
Improving the work of leader in the project	0.885	0.716	0.494	0.493	0.430	3.294
Adopting AI technologies in project	0.872	0.608	(-)	(-)	(-)	2.287
Using AI solutions in a project	0.846	0.667	0.548	0.547	0.560	2.483
Successful project implementation	0.971	0.865	0.468	0.462	0.483	1.907
Company competitiveness	0.897	0.714	0.599	0.598	0.570	2.478

Note: (-) values cannot be calculated because the construct is a baseline.

The data presented in Table 4 indicate that the latent variables' R^2, adjusted R^2, and Q^2 coefficients are all greater than zero. Furthermore, the CR values for all constructs exceed 0.7, and the AVE values for all constructs exceed 0.5, thus confirming convergent validity. The VIF values for all constructs range between 1.142 and 3.294, indicating no collinearity issues. The results of the structural equation modeling and the coefficients of relationships in the basic structural model are shown in Table 5. Additionally, Figure 3 displays the conceptual model with the corresponding path coefficients.

Table 5. Standardized path coefficients for the proposed model.

Hypothesized Path	Path Coefficient (γ)	Sig.	Effect Size (f^2)	Standard Error	Link Direction	Shape of Link
AWE→SPI	0.710	$p < 0.001$	0.473	0.042		
AL→SPI	0.745	$p < 0.001$	0.516	0.042		
ATSC→SPI	0.548	$p < 0.001$	0.362	0.041		
IWLP→SPI	0.673	$p < 0.01$	0.369	0.041		
AITP→SPI	0.702	$p < 0.01$	0.458	0.041	Positive	Nonlinear
UAIS→SPI	0.689	$p < 0.01$	0.376	0.043		
AITP→UAIS	0.564	$p < 0.001$	0.383	0.042		
AITP→IWLP	0.558	$p < 0.01$	0.357	0.042		
SPI→CC	0.774	$p < 0.01$	0.538	0.041		

Note: AWE—agile work environment, SPI—successful project implementation, AL—agile leadership, ATSC—agile team skills and capabilities, IWLP—improving the work of leader in the project, AITP—adopting AI technologies in project, UAIS—using AI solutions in a project, CC—company competitiveness.
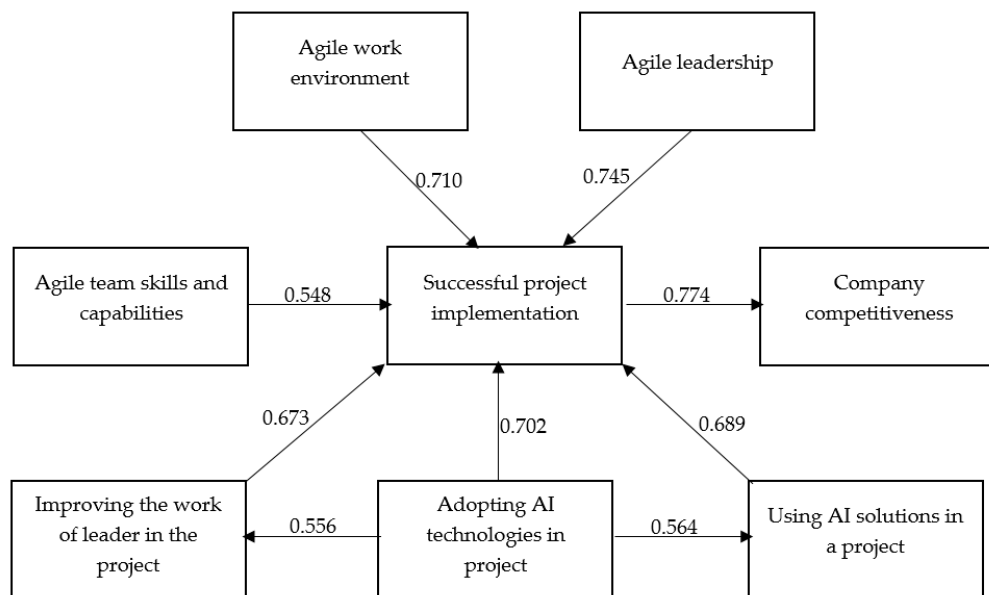
Figure 3. The conceptual model with the values of path coefficients.

The results in Table 5 and Figure 3 show that constructs agile work environment (AWE→SPI = 0.710, $p < 0.001$), agile leadership (AL→SPI = 0.745, $p < 0.001$), and agile team skills and capabilities (ATSC→SPI = 0.548, $p < 0.001$) have a positive effect on successful project implementation. In addition, adopting AI technologies in a project has a positive effect on using AI solutions in a project (AITP→UAIS = 0.564, $p < 0.001$) and a positive effect on improving the work of the leader in the project (AITP→IWLP = 0.556, $p < 0.01$). Furthermore, constructs adopting AI technologies in a project (AITP→SPI = 0.702, $p < 0.01$), using AI solutions in a project (UAIS→SPI = 0.689, $p < 0.01$), and improving the work of the leader in the project (IWLP→SPI = 0.673, $p < 0.01$) have a positive effect on successful project implementation. Moreover, the results show that successful project implementation has a positive effect on company competitiveness (SPI→CC = 0.774, $p < 0.01$). The Cohen's coefficient values for all constructs indicate a high level of predictive strength of the latent variables. Thus, the results confirm Hypotheses H1–H9.

5. Discussion

The manner in which work is performed is undergoing a significant transformation. Although some companies rely on outsourcing, temporary workers, and agency partners to supplement their in-house capabilities and manage spikes in demand, the majority of business operations are still handled by a core group of full- and part-time permanent employees [2,42]. While this approach may have been adequate in the past, it is imperative for HR and business leaders to reconsider and redesign their traditional employment models in order to ensure business sustainability [22]. Technology is a crucial component of an agile work environment [3], and the integration of artificial intelligence and machine learning technologies has the potential to revolutionize the workplaces of the future by providing guidance, organization, and automation of work. This, in turn, will enhance staff productivity and efficiency [13]. On the other hand, the AI algorithm supports a company's ability to use big data and derive value from it [19]. There has been great progress in artificial intelligence in recent years, as deep learning techniques can deliver state-of-the-art results in many applications, including image and speech recognition, natural language processing, and enhanced learning [49]. As companies approach digital transformation and adopt technologies such as cloud computing and artificial intelligence, they will experience serious changes that will bring them positive financial benefits as they increase the efficiency of their processes [12,20]. If they want to stay competitive, companies need to create new opportunities; this can be achieved by data-driven decision-making [23]. The advantage of integrating machine learning and artificial intelligence into a company is that it helps automate, organize, streamline, and analyze critical data sets [15]. This allows companies to use their time better and increase efficiency in their projects by better understanding consumer behavior patterns and adding value [7,8].

The need for rapid-paced, customer-focused continuous innovation initiatives drives the adoption of agile processes and concepts in today's dynamic marketplaces [52]. However, with many different and overlapping project management approaches available, choosing the right one for achieving project success can be a complex task [2]. Our study, based on the results presented in Table 5 and Figure 3, suggests that implementing an agile work environment and adopting agile leadership have positive effects on successful project implementation. In Table 2, we found that creating an optimal work environment for individuals and teams is the most important factor for agile work environment, followed by properly informing employees about the agile culture and goals of the company and defining clear roles and competencies. In addition, emphasizing the importance of rapid development learning and promoting a culture of growth, learning, and adaptation can facilitate the agility of the company [52,56]. Similarly, our results show that the most important factor for agile leadership is changing the leadership style to support agile thinking, followed by proper communication of the company's goals to the project team and facilitating knowledge exchange through internal training, seminars, and the use of artificial intelligence solutions between employees, project teams, and leaders. A study conducted by Ciric Lalic et al. [2] on 227 companies across 49 countries revealed that the agile project management approach is more effective than the traditional approach in terms of enhancing project efficiency. Moreover, the results presented in Table 4 and Figure 3 demonstrate that agile team skills and capabilities positively influence successful project implementation. According to Table 2, the most crucial aspect of agile team skills and capabilities is having highly skilled and competent team members who can adapt to changing requirements and employ the best practices. This is closely followed by team members who consistently work towards improving key performance indicators such as cycle time, speed to market, and customer responsiveness. Mani and Mishra [39] discovered that agile teams have a mindset of experimentation, work iteratively, and make continuous progress towards their goals, adapting quickly to changes in the environment. Agile teams have been shown to generate higher productivity, better quality, faster time to market, and enhanced team morale. Similarly, Ciric Lalic et al. [2] found that agile project management approaches have a greater positive impact on team effectiveness, satisfaction, and prepa-

ration for the future, improving business success. Gemino et al. [4] also found that agile approaches outperformed traditional approaches concerning stakeholder success measures. Pacagnella et al. [57] found that the team's ability to share tacit knowledge increases project agility, particularly in troubleshooting, bringing it closer to its goals concerning deadlines and costs. In many other studies, team satisfaction and effectiveness are considered an essential component of project success [35,58].

According to the findings presented in Table 5 and Figure 3, incorporating AI technologies into projects has a positive impact on the utilization of AI solutions in the project, as well as improving the project leader's work. Table 1 reveals that the most crucial factor in adopting AI technologies in a project is having a digital transformation strategy that encompasses AI adoption, employing program and portfolio structures to manage projects, and utilizing AI technologies for work design. Additionally, the most significant role in using AI solutions in a project includes the use of project scheduling software to enhance project planning, tracking, and analysis; utilizing predictive analytics tools to improve project outcomes; and employing chatbots (digital assistants) to enhance project performance. The most important role in improving the work of a leader in the project is that AI allows a leader to work effectively on a project, releases them from routine managerial tasks, and enables them to focus on the complex managerial tasks. In addition, results (Table 5 and Figure 3) show that these constructs using AI solutions in a project, improving the work of the leader in the project, and adopting AI technologies in a project have a positive effect on successful project implementation. Enholm and colleagues [3] argue that companies that implement AI applications in their project work can achieve higher business value, including increased revenue, cost reduction, and improved business efficiency. Similarly, Ransbotham and his team [24] conducted research on over 3000 executives, managers, and analysts across various industries and conducted in-depth interviews with more than 30 technology experts and executives. Their findings showed that over 80% of organizations consider AI as a strategic opportunity, and almost 85% see it as a means to gain a competitive advantage. Therefore, many organizations are investing in AI technologies to stay ahead in the competition. However, despite the increasing interest in AI, many firms are having difficulty extracting value from it [4,5]. Artificial intelligence has now become a crucial element of business strategy worldwide. Successful companies are always looking for ways to increase efficiency, improve customer experience, and reduce operating costs [13]. According to the results of a McKinsey Global Survey [59], which surveyed 2360 executives, the majority of companies that have implemented AI report an increase in revenue in the areas where it is used, and 44% of respondents say that AI has reduced costs. These findings suggest that AI is providing significant value to companies. Specifically, 63% of respondents reported an increase in revenue in the business units where AI is used. Additionally, successful companies often operate in high-stress environments, where overcoming stressful situations is a key factor in achieving success. However, continuous exposure to high levels of stress can seriously reduce the operational effectiveness of individuals and entire companies. According to a report by Verint [46], evolving technologies such as automation and AI can significantly reduce workplace stress. The study, which surveyed 34,000 respondents across 18 countries, found that companies that have adopted these new techniques now enjoy low-stress workplaces. In addition, 71% of employees support using technology to replace manual or laborious tasks, and 69% believe that automation will enhance their jobs rather than replace them. Schreck et al. [47] suggest that leveraging AI entails drawing conclusions from diverse perspectives, which can then inform process recommendations, project-related decisions, and reveal team insights. For instance, with the aid of technological advancements, it is likely that specific tools will emerge to match the appropriate skills and responsibilities with the right resources in the future. Human resources departments have increased investment in technology to improve their hiring processes. According to Auth et al. [60], integrating AI into recruitment processes leads to a 4 percent increase in revenues, along with a 35 percent reduction in employee turnover rates, which is critical for minimizing employee idle time.

Based on the results in Table 5 and Figure 3, we found that successful project implementation has a positive effect on company competitiveness. Table 2 shows that the most important role in successful project implementation is that AI technologies increase productivity by freeing up project managers to focus on more important decisions and, second, that AI technologies improve project performance and reporting. The third important role in successful project results is that AI technologies improve decision-making regarding project work/tasks and provide accurate data and information related to project work. Furthermore, the results presented in Table 2 indicate that AI plays a crucial role in enhancing a company's competitiveness, particularly in terms of enabling quick and informed decision-making for achieving successful outcomes, surpassing key competitors, increasing profitability, driving innovation, and fostering rapid growth. Lahmann et al. [23] identified various AI tools that can assist project managers in their diverse roles, such as chatbots, Stratejos, ZiveBox, Rescoper, ClickUp, Clarizen, and PolyOne [43]. These tools can aid in team composition, allocating roles and responsibilities to team members, and managing project deadlines. The utilization of AI technology offers several advantages to project managers, including relieving them of the burden and pressure of managing projects by providing support through machines, and providing accurate results as AI-driven tasks are performed without errors or mistakes [22]. Furthermore, AI can provide project managers with valuable insights and aid in strategizing. For instance, an AI tool can recommend alternative or supplemental steps for project managers who are dealing with particularly challenging projects. AI has numerous benefits for project managers, including enhancing effectiveness and efficiency, increasing productivity, and adding to their emotional intelligence [44,49]. AI can assist project managers in analyzing team members' performance and assigning tasks based on individual capabilities. Furthermore, AI creates a knowledge management system that stores valuable information that can be utilized when an employee leaves the organization. It also facilitates the consolidation of various workplace behavioral patterns, centralizes workers' knowledge, and enhances quality and consistency [25–27]. Additionally, AI can detect potential warning signs that are not visible to humans, which helps in managing construction projects and mitigating the risk of accidents during project implementation. It can monitor equipment performance, detect unsafe working environments, predict employee performance based on facial expressions, monitor air quality, and alert participants of possible accidents [38]. Additionally, AI systems do not experience fatigue, give excuses, or compromise, making them useful in identifying quality and accuracy deliverables [43]. The use of AI offers project managers a range of project-enhancing benefits [10]. For example, executives can leverage AI to identify projects requiring immediate attention and determine the specific actions required at each stage of project implementation [48]. Without AI, it can be difficult for executives to determine the necessary workload and schedule work while considering factors such as technological and skill requirements, as well as resource constraints [49,50]. Additionally, AI aids in developing a project portfolio that maximizes the project's value for the organization while identifying effective resource management practices. Several software algorithms have been designed specifically for this purpose [44]. According to Magaña Martínez and Fernandez-Rodriguez [45], integrating AI into project management can enhance schedule optimization by considering all ongoing and future projects within the organization, instead of just a few selected ones. Project managers often experience intense pressure to make quick decisions based on their instincts, without relying on automated deduction [13,22,36,39]. However, the implementation of AI in project management can offer considerable assistance to project managers, improving accuracy, strategic planning, and insight. This, in turn, can lead to increased productivity, emotional intelligence, and creativity for project managers, while also eliminating individual decision-making biases. Without AI, project managers may struggle to make informed decisions and can benefit greatly from the assistance provided by AI technology. As AI takes over more repetitive and mundane tasks, the agile workplace empowers employees to engage in more meaningful work, emphasizing creativity and emotional intelligence. In light of expanding business

intelligence, it is crucial to foster flexible workspaces that accommodate dynamic business processes. Our study focused on managers/owners from medium and large Slovenian companies, and the constructs we used in the survey were limited in scope. We sought theoretical foundations for each hypothesis; however, these theoretical foundations were not specific to Slovenia. By conducting research on relevant studies conducted by other authors, our objective was to validate the hypotheses in the context of Slovenia. This approach aimed to raise awareness among Slovenian companies regarding the significance of successful project implementation and provide them with practical solutions and recommendations. Through our research, we aimed to bridge the gap between theory and practice, translating existing knowledge into actionable insights for Slovenian companies. By validating the hypotheses in the Slovenian area, we aimed to provide empirical evidence and practical guidance to make companies in Slovenia aware of the importance of successful project implementation.

Thus, we recommend further research to explore and evaluate different constructs using structural equation modeling. Given our team's international background (Slovenia and Croatia), we encourage researchers to investigate these constructs in diverse countries and compare findings. Future research can also focus on refining and validating the developed model by conducting additional studies in different industries and organizational contexts. Furthermore, conducting longitudinal studies can provide insights into the long-term effects of agility and AI on project implementation and company performance. By tracking projects over an extended period, researchers can observe how the identified constructs evolve and their impact on project outcomes and competitiveness over time. While the model developed in this research is comprehensive, there may be additional constructs that could further enhance the understanding of successful project implementation. Future studies can explore other relevant factors that may contribute to project success.

5.1. Managerial Implications

The findings of this research and the developed multidimensional model have several managerial implications for companies aiming to enhance their project implementation processes and increase their competitiveness:

1. Enhancing the agile work environment: The research highlights the importance of fostering an agile work environment within the company. Companies should focus on creating a culture that encourages flexibility, adaptability, and collaboration among team members. This can be achieved by promoting open communication, empowering employees to make decisions, and supporting continuous learning and improvement.
2. Developing agile leadership capabilities: The study emphasizes the role of agile leadership in successful project implementation. Companies should acquire the necessary skills and knowledge to effectively lead agile teams. This includes the ability to provide clear direction, empower team members, facilitate communication and collaboration, and embrace change and innovation.
3. Building agile team skills and capabilities: The research underscores the significance of developing agile team skills and capabilities. Companies should invest in training and development programs that enhance team members' ability to work collaboratively, adapt to changing circumstances, and leverage their diverse skills and expertise. Additionally, creating cross-functional teams and encouraging knowledge sharing can contribute to improved project outcomes.
4. Leveraging AI technologies in projects: The study emphasizes the adoption of AI technologies in project implementation. Managers should explore and evaluate AI solutions that can automate repetitive tasks, enhance decision-making processes, and improve project efficiency and accuracy. Incorporating AI tools and techniques can streamline operations, reduce costs, and enable companies to leverage data-driven insights.
5. Utilizing AI solutions in projects: The research highlights the benefits of utilizing AI solutions within projects. Managers should identify specific areas where AI can add

value, such as predictive analytics, natural language processing, or machine learning, and incorporate these solutions into project workflows. Leveraging AI can lead to improved project outcomes, faster decision-making, and enhanced competitiveness.

Overall, the results of this research provide valuable guidelines for companies seeking to combine agile business practices and AI technologies to achieve successful project implementation and increase their competitiveness in today's turbulent business environment. By considering the implications outlined above, owners or managers can make informed decisions and implement strategies that drive project success and organizational growth.

5.2. Academic Implications

The academic implications of this research are significant as they contribute to the existing body of knowledge in project management, agility, and artificial intelligence. This research contributes to the theoretical understanding of the factors that influence successful project implementation. By introducing the constructs of an agile work environment, agile leadership, agile team skills and capabilities, as well as the utilization of AI technologies and solutions, the study expands the existing theoretical frameworks in project management and sheds light on the relationships between these constructs. Moreover, the research presents a multidimensional model that integrates the concepts of agility and AI in the context of successful project implementation. This model provides a comprehensive framework for understanding the complex interactions and interdependencies among the identified constructs. It offers a valuable contribution to the project management literature by providing a holistic view of the factors influencing project success and company competitiveness. The research employs a sample of 473 managers/owners from Slovenian medium-sized and large companies and utilizes structural equation modeling to test the hypotheses. The empirical findings validate the relationships proposed in the model, thus providing empirical evidence for the impact of agility, AI, and their related constructs on successful project implementation and company competitiveness. This strengthens the scientific rigor and validity of the research.

6. Conclusions

Based on the literature, we constructed a new multidimensional model, which integrates an agile work environment and the implementation of artificial intelligence for effective project management. Our model was tested on both medium and large-sized companies. Companies can achieve a competitive advantage in this turbulent environment with this multidimensional model. A turbulent work environment requires companies to constantly adapt if they want to strengthen their competitive power and stay in the market. Therefore, companies need to monitor and adapt to the market constantly. Every company must strive for growth and development, which it can achieve when it operates successfully and efficiently. To do this, it is necessary to introduce continuous improvements that help to make the company competitive. Therefore, we designed a multidimensional model with constructs (1) agile work environment, (2) agile leadership, (3) agile team skills and capabilities, (4) improving the work of the leader in the project, (5) adopting AI technologies in a project, and (6) using AI solutions in a project, which have a positive effect on successful project implementation to increase company competitiveness. An ever-changing work environment can facilitate the global marketplace, allowing for the exchange of goods and services and leveraging the integration of agile work environments and AI. While this integration may present both benefits and challenges of an unprecedented scale, adapting to this path will undoubtedly reward companies willing to take on entrepreneurial challenges and harness the power of AI. This presents vast opportunities for new products and services, significant improvements in productivity and efficiency, and the potential for increased revenue and competitive advantage.

Appendix A

Table A1. Items for each construct.

Agile work environment (AWE)
AWE1: We defined roles that provide clear guidance to employees of the expected outcomes and competencies required in the company.
AWE2: We have created a work environment in which individuals and teams work optimally.
AWE3: The training of new employees is tailored to the individual and the workplace
AWE4: Employees are properly informed about the agile culture and goals of the company.
AWE5: Employees are informed about the importance of development and rapid learning.
AWE6: We encourage employees to make suggestions for improving the company's performance.
AWE7: Open communication is a part of the whole company (among employees, departments, project teams, management).
Agile leadership (AL)
AL1: We have changed our leadership style into a style that allows for an agile way of thinking.
AL2: We have a project management office and other support structure for project management.
AL3: We ensure that the employees who work on the project are optimally engaged and motivated.
AL4: Our company includes internal training, seminars, meetings for the purpose of knowledge exchange, and solutions using artificial intelligence between employees, project teams, and leaders.
AL5: The project team is properly informed about the goals that the company wants to achieve.
AL6: We regularly monitor and anticipate changes in the environment.
AL7: The activities of the company and employees are focused on the quality of products/services and customer satisfaction.
AL8: We encourage the project team to examines different ways of solving problems in terms of learning opportunities and developing a new approach to the problem.
Agile team skills and capabilities (ATSC)
ATSC1: We organize for team members various forms of training to keep their skills up to date.
ATSC2: We have a highly skilled and competent team members that are continuously adapting to changing needs.
ATSC3: Team members work to ensure we are using best practice methods.
ATSC4: Team members are continually working to improve cycle time, speed to market, customerresponsiveness, or other key performance indicators.
ATSC5: Team members seek and give each other constructive feedback.
ATSC6: When team members' roles change, specific plans are implemented to help them assume their new responsibilities.
ATSC7: Team members work with a great deal of flexibility so that we can adapt to changing needs.
ATSC8: Team members are sure about what is expected of them and take pride in a job well done.
ATSC9: Team members display high levels of cooperation and mutual support.

Table A1. *Cont.*

Adopting AI technologies in project (AITP)
AITP1: Our company uses program and portfolio structures for managing projects.
AITP2: Our company has a digital transformation strategy, including AI adoption.
AITP3: Our company uses AI technologies in projects for work design.
AITP4: Our company uses AI technologies in projects to plan new tasks
AITP5: Our company uses AI technologies in projects to create teams.
Improving the work of leader in the project (IWLP)
IWLP1: AI allows a leader to work effectively on project.
IWLP2: AI releases the leader from routine managerial tasks.
IWLP3: AI allows the leader to allocate more time for leading the project team.
IWLP4: AI allows the leader to focus on the complex managerial tasks.
IWLP5: AI allows the leader to run more projects.
IWLP6: AI allows the leader to work remotely.
Using AI solutions in a project (UAIS)
UAIS1: We use chatbots (digital assistants) to improve the work on the project.
UAIS2: We use predictive analytics tools to improve the work on the project.
UAIS3: We use Robotic Process Automation to improve the work on the project.
UAIS4: We use project scheduling software (which helps in planning, tracking, analysis of projects) to improve the work on the project.
UAIS5: We use resource scheduling software (which helps to allocate resources such as equipment rooms, staff, and other resources) to improve the work on the project.
Successful project implementation (SPI)
SPI1: AI technologies improve communication with stakeholders.
SPI2: AI technologies improve compliance, security, and project risk management.
SPI3: AI technologies improve project performance and reporting.
SPI4: AI technologies improve decision-making regarding project work/tasks.
SPI5: AI technologies improve the resource utilization.
SPI6: AI technologies provide accurate data and information related to project work.
SPI7: AI technologies increase productivity by freeing up project managers to focus on more important decisions.
SPI8: AI technologies reduce costs and delivery time.
Company competitiveness (CC)
CC1: The risk of employee error is reduced by AI
CC2: AI accelerates and improves decision-making to achieve successful implementation.
CC3: Compared to our key competitors, our company is growing faster.
CC4: Compared to our key competitors, our company is more profitable.
CC5: Compared to our key competitors, our company is more innovative.
CC6: Compared to our major competitors, our capabilities and resources complement each other extremely well.

Note: AI—artificial intelligence.

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