AGILE MATURITY ASSESSMENT FOR INDUSTRIAL COMPANIES IN SLOVAKIA: ENHANCING PROJECT MANAGEMENT EFFICIENCY

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Agile project management is gaining influence across various industries and is gradually replacing the traditional waterfall approach. It enables flexible adaptation to change, delivers outputs in shorter intervals, and addresses deficiencies in real time. The aim of this paper is to present a methodology for measuring the maturity of agile project management in industrial enterprises. The methodology includes definitions of conditions required for transitions between levels, determined using checklists. The proposed methodology is based on an analysis of the current state of agile maturity measurement in Slovakia, obtained through a questionnaire survey and structured interviews. The findings indicate that although companies have some awareness of agile maturity measurement, further development is necessary to achieve sustainable competitiveness and a higher level of agility.

KEYWORDS

agile maturity models, maturity levels, industrial enterprises, checklist

1 INTRODUCTION

Traditional project management methods are often criticized for their rigidity and inability to adapt to evolving project requirements. Due to these limitations, they are gradually being replaced by agile approaches, which focus on enhancing output quality and accelerating solution delivery. A key benefit of agile methods is their emphasis on refining the project execution process to ensure stakeholder satisfaction by incorporating their feedback and requirements from the project's inception.

Agile project management is increasingly recognized as a potential future standard in the field. It prioritizes the consistent execution of tasks, streamlined and rapid project management, and a strong focus on adapting to evolving customer needs [Moreno 2024, Drabikova 2018].

Not all collaborating parties rely exclusively on agile project management. In many cases, project owners or implementers may be unaware that their partners have agile capabilities, leading to differences in collaboration. Therefore, it is crucial for companies and clients to access relevant information about whether their current or potential business partners apply agile project management. With this knowledge, organizations can adopt a more flexible approach, allowing them to respond to changes effectively, deliver incremental solutions, and build stronger business relationships. Identifying industrial enterprises in Slovakia that implement agile project management is essential for understanding their agile maturity level. A well-designed methodology for measuring agile project maturity would help uncover previously unnoticed insights among existing and future partners, as well as improve their collaboration and effectiveness. This framework would enable businesses to assess their agility while increasing transparency and visibility both within the company and externally. The proper implementation of project management strategies can significantly contribute to achieving project excellence. However, assessing agile maturity is an ongoing, long-term process [Fajsi 2022]. The insights gained from such a methodology should serve as guidelines that businesses can voluntarily adopt, fostering continuous improvement and progress in agile project management.

2 LITERATURE REVIEW

Agile maturity models focus on various areas that require continuous improvement, even for companies that have been implementing agile project management for a long time. These models are not just evaluation tools; they also serve as instruments for tracking a company's agile performance and fostering ongoing improvements. They allow businesses to recognize their strengths while also identifying areas that need further development [Calcada 2024]. Agile maturity assessment is primarily used to determine the current state of agile implementation within an organization and pinpoint areas for improvement while evaluating different aspects of agile adoption [Marsikova 2018]. Closely linked to embracing agile principles and mindset, it focuses on agile methodologies, core values, and corporate culture. Identifying agile maturity should not be seen as a one-time success but rather as a continuous journey toward improvement and growth [Ojha 2024]. Agile project management delivers a faster return on investment, reduces the impact of unpredictable changes, enhances time-to-market, and quickly improves customer satisfaction [Soares 2022]. Here is an assessment of commonly used agile project management maturity models, known for their versatility and broad applicability. Each model features its own framework, objectives, maturity levels, and specific evaluation criteria. The most widely recognized models include:

• The Agile Crawl, Walk, Run Model is designed to assess the maturity of agile teams, ensuring they establish a solid foundation at each stage of their development. Initially, teams experiment with agile frameworks and progressively adopt new practices until they achieve a successful agile transformation and fully integrate agile values. The model generally includes four maturity levels, though an additional preliminary stage, known as Pre-Crawl, is sometimes incorporated but remains relatively rare. The key characteristics of each maturity level are as follows [Agilityinsights 2022]:

- Pre-Crawl - The team has not yet adopted agile practices and has not explored agility-related topics.
- Crawl - The team is beginning to engage with agile concepts, asking questions, and seeking understanding.
- Walk – The team requires guidance, including agile training and coaching, as they build their knowledge and skills.
- Run – The team actively applies agile practices, gains confidence, and encounters fewer uncertainties.
- Fly – With extensive experience, the team not only excels in agile methodologies but also mentors and supports less experienced teams in their agile journey.

• Agile Maturity Matrix - This framework is designed as a matrix and evaluates the agile maturity of an organization or team using five core aspects: leadership, organizational culture, teamwork, delivery efficiency, and work environment. The Agile Maturity Matrix evaluates five levels of maturity, starting from the foundational first level—the lowest—up to the fifth and highest level, known as the optimized stage. This model is widely used to establish key goals that a company strives to achieve during its agile transformation and to monitor progress. It also ensures that all employees attain a unified level of agile maturity. Designed as a structured visual tool for self-assessment, the matrix helps organizations and teams gauge the efficiency of their agile practices. It systematically assesses agile behaviours and methodologies across different criteria. Each matrix cell provides a concise description of what it means to be at a specific level, highlights existing gaps, and suggests improvements [Poole 2024, Pelantova 2015].

• Scrum maturity model (SMM) - The model was developed and tested by Alexandre Yin from the Technical University of Lisbon. The SMM specifies the individual steps for agile teams to help them implement Scrum practices in detail. It aims to improve team development processes and shifts the mindset towards customer involvement from the very beginning of the final product creation [Eby 2023].

The main objective of the SMM was to direct and assist businesses in IT software development. It also aimed to help companies with no prior experience in the Scrum methodology to implement it step by step. The SMM model consists of five maturity levels: initial, managed, defined, quantitatively managed, and optimized. A significant advantage of this model is that it offers detailed descriptions of the goals, processes, and recommended actions for each Scrum maturity level [Yin 2011].

• Echometer – is a software tool that allows organizations to regularly assess their agility status. It focuses particularly on the agile culture and psychology within teams. The tool enables agility levels to be measured at both managerial and team levels using specific KPIs. These metrics are then evaluated during agile retrospectives [Schafer 2021].

The purpose of Echometer is to improve team success by efficiently measuring and simplifying the effectiveness of each retrospective. A retrospective is a recurring team meeting where shortcomings that occurred during the previous product development iteration are discussed and clarified. During this process, Echometer serves as a “digital coach” that aids in the development of agile teams by applying psychological insights, alongside contributions from artificial intelligence. The main objective is to foster the adoption of agile practices within teams, which is primarily facilitated during retrospectives. By utilizing this tool, teams can gather valuable insights for tracking long-term progress in a measurable way [Odiseev 2020].

• Agile Maturity Curve – Agile Maturity Curve model benefits businesses by offering a structured roadmap for adopting and advancing agile project management. It consists of seven maturity levels, progressing from an initial assessment of agile methodologies to the most advanced "enhancement" stage. This model provides organizations with a clear framework for evolving on their agile journey. It is essential to recognize that agile project management is not merely an end goal but a continuous path toward success. The levels of the Agile Maturity Curve are defined as follows [Fernandes 2023]:

- Evaluation level – Includes the identification of critical processes, assessment of the overall readiness of the organization for agile implementation, and familiarization with the agile philosophy.
- Pilot level – This phase focuses on exploring agile practices in a controlled setting. Teams at this level experiment with agile methodologies by applying them to selected projects or specific business areas to gain practical experience.
- Adoption level – At this level, agile principles, values, and mindset are embedded throughout the entire organization, becoming a fundamental part of its operations.
- Refinement level – Focuses on fine-tuning agile processes established during the experimental phase. Teams operate iteratively, and the organization adapts to the specific needs of teams and projects.
- Improvement level – Teams are committed to continuously enhancing their skills, optimizing processes, and accelerating value delivery.
- Acceleration level – Agile collaboration is at a highly advanced level, with agile project management deeply embedded in the organization’s strategy. The company outperforms competitors by ensuring high customer satisfaction and rapid solution delivery.
- Amplification level – The organization has reached the peak of agile project management excellence. Agile principles are fully integrated across all business areas.

• Agility Health Radar (AHR) – It not only facilitates agile implementation but also focuses on continuous improvement across various business areas. Featuring frequent graphical assessments, such as radar charts, it enables precise measurement of different aspects. AHR emphasizes in-depth analysis of each evaluation, leading to long-term and consistent enhancements. Its flexibility and adaptability provide a comprehensive overview, making it an effective tool for insightful retrospectives. Moreover, it actively involves both employees and management, ensuring that their contributions go beyond what agile teams can achieve independently [Boyce 2024]. AHR utilizes digital surveys to evaluate agile maturity based on specific criteria such as agile culture, team efficiency, core agile principles, delivery performance, transparency, and workload management. These surveys consist of predefined questions that employees need to complete. The responses are then automatically processed into a model, providing valuable insights and conclusions about the organization's level of agile maturity. This approach frequently reveals further opportunities for enhancement, not just within agile teams but across the entire agile transformation [Schafer 2021].

• The Agilometer model consists of six key areas that serve to identify potential risks. The assessment is carried out by employees or, in the early stages of agile project management, by a project manager after consulting with relevant stakeholders. Each area is rated on a scale from 0 (lowest level) to 5 (highest/perfect level) [Shinde 2021].

The key areas are divided as follows [Heidemeyer 2021]:

- Flexibility of delivered outputs,
- Level of Collaboration,
- Clarity and effectiveness of communication,
- Ability to work iteratively and deliver incrementally,
- Suitability of the work environment,
- Acceptance and adoption of agile values.

Businesses use the Agilometer to evaluate how ready and mature their project environment is for adopting agile principles and methodologies. After completing the Agilometer, the results are assessed within the company. This evaluation identifies areas that need improvement and outlines actions to elevate "weaker areas" towards the highest level (level 5). This process is repeated periodically, helping the company gradually move closer to achieving its desired level of excellence [Shinde 2021].

3 METHODS AND METHODOLOGY

In the next section, we will discuss the process of gathering information to obtain accurate insights into the current state of agile project management maturity measurement in companies in Slovakia. The data was first collected through a questionnaire survey, followed by structured interviews with project management experts from industrial companies. After collecting the necessary data, we proceeded to evaluate the defined research hypotheses.

The survey conducted comprised various questions, with the initial section focused on gathering identification details from the respondents. During September and October 2024, we contacted 458 individuals. The total number of completed surveys was 152, of which 16 responses came from small businesses. As the methodology was specifically aimed at medium and large industrial companies, the final sample for further analysis consisted of 136 respondents. The classification of businesses followed the definitions set by the [European Commission 2020].

Od In the survey, we asked respondents about their understanding of agile project management and whether they are utilizing it. We also wanted to know if they assess whether their potential customers, partners, or suppliers are using agile project management. Additionally, we sought to understand what benefits they believe come from measuring the maturity of agile project management in industrial companies. The responses revealed that the top benefit, with 48.53%, was improving customer relationships. Following closely, 42% of respondents highlighted increased productivity, and 36% pointed to reduced time to market. In agile-managed projects, improved customer relationships can be attributed to regular interaction, ongoing communication, and the development of strong relationships. This is because any issues on the projects are regularly communicated, and everyone involved continuously works to find the best solutions, which ultimately builds trust and transparency. We also asked respondents about the most important reasons for measuring the maturity of agile project management within an organization. The most selected reason was improving cooperation with customers, with 46.32%. Developing good, trustworthy relationships can be achieved through regular project meetings between collaborating parties. Second, with over 44%, respondents valued the ability to better manage changing priorities, and third, nearly 43% of respondents emphasized accelerating time to market. In another question, we explored the drawbacks of assessing the maturity of agile project management in industrial companies. Most respondents identified that the main challenge was the time-consuming nature of the maturity assessment process, with over 41% agreeing. Other drawbacks mentioned included reluctance to respond from the other party (39.71%) and a lack of understanding about the importance of the issue (36%). Companies should consider investing more time in innovations, not just technological ones, but also in improving knowledge and information management [Teplicka 2023]. It's essential to recognize that these challenges can be overcome by being more open to new information, staying persistent with positive practices, and maintaining good communication.

To gain a clearer understanding of the topic based on the survey results, our study was supplemented by structured interviews. These interviews were conducted with project management experts working in medium and large industrial enterprises across Slovakia. The data was gathered during November and December 2024, and all interviews were carried out in person. Each respondent answered the same set of predefined questions. Among the questions, we explored how the respondents perceive the differences between traditional and agile project management, and how frequently they apply agile project management in their work. Most of the questions focused on assessing agile project management maturity within industrial enterprises, its benefits, and potential challenges. The expert insights were crucial for describing the current situation. All the respondents expressed strong support for agile management, recognizing its distinct advantages compared to traditional project management. They acknowledged the considerable potential of measuring the maturity of agile project management and its various benefits. They also emphasized the need for a new, universal, and clearly defined methodology to evaluate the maturity of agile project management.

Based on the data obtained, we formulated two research hypotheses. To accurately assess these hypotheses, both null and alternative hypotheses were defined. We also determined the appropriate test criterion and significance level. The results were then summarized into final conclusions for each hypothesis.

Evaluation of Hypothesis H1: "There is a dependency between the assessment of agile project management maturity and the size of the organization"

For evaluating this hypothesis, it is necessary to first formulate the null (H01) and alternative (HA1) hypotheses. These hypotheses are as follows:

H01: There is no dependency between the assessment of agile project management maturity and the size of the organization.

HA1: There is a dependency between the assessment of agile project management maturity and the size of the organization.

Hypothesis testing was performed using two questions from the questionnaire: "How many employees work in your organization?" and "Do you check if your potential new customer, partner, or supplier uses agile project management?" The hypothesis was evaluated using the Chi-square test in MS Excel, where we used both empirical (actual) and theoretical (expected) frequencies for the different responses. The significance level α was set to 5%, i.e., $\alpha = 0.05$. After performing the Chi-square test in MS Excel, the calculated p-value was 0.7453. Since $p > \alpha$ ($0.7453 > 0.05$), we fail to reject the null hypothesis. If p had been less than α, we would have rejected the null hypothesis in favour of the alternative hypothesis. In conclusion, we can state that there is no significant relationship between the assessment of agile project management maturity and the size of the organization.

Evaluation of Hypothesis H2: "There is a statistically significant relationship between the size of the company and the benefits derived from measuring the maturity of agile project management within industrial companies."

To test this hypothesis, both the null (H02) and alternative (HA2) hypotheses were formulated:

H02: There is no statistically significant relationship between the size of the company and the benefits derived from measuring the maturity of agile project management within industrial companies.

HA2: There is a statistically significant relationship between the size of the company and the benefits derived from measuring the maturity of agile project management within industrial companies.

For testing this hypothesis, two questions from the survey were utilized. The first question asked: "How many employees are employed in your organization?" The second question focused on the benefits of maturity assessment and was phrased as: "What benefits do you believe the assessment of agile project management maturity brings to industrial enterprises?"

To test the hypothesis, the One-way Analysis of Variance (ANOVA) test was used in MS Excel. This test assessed the relationship between the size of the company and the benefits respondents associate with measuring agile project management maturity. A significance level (α) of 5% was applied, i.e., α = 0.05. The results of the ANOVA test performed for this hypothesis verification are presented in the Table 1.

Table 1. Verification of Hypothesis H2 using the ANOVA Test (Own Processing)

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Medium-sized enterprise	10	123	12,3	36,9
Large enterprise	10	251	25,1	91,21111

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	819,2	1	819,2	12,7889	0,002159	4,413873
Within Groups	1153	18	64,05556			
Total	1972,2	19				

In Table 1, labelled "summary," the groups, count of values, their sum, average, and variance are displayed. For interpreting the results, the "ANOVA" section of the table is key, where we can find the sources of variation, as well as the values of F and F crit. It's important to understand the following: If F > F crit, the null hypothesis is rejected, confirming the alternative hypothesis, meaning the factor has a significant effect. If F < F crit, the null hypothesis is accepted, indicating no significant influence from the factor.

In our analysis, comparing the F and F crit values yields the following: 12.7889 > 4.4138 (F > F crit). As a result, we reject H02, suggesting a statistically significant relationship between the size of the company and the advantages of assessing agile project management maturity in industrial enterprises.

The results strengthen the belief that agile project management has strong potential for adoption, with a high probability of increasing its implementation in the future. Companies should be well-prepared to assess their agile maturity for project management purposes, which will significantly improve their chances of long-term success.

4 RESULTS

The analysis of the current situation has reinforced the validity of the proposed methodology for assessing the maturity of agile project management. This methodology is designed to be versatile and can be applied to medium and large industrial enterprises across any sector. Each industrial enterprise is unique, with its own history, management practices, work processes, and specific expertise. Therefore, it is crucial to note that the implementation process and the timing of applying the proposed methodology can be tailored to suit the needs of individual businesses. The methodology itself is organized into four levels of agile maturity, which are visually illustrated in Figure 1.

The methodology outlines a sequence of specific steps that characterize the transition between each maturity level. In the following sections, we will describe in detail what each level defines and how the transition from one level to another will be possible. Each transition will require meeting certain conditions that are defined for each level. It is important for businesses to realize that achieving the highest (green) level may not always be realistic for all industrial companies. A key step for enterprises is correctly identifying their agile maturity level, as this will serve as a steppingstone toward achieving the desired level of maturity and successfully executing agile-managed projects. When moving to a higher level, all requirements from previous levels must be met. In the following subsections, we will provide a checklist for each level, serving as a brief guide for the transition to the next level

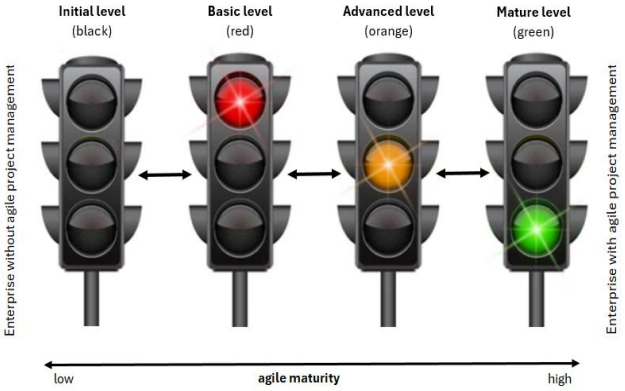

Figure 1. Model for Designing Agile Project Management Maturity Methodology (Own Processing)

A common challenge in clearly defining the agile maturity level is that companies often lack awareness of how to measure it, making the task a significant challenge. It is usually a difficult step for organizations, as they struggle to understand where to start and where they currently stand. This was one of the reasons we decided to propose a suitable methodology and describe in detail the steps needed to determine the correct level of agile maturity. It is important to note that understanding the different levels of agile project management maturity can help companies identify their current maturity level and find ways to improve their market position, enabling them to successfully execute projects.

Initial level (black)

The first level is designated as the "initial" level, which includes businesses that either do not engage in project management at all—i.e., those with minimal awareness of project management—or businesses that only apply traditional project management methods. In our metaphorical traffic light model, this level is marked by the colour black. To put it in traffic terms, this is a situation where the traffic light is completely off, and the business cannot be considered an active participant in the flow of traffic. At this stage, companies often lack knowledge of agile principles or may even actively resist them. This level is an opportunity for businesses to recognize the potential of applying agile concepts to improve work efficiency. It marks the beginning of an awareness that there are better ways to achieve goals.

As previously mentioned, two types of businesses typically belong to the initial level. The first category includes companies that do not apply any project management at all. These are businesses with low awareness of project management. They typically exhibit the following characteristics:

- Weak support and willingness of top management to implement project management.
- Lack of interest in acquiring new knowledge in project management.
- Project management is only used for less important tasks and simple projects.
- Insufficient support for acquiring information on the benefits and advantages of project management.
- Lack of experts in project management.
- Missing methodologies, procedures, and clearly defined processes for managing projects.
- Fear of transitioning from authoritative management to project management.
- Lack of training in project management.

- Insufficient knowledge of project management methods, techniques, and tools.

The second type of businesses in the initial stage are those that solely employ traditional project management. These businesses exhibit the following characteristics:

- Customer requirements are fixed at the beginning of the project and remain unchanged throughout its execution.
- The final deliverable is provided to the customer based on pre-agreed specifications.
- The project follows a structured life cycle divided into distinct phases, with each phase needing to be completed before moving on to the next.
- Experts are specialized in handling specific project phases.
- Clear, defined project management processes are in place, including guidelines, models, analyses, methodologies, handbooks, or procedures that must be followed.
- A system for monitoring compliance with established project management rules is in place.
- The project's steps and responsibilities are standardized and clearly defined (e.g., Work Breakdown Structure - WBS).
- Employees responsible for project management undergo training and obtain certifications.
- A functioning reporting system is in place to inform managers about the project's status.
- Ongoing learning and development opportunities in project management are provided.
- A knowledge database, including lessons learned from projects, has been established.
- The project resists changes, meaning that any changes during the project's life cycle are not accepted.
- Strict adherence to pre-established milestones is maintained.

When implementing agile project management for the first time, the focus should be on shifting the mindset and way of thinking of individuals, rather than altering processes. Companies that do not wish to adopt an agile approach are typically not looking to tackle new challenges, stay on the cutting edge with the latest technological products, or maintain a leading position in the market. In contrast, agile project management is most relevant for companies that aim to rise to the top in their industry and remain competitive.

The time it takes to move from the first/initial level to the second/basic level can vary, and this transition may take a significant amount of time. Several factors can influence this progression, and these same factors apply when transitioning between other levels as well. Factors influencing transitions between the different levels include:

- Support from top management.
- Size and type of the company.
- Established corporate culture.
- Business performance (positive/negative).
- Employee turnover and shortages.
- Unfavourable external market factors (inflation, energy crisis, insufficient demand, pandemics, raw material shortages, etc.).).
- Opportunities, speed, and suitability of the retraining process.

For a company to progress from Level 1 to Level 2, it must meet the specific criteria outlined in Table 2. Achieving these criteria is essential for any organization moving toward agile development. To successfully reach Level 2, all the requirements must be fully satisfied. Partial fulfilment of these criteria will not be sufficient for advancement. The goal of the initial level is to help organizations understand that projects can be carried out more efficiently, but they must carefully examine how to implement this improvement.

Table 2. Checklist for Transition to Level 2 (Own Processing)

Requirements	1st level	For transition to the 2nd level
Familiarizing oneself with the issues and understanding the concepts and principles of agile project management.	Is missing	Must be
Knowledge of the key terms and concepts within agile project management.	Is missing	Must be
Understanding the potential benefits of adopting agile project management.	Is missing	Must be
Completion of training or mandatory preparation in agile project management.	Is missing	Must be
Acceptance of future changes, whether related to agile thinking or project execution.	Is missing	Must be
Establishment of at least one test self-organizing team with all the necessary skills for project implementation.	Is missing	Must be
Acceptance of change requests from the customer during the project's execution.	Is missing	Must be

For companies aiming to adopt agile project management, it is essential to clearly define their objectives and outline a step-by-step implementation plan, whether transitioning from traditional project management or introducing agile practices. Once agile is fully adopted, it can become a highly effective approach for successfully delivering projects. Conducting a thorough analysis of agile project management, along with completing relevant training, is a critical part of the transformation process. It's also recommended that the transition to agile should not be driven by a single person's authority but should involve discussions among a wide range of employees across different roles. A comprehensive brainstorming session can provide valuable insights and diverse perspectives, which are often instrumental in making informed strategic decisions.

Basic Level (red)

The defining characteristic of this level is that organizations have fulfilled all the necessary requirements from the initial stage. Meeting these criteria is essential to progressing to the next level. We've labelled this second stage as the "basic" level, represented by the colour red in our traffic light analogy. To use a traffic metaphor, it's like being in the flow of traffic but having to wait for the signal to turn green before continuing.

The key feature of this level is that organizations are familiar with agile project management and recognize its importance for effectively managing projects in an agile way. They also acknowledge that adopting agile project management involves a challenging transformation, including changes to mindsets, workflows, practices, values, collaboration, and coordination. All these aspects need to be addressed and resolved. It's important to note that reaching the "basic" level does not mean the organization is fully agile. It's simply one step toward achieving full agile maturity and excellence in project management. Organizations should not become complacent but must continue advancing toward their goal.

A critical aspect at this level is the creation of a functioning self-organizing agile team. The number of agile teams at this stage can range from one or more, depending on the size of the organization. In simpler terms, these are teams that manage entire projects in an agile manner, utilizing all the knowledge and resources available for agile project management. Agile teams need to feel supported by top management, but they should not be directly or regularly controlled by them. Their autonomy must be preserved.

The role of management is critical when implementing agile project management. For companies that have reached the basic level of agile maturity, it is essential for the management to steer clear of common mistakes that could hinder or even halt further progress towards a higher level of maturity. Some of the most typical pitfalls management faces during the agile project management implementation process include:

- The management perceives agile project management as a threat to their position within the company.
- The management does not provide sufficient support to employees attempting to manage projects using agile methods.
- The management intervenes in projects from a position of power, seeking to maintain control.
- The management lacks trust in the established agile teams and is not convinced of their validity
- The management does not adequately support education and invest in further training for new agile candidates among employees. This means that management should be among the first to undergo training in agile project management and should recognize the ongoing need for training for other employees.
- The management clings to established processes and defined guidelines stemming from traditional project management.
- The management does not clearly communicate the company's agile direction and does not exemplify the acceptance of agile thinking and work according to defined agile principles.
- The management is not open to changes in projects and has concerns about the unknown.

To move from level 2 to level 3, all the requirements specified in Table 3 must be fully met. Partial fulfilment of these requirements will not be considered adequate for progression. Achieving these criteria is essential for a seamless transition to the next, more "advanced" level.

Table 3. Checklist for Progression to Level 3 (Own Processing)

Requirements	2nd level	For transition to the 3rd level
Basic utilization of procedures, methodologies, and terminology in the field of agile project management.	Is missing	Must be
Adapted organizational culture for agile project management.	Is missing	Must be
Gradual shift away from traditional project management life cycles.	Is mussing	Must be
Employees managing agile projects are certified in agile project management and capable of conducting internal training for other staff.	Is missing	Must be
Positive feedback from customers with whom an agile-managed project was executed.	Is missing	Must be
At least one fully functional self-organizing team with experience in implementing agile project management.	Is missing	Must be
Successful implementation of change requests into the agile-managed project during its execution.	Is missing	Must be

Advanced Level (orange)

The advanced level is characterized by the organization's adoption and understanding of agile project management principles and values. The organization can apply appropriate agile project management methods or even developing its own processes by combining elements from available agile approaches. At this stage, agile teams can work autonomously and continuously deliver the expected outcomes. They efficiently complete planned iterations while actively focusing on improving their work, which is regularly showcased to customers. These teams consist of experienced professionals who demonstrate mutual trust, collaboration, and consistent communication.

However, it's important to note that not all organizations may reach this level. This could be since achieving the advanced level may not be a goal for some organizations, or the leadership may not provide the necessary support to reach a higher level.

If we were to explain it using a traffic light analogy, the advanced level would be represented by the colour orange. In this context, it means that we're on the move, fully participating in the process, and our journey has begun. There shouldn't be any significant obstacles along the way soon.

At the advanced level, awareness of agile project management should be high. It's crucial that this awareness continues to grow and those employees understand the benefits and positive impact it brings to the business. It is recommended that information about the advantages of implementing agile project management be shared with all employees, focusing on the positive outcomes observed so far. Real-life examples should be highlighted, allowing employees to see how their contributions have affected the projects and what value those projects have delivered to the company. At this level, it's also recommended to begin creating a "lessons learned" database, where all challenges, anomalies, and gaps encountered during agile project management are documented. Furthermore, the approach to accepting and implementing customer change requests should be fully integrated and well-established at the advanced level.

Each level of agile maturity comes with specific requirements for progressing to the next stage. This is also the case for advancing from Level 3 to the highest, Level 4, as detailed in Table 4. To reach the highest level, all the listed criteria must be fully satisfied. Only when these criteria are completely met can the transition to the "mature" level occur. Partial fulfilment of these requirements will not be enough for progression.

Table 4. Checklist for the transition to 4th level (Own Processing)

Requirements	3rd level	For transition to the 4th level
The company has successfully implemented and adopted agile project management methodologies, practices, and terminology.	Is missing	Must be
All employees involved in agile project management are either internally or externally trained or certified as necessary.	Is missing	Must be
Changes within projects are welcomed and expected.	Is missing	Must be
Members of agile teams can clearly define their roles, with each team member having a clear understanding of their objectives and the path to achieving them.	Is missing	Must be
Agile teams have standardized processes and are committed to continuous improvement and innovation in their agile practices.	Is missing	Must be
The company maintains more than 50% active and functioning self-organizing teams that manage projects using agile methodologies.	Is missing	Must be
There is a strong focus on communication with customers who prefer agile project management, while traditional project management methods are not prioritized.	Is missing	Must be

Mature Level (green)

The highest level of agile maturity is referred to as the "mature" level. This stage is marked by the company's achievement of near perfection in agile project management. At this point, agile processes are fully implemented and operating effectively, producing optimal results. Both employees and management have shifted their mindset, work habits, and approaches, with traditional project management being pushed into the background. It's important to note,

however, that just because a company reaches the mature level, it doesn't mean they will exclusively use agile project management moving forward. Ideally, they would not revert to traditional methods, but there may be instances where customers require traditional project management for certain projects. If the business wants to secure those opportunities and make a profit, it must be flexible enough to adapt to customer demands. While doing so, they can still incorporate agile principles in their approach and potentially offer additional support for implementing agile, providing the customer with more than they initially expected.

Achieving the mature level can be particularly challenging for industrial companies due to ingrained practices, market demands, contractual obligations, and company size. However, any business has the potential to reach the highest level of agile project management maturity. For some, this journey may be more difficult and time-consuming than for others. Success depends on the determination of individuals and the right mindset.

The mature level is represented by a green colour on the traffic light model. This means the company is in a position where, in terms of traffic, it has a clear path ahead—no stopping, no delays. It can accelerate and reach its goals faster than others. In this context, the company gains a significant competitive advantage, particularly with customers who favour agile project management.

At the mature level, agile teams truly embody agility, going beyond simply working in an agile manner. These teams are composed of individuals who fully embrace the agile mindset. They engage with their assigned customers daily, consistently gathering feedback and insights. Trust is immediately established among team members, fostering open communication, and enabling them to deliver high-quality solutions. This collaboration leads to optimal customer satisfaction, with the customer becoming an integral part of the team's dynamic. In these agile teams, any customer change requests are swiftly addressed, discussed, and integrated into the project without relying on pre-approved plans. The deliverables are consistently produced with technical excellence and simplicity. Continuous improvement is a key element of these teams, as they strive to enhance their processes and outcomes to meet evolving customer needs and expectations.

If a company wants to maintain its achieved level in the long term, it is essential that:

- Never slowed down in his long-term efforts.
- Continuously improved and progressed.
- Developed his potential in the market.
- Constantly monitored new trends and opportunities in agile project management.
- Regularly provided training and development for employees.
- Focused on the needs of both employees and the organization.
- Ensured independence, support, and trust within agile teams.
- Protected team members from disruptive influences, ensuring maximum focus and increasing time for meaningful work.

The suggested methodology for evaluating the maturity of agile project management in industrial companies provides a framework for enhancing agile practices, offering valuable guidance for businesses looking to embrace this approach.

5 DISCUSSION

The analysis of agile maturity models for project management reveals that traditional models primarily focus on establishing and correctly identifying the processes necessary for standard or waterfall project management within companies, where the project manager holds full responsibility for the project. These models emphasize a continuous transition between phases, where one phase must be completed before moving on to the next. In contrast, agile maturity models are designed to identify, analyse, and evaluate the current state of agile maturity, including the implementation of agile project management, mindset, and awareness within organizations. These models help businesses and teams track the effectiveness of their agile practices.

One of the biggest challenges with agile maturity models is their diversity and the lack of consistency across different models. A major risk is the possibility that employees may misidentify the maturity levels within organizations or teams due to insufficient clarity on the conditions required to transition between levels. This can ultimately lead to a decline in motivation to advance agile practices.

Some academic studies have highlighted concerns about the absence of a universally accepted agile maturity model that can be applied across various types of businesses. A 2013 article explored a case study focused on evaluating agile maturity models, and the findings revealed that the compared models were not cohesive and demonstrated very low effectiveness in accurately measuring agile maturity [Ozcan-Top 2013].

A similar study conducted in 2019 analysed several agile maturity models and arrived at conclusions comparable to the earlier research. The models were found to be inconsistent, with several failing to provide clear justifications for implementing agile practices, as well as lacking detailed descriptions of the transitions between different maturity levels. Additionally, the study revealed that teams had introduced agile practices in an order different from what most of the models suggested. This was attributed to the unclear and ambiguous definitions provided in the models. Furthermore, the models showed discrepancies in how the maturity levels were characterized [Nurdiani 2019].

One of the common issues identified is that agile maturity models often target the wrong objectives. The existing models may inadvertently prompt organizations to focus solely on processes, while agile businesses need their employees to be capable of managing projects using agile methods and have the skills to resolve problems independently. Moreover, these models might lead managers to develop a false sense of control over their teams, rather than promoting trust and freedom to help employees develop their strengths [Eby 2023, Stefko 2024]. These findings help answer the question: "How does the agile maturity model we propose for industrial enterprises differ from existing models?" The answers are as follows:

- Clear and well-defined checklists will be created for transitions between levels. These checklists are designed to be straightforward, ensuring a lower time commitment for respondents. Each level includes a clear description of the requirements needed for a successful transition between the chosen levels.
- Four distinct levels of maturity are proposed, which is considered an advantage, making it easier to identify the appropriate level of maturity.
- The defined sequence of steps will facilitate easier acceptance and alignment between the company and the proposed methodology for industrial enterprises operating in Slovakia. This will save companies time and avoid the complicated task of selecting the right agile maturity model from the many available options on the market.
- The suitability for companies operating in Slovakia, considering the ease of applying the methodology through

defined checklists, as well as the clear understanding of the issue, thanks to the removal of potential language barriers.

6 CONCLUSIONS

The proposed methodology for assessing the maturity of agile project management is designed to be universally applicable for both medium and large industrial enterprises, regardless of their specific industry. By implementing this methodology, industrial companies in Slovakia will be able to gradually adopt agile project management practices. Proper application of this methodology will help companies become more competitive, reliable, and appealing to potential partners both domestically and internationally.

The implementation of this methodology may vary for each company, as each organization is unique with its own goals, processes, culture, and development trajectory. Therefore, it is important for each company to carefully assess what they expect from this methodology and adapt the steps and recommendations to suit their specific needs. Additionally, not all procedures and recommendations may be universally applicable to every type of business. In cases of uncertainty, external support from agile experts or the organization of training sessions for employees on agile project management is recommended. These training sessions often address questions that seemed difficult or unattainable at the initial stages of becoming familiar with agile project management.

After reviewing the methodology and overcoming any initial challenges, it is crucial to communicate the planned changes to employees and prepare them for the intended transformation in the company culture. Employees will need time to accept the proposed changes, which can be achieved through clear and timely communication across the organization. It's important to highlight the benefits and positive outcomes that the transition to agile project management can bring. Regularly gathering feedback from employees will also provide valuable insights for improvement and help identify any training needs for the staff. If industrial enterprises decide to implement the proposed methodology, it's recommended to follow the instructions laid out in each level and meet the necessary requirements to progress to higher levels.

The implementation of the proposed methodology is a process that requires a longer time frame. Therefore, it is advisable to validate the effectiveness and suitability of the implementation after a certain period, potentially several years. Verification can take place in companies that have already adopted the methodology. Knowledge gathering can be done through verbal discussions, such as one-on-one interviews with managers involved in project management, or through pre-prepared surveys. Once feedback on the methodology's usage is collected, further adjustments and additions can be made, incorporating new trends in agile project management to assess its potential for future real-world implementation.

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