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Intentions to continue using agile methods: The case of the Greek banking sector☆

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ABSTRACT

The purpose of this study is to examine the factors that influence team members of software development projects to continue using agile methodologies after their initial adoption. The research focuses on large-scale projects in the banking sector and uses the expectation-confirmation model (ECM) as a conceptual framework. The research model is tested by employing partial least square structural equation modeling (PLS-SEM). The findings validate the model and report statistically significant positive associations between all constructs. The results suggest that confirmation of expectations regarding perceived usefulness and satisfaction are key determinants of agile continuance intentions in software development large-scale projects. The study has both theoretical and practical implications and calls for further research in the field of agile post-adoption.

1. Introduction

Agile software development (ASD) methods have become very popular during the last decades and team members working on agile projects have learned to communicate more, work closely together, shift workload between individuals, and understand each member's efforts (Lindsjørn et al., 2016). Human aspects play an indisputable role in the success of ASD projects (Vishnubhotla et al., 2021) and researchers have focused on emotions (Abd El-Migid et al., 2021), satisfaction (Kropp et al., 2020), and people factors (Tam et al., 2020a) of agile team members. However, little is known about the aspects that influence the intention of individuals to continue using agile methods after their initial adoption.

ASD methods were originally developed and used in small projects, but their numerous advantages led to their employment in large-scale software development projects (SDPs) as well (Batra, 2020). Large-scale agile projects are defined as having 2–9 collaborating teams (Dingsøyr et al., 2014), or more than 50 people working together (Dikert et al., 2016). Adopting agile methods in large-scale projects is considered a difficult process (Dyba and Dingsoyr, 2009), especially due to many existing dependencies between projects and teams, that extend the need for formal documentation and minimize agility (Lindvall et al., 2004). Moving from traditional to agile methods in an organization is considered a complex process, especially due to change resistance and insufficient management support (Chow and Cao, 2008), whereas it often requires a complete organizational culture change (Misra et al., 2009).

Team members in large-scale agile projects need to interact with other, non-development organization units that are non-agile (e.g. human resources) (Boehm and Turner, 2005), better synchronize their activities, and deal with inter-team coordination. This increases the difficulties of agile implementation, intensifies change resistance, and creates challenges in requirements engineering (Dikert et al., 2016). Thus, it is important to understand the agile team members' beliefs and feelings about the used ASD methods and identify the factors that lead to their reuse. Since one of the basic success factors for ASD projects is people (Misra et al., 2009; Tam et al., 2020a), understanding agile team member expectations is crucial for agile continuance in organizations. The lack of empirical research into the continuance intentions of agile team members may reflect an assumption that individuals are willing to embrace any ASD method introduced for their projects. This assumption though may not hold, since people working in agile SDPs could think otherwise. Moreover, although many researchers have studied the initial acceptance of agile methods, there is still a call to better understand them in the post-adoption stage (Abrahamsson et al., 2009; Gregory et al., 2016).

This study tries to fill this research gap, by focusing on the banking sector in Greece – a country whose banking industry was

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highly affected by the economic crisis (Keisidou et al., 2013) – and examining the factors that drive team members of large-scale agile SDPs to continue using ASD methods. The theoretical basis for our study is the expectation-confirmation theory (ECT) introduced by Oliver (1980) and we suggest using the expectation-confirmation model (ECM) developed by Bhattacherjee (2001) as our research framework.

The contribution of this study is threefold. First, this research tries to fill the literature gap regarding the empirical examination of the post-adoption of agile software development methods from the team members' viewpoint, using a causal-prediction modeling perspective. To the best of our knowledge, this is the first study that focuses on the antecedents of agile methods continuance intentions from the team members' perspective and sets a baseline on how ECM can be applied in the context of agile methods acceptance after initial use. Second, this study focuses on large-scale agile projects in the banking industry, which needs to quickly develop automated systems in order to reach the competition against fintech companies (Munteanu and Dragos, 2021). Since no previous research has focused on the intentions of banking team members to continue using ASD methods, this study contributes to the literature on banking agile SDPs. Third, our research proposes guidelines to companies and project leaders who decide to move from traditional to agile software development methods, suggesting that the confirmation of the team members' expectations, along with the perceived usefulness and their satisfaction from using ASD methodologies will influence their post-acceptance level.

The remainder of the paper is arranged as follows. The next section presents an overview of the literature on agile software development and its implementation in the banking sector, as well as previous research regarding post-adoption agile usage. In Section 3 we reveal our research framework and hypotheses. Section 4 and Section 5 focus on the research methodology and results, respectively. In Section 6, we offer a discussion of the results, the contributions, limitations, and further research opportunities. Finally, the last section presents the conclusions of this research.

2. Literature review

2.1. Agile software development

A major concern that is still present in today's organizational environment is the difficulty faced in handling successful software development projects (Tam et al., 2020a). The factors that lead to successful SDPs have been studied in previous research (Chow and Cao, 2008; Cooke-Davies, 2002), highlighting the involvement of organizational, people, and technical issues (Radujković and Sjekavica, 2017). Despite the importance of software in the modern world, software development has not always been a successful process, resulting in failed, abandoned, delayed, or rejected projects (Chow and Cao, 2008). Understanding the conditions and situations that cause SDP failure could lead to early detection and prompt responses toward avoiding such outcomes (Bawack and Ahmad, 2021).

To overcome the difficulties of high-quality, under budget, and timely software delivery, and at the same time be able to handle unstable requirements and adapt to changes rapidly and flexibly (Jyothi and Rao, 2011; Qumer and Henderson-Sellers, 2006), software development projects have adopted an agile methodology that can be used for project management and software development practices (Bawack and Ahmad, 2021). The manifesto for agile software development was developed in 2001 by seventeen software developers (Beck et al., 2001), who later formed the Agile Alliance. The primary purpose of the manifesto was to uncover better ways of developing software by collecting principles from well-established agile methods and converting them into software development projects (Campanelli and Parreiras, 2015). Agile software development (ASD) is considered an alternative to traditional SD methods since it is designed to accept and manage changes, motivate customer involvement, deliver the product incrementally, and encourage the free flow of communication (Dikert et al., 2016; Tam et al., 2020a). It requires multidisciplinary skills, small teams, and collaborative work, in contrast to traditional software development that focuses on specialized skills, larger teams, and individual work (Lindsjørn et al., 2016).

Different ASD methods have been developed, which constitute a collection of techniques and principles that focus on the continuous and fast delivery of good quality software (Cohen et al., 2004). By breaking the development process into smaller cycles, agile methods initially provide a limited set of functions to users and then evolve based on the customers' changing requirements (Hong et al., 2011).

The rapid adoption of agile methods in the software industry worldwide (Digita.ai, 2021) has increased the efficiency and transparency of the development process, along with the stakeholders' satisfaction (Munteanu and Dragos, 2021). Some of the advantages of the ASD methods are the autonomy and high effectiveness, the timely detection of defects, the transparency of the procedures, and the quality of the deliverables, which lead to project managers', developers', and customers' greater satisfaction (Lee and Chen, 2019).

2.2. Post-adoption agile usage

While previous research has focused mainly on the adoption of agile methods in organizations (Chow and Cao, 2008; Misra et al., 2009), there has also been an effort to examine their post-adoption usage. Post-adoption refers to the phase where agile methods have completed the adoption stage and start to become well-established processes within an organization (Abrahamsson et al., 2009) and part of the normal routine activity (Bhattacherjee, 2001). An organization is considered to be in a post-adoption stage when it has been using agile practices for more than two years (Senapathi and Srinivasan, 2012). Post-adoption is also found in the literature as post-acceptance (Bhattacherjee, 2001) and sustainable (Overhage and Schlauderer, 2012; Senapathi and Drury-Grogan, 2017).

Senapathi and Srinivasan (2012) proposed a model that recognizes critical factors for post-adoptive usage of agile practices. Their results suggest that top management support, team attitude and technical competence, relative advantage, and championing are the key factors for agile practices' adoption in an organization. Later, Senapathi and Drury-Grogan (2017) refined the model of sustained agile usage to illustrate a complete understanding of the critical factors for the continuous usage of agile methodologies, which include agile team factors, technological factors, and organizational factors.

Wang et al. (2012) examined the assimilation of agile practices (Scrum & XP) using four case studies. They focused on the acceptance, routinization, and infusion of the agile methods in the organizations, i.e. the post-adoptive stages. Their findings indicate that the time agile practices are used does not have a proportional effect on their assimilation depths and that teams that have adopted agile methods do not always move through the assimilation stages linearly. Overhage and Schlauderer (2012) investigated the long-term acceptance of an agile methodology (Scrum) and identified several post-acceptance factors, including relative advantages, compatibility, and complexity. Barroca et al. (2018) explored the perceptions of post-adoptive agility by interviewing 50 practitioners and identified that sustainability in agile is about being completely agile, independent, focused on business

value and need, and consistent across time. They emphasize that the area of post-adoptive agility lacks necessary research, and they point out the inconsistency in terminology, as well as the different perceptions of researchers and practitioners regarding the key factors for sustaining agility.

Vijayasarathy and Turk (2012) investigated the factors that influence an adopter of agile development methods to continue using them. Drawing on the theories of planned behavior and reasoned action, they found that the interplay between perceived benefits and limitations is the determinant of the acceptance and use of agile software development techniques. Bahli et al. (2011) tried to explain the reasons for the adoption and usage of agile software development methods, by extending the technology acceptance model (TAM) with absorptive capacity. Their findings indicate that the absorptive capacity of information systems developers is an important factor not only for the initial adoption of agile techniques but for their future usage as well. Gregory et al. (2016) investigated the challenges that agile practitioners face and the way these challenges manifest themselves in an organizational setting. One of their findings suggests that practitioners are nowadays less concerned about adopting agile and more concerned about sustaining agile.

2.3. The banking sector

The banking sector, with its large, sometimes monolithic, legacy systems and processes, seeks to incorporate the rapid improvements in software technology and implement innovative digital solutions (Christou et al., 2009). Compared with other industries, it is considered one of the most important revenue contributors (Trisaktyo et al., 2020). Information technology adoption can lead to radical organizational improvements through customer satisfaction (Nudurupati et al., 2011) and banks are encouraged to enhance this opportunity and produce new products and services (Priambodo et al., 2019). Thus, they make investments in hardware and software development and employees training (Shaik and Abdul-Kader, 2014), in an attempt to upgrade existing services, automate outdated processes, and reach the competition, especially against fintech companies (Munteanu and Dragos, 2021).

The changes brought by industry 4.0 had a great impact on the banking sector. Banks are urged to transform digitally, by offering new products and services, in order to improve customer experience, maximize operational efficiency, and avoid being outperformed by the competition (Machkour and Abriane, 2020). Therefore, new software development projects require the necessary attention to reassure quick and high-quality delivery. Digital transformation in commercial banks highly interests companies, researchers, and policymakers (Lee and Shin, 2018), and it refers to the developments of banking software, mobile, and digital banking solutions, system automation, etc. (Ortaköy and Özsürünç, 2019). Banking SDPs are usually long-term projects that require major strategic changes and successful risk management and thus they are considered a great challenge for executive management (Bilal et al., 2020). Traditional software development methods delayed the development of new products and services in banking institutions (Chen et al., 2017) and agile approaches are now considered a possible alternative solution (Indriasari et al., 2021).

The use of agile software development methods in the banking industry is a subject of current research. Munteanu and Dragos (2021) examined the basic differences between agile and traditional methodologies in the development of software solutions for the banking sector. They found that the application of agile concepts increases the efficiency and transparency of the development process, while strengthens the stakeholders' satisfaction. Moreover, they argued that it is crucial for project managers to understand the different agile frameworks and to adopt the most suitable one for the context of their organization. Berkani et al. (2019) investigated the reasons that lead to agile transformation in large organizations, using the French central bank as their case study. Their results indicate that top management support was a crucial factor in the generalization of an internal agile method. Indriasari et al. (2021) explored the process of banking digital transformation, studying four Indonesian banks. They focused on the adoption of agile software development, design thinking, and co-creation concepts and found that ASD improved the quality of digital product delivery timely and cost-effectively. Roses et al. (2016) proposed a model for assessing the degree of conditions favorability in the adoption of agile methods for software development where traditional methods prevail. They tested their model in a Brazilian public banking institution and found that the agile practices were favorable for adoption in the institution. Gupta et al. (2019b) developed a framework to measure the critical success factors for agile software development methodologies in the banking sector and to estimate the maturity of the agile implementation. Their meta-analysis research indicated twelve success factors that should be evaluated when assessing ASD success, which include automated verification of requirements, accuracy of estimates, active client involvement, expertise with product/technology, availability of skilled resources, effective communication/knowledge sharing, effective risk mitigation, automation and productivity improvement, continuous integration, parallel development, real-time root cause analysis and test driven development.

Trisaktyo et al. (2020) examined whether agile approaches can be applied to banks running on legacy systems. Therefore, they analyzed a bank in Indonesia that used ASD methods to implement new technologies above its existing infrastructure. The results of their case study revealed that agile methods can be used for such an organization since they can minimize platform barriers. Indra et al. (2021) tried to identify the challenges in banking agile IT projects and rank them according to their significance. They used Analytical Hierarchical Process (AHP) and found that the most important challenge is the absence of customer or stakeholder commitment throughout the project, followed by the unclear high-level requirements in early development and the change of demands.

The above studies, however, focus mainly on the pre-adoption stages of agile methods in software development projects in the banking industry as well as on the improvements brought by agile practices, leaving a gap regarding the factors that lead team members to continue using ASD methods after adoption.

3. Research framework and hypotheses

Many models have been developed and used to understand the initial adoption of a technology or a system. Such models include the technology acceptance model (TAM) (Davis, 1989), the theory of planned behavior (TPB) (Ajzen, 1991), the unified theory of acceptance and use of technology model (UTAUT) (Venkatesh et al., 2003), and the integrated TAM model including the extension of user satisfaction (Wixom and Todd, 2005). However, even though these models have been used in many studies, they are not considered suitable for examining continuous usage behaviors (Bhattacherjee and Barfar, 2011; Nabavi et al., 2016).

As a result, to study post-adoption continuance usage, a handful of other models have been developed. DeLone & MacLean developed the IS success model (DeLone and McLean, 2003) which includes the independent variables of information quality, system quality, and service quality that positively affect user satisfaction, intention to use, and net benefits. Deng et al. proposed a model

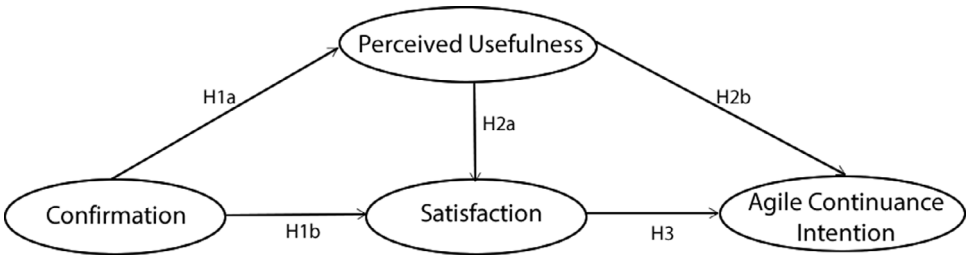

Fig. 1. Research framework.

to investigate the factors that lead to the continuance intention of using technology (Deng et al., 2010). Their findings suggest that satisfaction is the only factor that influences users' continuance intention, whereas cognitive absorption is positively associated with perceived hedonic performance, perceived utilitarian performance, expectation disconfirmation, and satisfaction.

Drawing on the expectation-confirmation theory (ECT) introduced by Oliver (1980), a model to identify information systems continuance intention has been developed (Bhattacherjee, 2001). The expectation-confirmation model (ECM) consists of four variables: (1) the extent of the user's confirmation of expectations; (2) the post-adoption expectations, in the form of perceived usefulness; (3) the user's level of satisfaction; (4) the user's continuance intentions. ECM has been tested in studies in different fields, from online shopping (Wu et al., 2020) and mobile applications (Tam et al., 2020b), to agile SDPs (Bawack and Ahmad, 2021; Hong et al., 2011).

The ECM is based on the assumption that the user's intention to continue using the IS depends on the perceived usefulness of the system, and the overall satisfaction the individual receives from its use. The level of confirmation of the users' expectations before the utilization of a system influences their satisfaction, as well as the expected anticipated benefits (Bhattacherjee, 2001). Bawack and Ahmad (2021) employed ECM to examine the expectations from business analytics (BA) by agile ISD project members and understand how it affects their intention to continue using BA technologies in such projects. Their results indicate that perceived usefulness and technological compatibility are the main antecedents of BA continuance intention. Hong et al. (2011) investigated the factors that lead to user acceptance and continuance intention of agile IS, combining ECM with the unified theory of acceptance and use of technology (UTAUT) model, habit, and individual differences. Their findings suggest that the users' intention to continue using agile information systems is affected by their satisfaction and perceived usefulness of past upgrades, as well as by their level of comfort with constant changes, habit, and facilitating conditions.

Although ECM was first introduced to examine the post-acceptance usage of a system, it has later been used in studies to investigate continuance intentions in other areas, like customer loyalty (Wu et al., 2020), processes, technologies (Bawack and Ahmad, 2021) and services (Kim, 2010). Moreover, in contrast to other frameworks, ECM theorizes on the cognitive beliefs that influence users' continuous intentions (Bhattacherjee, 2001). Thus, in our research, we use ECM, as the most appropriate model, to understand the intentions of the members of agile software development projects to continue using agile methods. Since this study is a first attempt to examine whether ECM is capable of measuring continuance intentions in agile methodologies, it was considered important not to add any other constructs, and thus keep the original ECM model. We focus on examining ASD methods held in the banking sector since it highly concerns researchers, companies, and policymakers, it is one of the most important revenue contributors and it involves large-scale, complex projects that are subject to substantial risks. Fig. 1 illustrates the research framework of this study.

According to Franque et al. (2020), IS continuance intention refers to the long-term factors that determine an individual's will to keep on using a system in the future. Previous studies have recognized many antecedents of continuance intention, ranging from behavioral and psychological to social and technological ones (Yan et al., 2021). In our study, we examine the agile continuance intention (CI), which corresponds to the intention of an SDP member to continue using agile methodologies in future projects. Exploring the factors that affect CI in large-scale agile projects, like the ones in the banking sector, gives insights into the qualities of future SDPs and helps recognize critical success and risk factors.

Confirmation is the user's realization of the convergence between their expectations before using a system and its actual performance after use (Bhattacherjee, 2001) and it implies an understanding of the post-adoption benefits (Veeramootoo et al., 2018). Past studies have revealed that confirmation is positively associated with perceived usefulness, due to users' initial uncertainty about the system's or technology's value (Chong, 2013). People expect that the use of a system, technology, or method will enhance their job performance, and thus, they will continue using it as long as they perceive it useful for their work Bhattacherjee (2001). In the case of agile methodologies, we suggest that this is also true, and that team members' expectations will influence the perceived usefulness of the specific ASD method. Team members develop initial expectations about agile methodologies prior to their use. After they actually test them in a real working environment, they update their expectations based on their experiences. If the agile methodologies meet their initial expectations, team members' post-adoption expectations are confirmed. In many studies, post-adoption expectations are represented by perceived usefulness (Kim, 2010; Thong et al., 2006). Furthermore, research has shown that confirmation is also a determining factor of user satisfaction since individuals whose expectations regarding a system are confirmed become more satisfied with its use (Bawack and Ahmad, 2021; Franque et al., 2020). In this study, we argue that this is also the case in ASD projects. Taking into consideration that agile projects call for efficient ways to adapt to the changing environment (Munteanu and Dragos, 2021), team members expect that the methodologies used are capable of satisfying their expectations.

Therefore, we hypothesize that:

H1a: Users' confirmation has a positive effect on the perceived usefulness of agile methodologies.

H1b: Users' confirmation has a positive effect on satisfaction with agile use.

Perceived usefulness reflects the profitability linked with using a system (Zhou, 2014) and it is associated with increased job performance (Davis et al., 1992). In previous research, perceived usefulness is also mentioned as expected benefits (Bhattacherjee, 2001) and it refers to users' or organizations' expectations

regarding the advantages they receive from using a system (Zhu et al., 2006). ECM argues that perceived usefulness is positively associated with user satisfaction (Bhattacherjee, 2001) and previous research has validated that argument (Bölen, 2020; Hew et al., 2017). In this study, we suggest that in ASD projects, team members will also be satisfied with the employed agile methodology, if they perceive it is useful. Moreover, perceived usefulness has proven to be positively associated with users' continuance intentions, since people tend to subconsciously pursue benefits even after the original acceptance of using a system (Bhattacherjee, 2001). Based on the ECM and the results found in previous studies, Bawack and Ahmad (2021) and Zheng (2019), we argue that this is also the case in the continuance intentions of agile methodologies. Hence, we form the following hypotheses:
H2a: Perceived usefulness of agile methodologies has a positive effect on satisfaction with agile use.
H2b: Perceived usefulness of agile methodologies has a positive effect on agile continuance intention.

Satisfaction refers to the positive feelings a user receives from the evaluation of using the technology (Bölen, 2020). Increased satisfaction strengthens the possibility of repeated use, whereas low satisfaction can lead to discontinuance intention of related IS products or services (Lee and Kwon, 2011). ECM argues that continuance intentions are primarily determined by the users' satisfaction (Bhattacherjee, 2001). Many studies have examined the influence of satisfaction on continuance intention (Alruwaie et al., 2020; Hew et al., 2017) and found that it is one of its strongest predictors (Mouakket, 2018; Veeramootoo et al., 2018). Thus, in our study, we suggest that:
H3: Satisfaction with agile methodologies has a positive effect on agile continuance intention.

Several studies have found that perceived usefulness mediates the relationship between confirmation and satisfaction (Limayem et al., 2007). This is because perceived usefulness is a critical factor in determining the level of confirmation that an individual perceives to have occurred, and it represents the degree to which a system is perceived as able to enhance performance and job-related tasks, leading to higher levels of satisfaction with the system. Moreover, previous research has suggested that satisfaction plays a mediating role in the relationship between perceived usefulness and continuance intentions (Arunachalam, 2019; Lin and Wang, 2012). This suggests that perceived usefulness leads to increased user satisfaction, which in turn results in increased continuance intentions. The reason behind this is that user satisfaction explains how and why users' perceptions of the usefulness of a system or method can influence their continuance intentions to use it (Bhattacherjee, 2001).

Thus, this research also examines the mediation role of: (1) perceived usefulness on the relationship between confirmation and satisfaction and (2) satisfaction on the relationship between perceived usefulness and continuance intentions. Hence, we hypothesize that:
H4: Perceived usefulness partially mediates the relationship between users' confirmation and satisfaction with agile methodologies.
H5: Satisfaction with agile methodologies partially mediates the relationship between the perceived usefulness of agile methodologies and agile continuance intention.

4. Research methodology

4.1. Measurement

This study is based on the expectation-confirmation model (ECM) consisting of four constructs. The scale measures of these constructs were adapted from previous studies that empirically tested and validated them. Continuance intention (CI) consisted of two items originating from Bhattacherjee (2001). For satisfaction (SAT), the three items were modified from Lee (2010), Bölen (2020), Hsiao et al. (2016), Vila and Kuster (2011), Cheng (2014), and Zheng (2019). Six items for perceived usefulness (PU) were adopted from Zhou (2014), Davis (1989), Bhattacherjee (2001), Chong (2013), and Kim et al. (2010). For confirmation (CONF) four items were derived from Bhattacherjee (2001), Bölen (2020), Hsu and Lin (2015), and Cheng (2014). Each item was measured by a 7-point Likert scale ranging from (1) strongly disagree to (7) strongly agree. To ensure the consistency and internal validity of the questions, three professional members of agile SDPs with at least 5-year experience in such methods were asked to participate in a pre-test to evaluate them. Based on their suggestions, some items were restated to improve clarity and understandability. The final list of the measurement constructs and items is shown in Appendix.

In terms of construct measurement, the items of CI, SAT, and CONF are reflective measures of the underlying constructs. On the other hand, following the suggestion of Baumgartner and Weijters (2021) PU items are formative indicators (Baumgartner and Weijters, 2021). Reflective measurements suggest that the estimation of the indicator variables is caused by the construct. On the other hand, formative measurements capture a specific aspect of the construct's domain, and thus the items determine the meaning of the construct (Dirsehan and Henseler, 2022; Hair et al., 2021).

To avoid common method bias we took the following ex-ante measures: (1) we used fact-based questions to minimize the possibility that respondents distort their answers to make them socially attractive or more compliant (Podsakoff, 2003); (2) we urged participants to provide honest responses, ensuring them about the anonymity and confidentiality of their involvement in the academic study and guaranteed them that there were no right or wrong answers (Chang et al., 2010); (3) we tried to avoid ambiguous terms, unfamiliar and vague expressions, we reworded some questions after the pre-test and kept the questionnaire short to prevent fatigue (Lindell and Whitney, 2001).

4.2. Data collection and sample

An online questionnaire was developed and used for data collection. The questionnaire was in Greek to avoid misunderstanding of English terms for non-familiar respondents. The survey consisted of three parts. The first part included a short greeting, the purpose of the study, a statement that guaranteed anonymity and confidentiality, questions regarding the respondent's familiarity with agile methodologies, and a question about the organization's post-adoption stage of using agile methodologies. If the respondents were unfamiliar with ASD methods, had less than a year of working experience, or their organization was using agile practices for less than two years (Senapathi and Srinivasan, 2012), then their answers were not included in the sample. The second part included questions related to the measurement constructs, necessary to examine their intention to continue using agile SD methods. The final part contained demographic questions, like gender, age, and position.

The questionnaire was sent to software development team members who work on agile projects in the banking sector in Greece. Three of the country's largest banks were used for data collection. 173 responses were collected from September to December 2021. Of these, 11 were excluded from the sample, due to the respondents' insufficient knowledge of the agile methods and/or less than a year of working experience. Thus, 162 responses were suitable for further analysis. The sample size exceeds the minimum required for the application of PLS-SEM,

Table 1
Sample characteristics (N = 162).

Feature	Distribution	Frequency	Percent
Gender	Female	79	48.77%
	Male	83	51.23%
Age	18–25	13	8.02%
	26–35	108	66.67%
	36–50	41	25.31%
	Over 50	0	0%
Current position	Product Owner	29	17.90%
	Project Manager	9	5.56%
	System Administrator	2	1.23%
	Tester	17	10.49%
	Business analyst	27	16.67%
	Software developer	70	43.21%
	Other	8	4.94%
Working experience	1 to 5 years	36	22.22%
	6 to 10 years	83	51.23%
	More than 10 years	43	26.54%
Agile experience	1 year or less	8	4.94%
	2 to 4 years	87	53.70%
	5 to 7 years	59	36.42%
	More than 7 years	8	4.94%
Agile method currently used	Kanban	31	19.14%
	Lean	47	29.01%
	Scrum	76	46,91%
	Other	8	4.94%

which according to statistical power analyses suggested by Cohen (2016) and implemented by Hair et al. (2021) in the form of a statistical power table, for statistical power of 80%, significance level of 5%, a minimum R^2 of 0.10, and three independent variables, the recommended sample size is 103.

Table 1 presents the sample characteristics. The respondents were almost equally distributed between females (48.77%) and males (51.23%), concentrated in the ages of 26–50 (89.98%). Most of them (43.21%) work as software developers, 17.90% as product owners, and 16.67% as business analysts. They all have more than a year of working experience and 95.06% worked on agile projects for more than 2 years, which ensures post-adoption stage (Senapathi and Srinivasan, 2012). Regarding the agile methods they currently use in the SD projects they work for, Scrum comes first (46.91%), followed by Lean (29.01%) and Kanban (19.14%). Variants of Scrum, like SAFe and LeSS were measured separately and are included in "Other". Drawing on this, we further investigated whether the specific agile method used would lead to different responses regarding the users' continuance intentions. We performed the Kruskal–Wallis non-parametric test to compare differences between the subgroups. The test results did not show any significant differences between the agile method used and the users' continuance intentions. Moreover, we tested whether there were statistically significant differences regarding continuance intentions coming from team members of different banks. The Kruskal–Wallis non-parametric test results did not indicate such differences.

4.3. Data analysis

The data analysis was performed using SPSS v. 26 and SmartPLS v. 3.3.7. Ex-post measures were taken to ensure the absence of significant common method bias in our data: (1) Following Podsakoff's (2003) suggestion we performed the Harman single-factor test to examine whether a single factor could explain most of our model's variance. The results of this test indicate that the general factor only accounts for about 45.40% of covariance among items, which is less than the threshold of 50%. (2) We examined the bivariate correlations between the measures and found that no pair of items showed a high correlation ($r > 0.90$) (Pavlou et al., 2007). (3) We calculated the variance inflation factor (VIF) for all our model's measures and discovered that all VIFs were less than 3.3 (Tables 2 and 6) (Kock, 2015). All these tests suggest that our model was free from common method variance bias.

Table 2
Internal reliability, convergent validity, and multicollinearity.

Construct	Item	Factor loadings	VIF
Continuance Intention (CI)	CI1	0.888	1.773
(CA = 0.795, CR = 0.906, AVE = 0.828)	CI2	0.932	1.773
Satisfaction (SAT)	SAT1	0.855	1.928
(CA = 0.789, CR = 0.877, AVE = 0.705)	SAT2	0.768	1.411
	SAT3	0.891	2.092
Confirmation (CONF)	CONF1	0.801	1.606
(CA = 0.790, CR = 0.864, AVE = 0.614)	CONF2	0.787	1.580
	CONF3	0.735	1.477
	CONF4	0.810	1.700

Notes: CA = Cronbach's alpha; CR = Composite reliability; AVE = Average Variance Extracted, VIF = variance inflation factor.

Structural equation modeling (SEM) was used to test our research model. SEM is a statistical technique that is widely used in various scientific fields to analyze the relationships between multiple variables (Hair et al., 2021; Henseler and Schuberth, 2022). SEM is a multivariate method that combines factor analysis and multiple regression analysis to test hypotheses about causal relationships among variables. It allows for the examination of complex models of relationships among multiple variables, including latent variables, i.e. variables that cannot be directly observed or measured (Hair et al., 2021). SEM is particularly useful in situations where the researcher is interested in understanding the underlying structure of the relationships among variables and how they are interrelated (Henseler et al., 2016). Additionally, SEM provides a way to test for measurement invariance and to examine the goodness of fit of the model (Hair et al., 2021). It is a powerful technique that can be used to examine relationships in various fields such as marketing, management, social sciences, and information systems (Batra, 2020; Bawack and Ahmad, 2021; Henseler et al., 2016).

In Structural Equation Modeling (SEM), two main approaches can be distinguished: covariance-based SEM and variance-based SEM. The covariance-based (CB) approach estimates the model parameters using the empirical variance–covariance matrix, and it is typically used when the hypothesized model includes one or more common factors. On the other hand, the variance-based approach first creates surrogate variables as linear combinations of observed variables, and then estimates the model parameters using these surrogates (Henseler et al., 2016).

Partial least square structural equation modeling (PLS-SEM) is a variance-based SEM method that focuses on prediction while also providing causal explanations through the structure of the estimated statistical models. In other words, it acts as a "causal-predictive" technique, which means that the path relationships are considered causal, as long as the structural theory is strong enough (Sarstedt et al., 2021). PLS-SEM can handle both reflective and formative constructs (Hair et al., 2019), and it is used to test theories and concepts (Romo-González et al., 2018). It is a suitable technique for analyzing complex inter-relationships between observed and latent variables, i.e. variables that are not directly measured but are inferred from other observed ones, through the measurement model (Dash and Paul, 2021; Hair et al., 2021). Observed and latent variables synthesize the measurement model, which is assessed based on the type of its measured constructs (reflective of formative). For reflective measurement

models, it is recommended that the following steps should be taken to ensure the model's reliability and validity (Benitez et al., 2020; Hair et al., 2021): (1) Test the internal consistency reliability using Cronbach's alpha. (2) Examine the indicator reliability, using factor loadings. (3) Check for convergent validity, using the average variance extracted (AVE) and composite reliability (CR). (4) Assess the discriminant validity, using the Fornell–Larcker criterion, cross-loadings and HTMT. For formative measurement models, it is important to Sarstedt et al. (2021): (1) Examine the significance of each indicator's weight. (2) Assess levels of collinearity, using each indicator's variance inflation factor (VIF).

After the validation of the measurement model and the evaluation of the model fit, the structural model is analyzed. The structural model represents the proposed theory and is a set of multiple regression equations, calculated simultaneously, which represent the hypothesized assumptions (Benitez et al., 2020). To evaluate the structural model, a number of assessments are required (Hair et al., 2021; Sarstedt et al., 2021): (1) R^2 values for all the endogenous latent variables that indicate the model's explanatory power. Values of 0.75, 0.50, or 0.25 can be described as substantial, moderate, or weak, respectively. (2) Path coefficients' significance, using bootstrapping with a minimum of 5000 iterations of re-sampling and 95% bias-corrected confidence intervals. (3) Q^2 values that should be larger than zero to satisfy that the exogenous constructs have predictive relevance for the endogenous construct under examination. (4) PLS path model's predictive power (or out-of-sample predictive power) using the $Q^2_{predict}$ for the model's key endogenous construct, which indicates whether the predictions made by PLS-SEM outperform the most naïve benchmark, defined as the indicator mean from the holdout samples. $Q^2_{predict}$ values should be larger than zero.

PLS-SEM is recommended for investigating the relationships and theoretical concepts of research problems (Benitez et al., 2020), especially when the analysis is concerned with testing a theoretical framework from a prediction perspective (Hair et al., 2019). It is usually preferred to other methods, such as CB-SEM, when the sample size is small, and the data are nonnormally distributed (Hair et al., 2021). We decided to use PLS rather than covariance-based SEM since our study's goal is not only to explain but also to predict the key target construct "agile continuance intention" and to identify its relevant antecedent constructs (Sarstedt et al., 2021). Moreover, our model consists of both reflective and formative indicators, our sample size is relatively small, and our data are not normally distributed ($p < 0.01$ based on the Kolmogorov–Smirnov test), without however being heavily skewed (skewed values between −0.199 and −0.859).

5. Results

To establish the validity of the model and to test the research hypotheses, the data were analyzed using PLS-SEM. First, the measurement model was examined to assess the validity and reliability of the variables. Then, the structural model was evaluated to determine the strength of the hypothesized links among the constructs and the moderating effects.

5.1. Reflective measurement model assessment

We performed several tests to ensure the reliability and validity of our reflective measurement model. Cronbach's alpha was used for the internal consistency reliability of the dimensions. The results indicate acceptable internal consistency since all constructs were beyond the threshold of 0.70 (Hair et al., 2011). Factor loadings, average variance extracted (AVE) and composite reliability (CR) were used to test the convergent validity. The results presented in Table 2 show that all factor loadings are high (>0.70), CR values are greater than the threshold of 0.70 and AVE exceeds 0.50 (Hair et al., 2011) and thus suggest strong evidence of convergent validity.

Table 3
Fornell–Larcker criterion.

	Confirmation	Continuance intention	Satisfaction
Confirmation	**0.784**		
Continuance intention	0.656	**0.910**	
Satisfaction	0.712	0.579	**0.839**

Notes: Square root of each item's AVE in bold.

Discriminant validity was tested using three measures: (1) the Fornell–Larcker criterion that ensures validity if the square root of each item's AVE is greater than the correlations with all other latent items (Fornell and Larcker, 1981); (2) cross-loadings that require that each item's loadings are greater than all other factors' loadings (Chin, 1998) and (3) the heterotrait–monotrait (HTMT) ratio of correlations criterion, according to which the HTMT value between two reflective constructs should be less than 0.90 (Henseler et al., 2015) or significantly smaller than 1 (Henseler et al., 2015). As presented in Tables 3–5, all the above-mentioned test results suggest that the discriminant validity of the measurement model was established. Especially in the case of HTMT, where some values are close to the threshold of 0.90, we examined the one-sided 95% percentile confidence interval and found that it does not cover 1, and thus, it is significantly different from 1.

5.2. Formative measurement model assessment

For assessing the formative construct of perceived usefulness (PU), we first tested its indicator weights' significance. The results presented in Table 6 show that all indicator weights are significant ($p < 0.001$). Next, we examined whether critical levels of collinearity could affect the weight estimates and found that all VIF values were below the conservative threshold of 3 (Table 6).

5.3. Structural model

The structural model was tested using PLS-SEM and the bootstrapping technique with 5000 iterations of re-sampling and 95% bias-corrected confidence intervals (Hair et al., 2011). The results indicate that all our hypotheses were supported, as shown in Table 7.

The overall explanatory power of our model was assessed through R^2 and Q^2 values. R^2 values were found to range between 43.7% and 59.7%, suggesting moderate to substantial explanatory power (Hair et al., 2019). Q^2 values were calculated to evaluate our model's predictive accuracy since an assessment based only on R^2 values is not sufficient (Hair et al., 2019). Q^2 values above zero suggest that the model's predictive accuracy is acceptable (Chin, 2010). The predictive relevance of our model's constructs was found to be adequate, with Q^2 values ranging from 0.24 to 0.41. Fig. 2 illustrates the results of the PLS analysis.

In order to assess the model's out-of-sample predictive power $PLS_{predict}$ was performed with ten folds and ten repetitions. The focus was on the model's key target construct represented by continuance intentions in agile methodologies. The results revealed that both its indicators achieved $Q^2_{predict}$ values larger than zero (CI1 = 0.259, CI2 = 0.393), indicating that the model outperforms the naïve benchmark.

The results provide evidence that users' confirmation has a positive effect on the perceived usefulness of agile methodologies ($\beta = 0.661$, $p < 0.001$) and satisfaction ($\beta = 0.447$, $p < 0.001$),

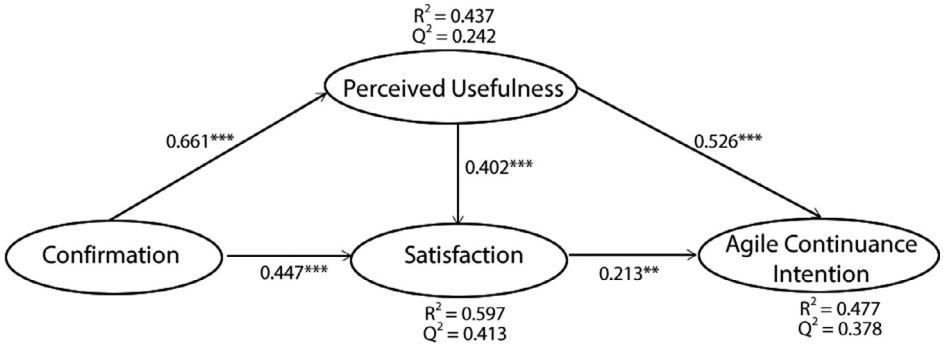

Fig. 2. PLS analysis results.

Table 4
Cross-loadings.

	Continuance Intention	Confirmation	Perceived Usefulness	Satisfaction
CI1	**0.888**	0.521	0.545	0.436
CI2	**0.932**	0.661	0.670	0.601
Conf1	0.611	**0.801**	0.530	0.602
Conf2	0.507	**0.787**	0.580	0.539
Conf3	0.397	**0.735**	0.434	0.515
Conf4	0.527	**0.810**	0.518	0.571
PU1	0.573	0.573	**0.874**	0.594
PU2	0.509	0.649	**0.747**	0.651
PU3	0.533	0.426	**0.738**	0.432
PU4	0.443	0.379	**0.711**	0.397
PU5	0.483	0.385	**0.757**	0.445
PU6	0.556	0.561	**0.786**	0.623
Sat1	0.436	0.605	0.618	**0.855**
Sat2	0.482	0.496	0.526	**0.768**
Sat3	0.538	0.679	0.608	**0.891**

Notes: Factor loadings in bold.

Table 5
HTMT.

	Confirmation	Continuance intention
Continuance intention	0.811	
Satisfaction	0.895	0.718

Table 6
Formative indicator weights and VIF values.

	Weight	VIF
PU1	0.244***	2.749
PU2	0.254***	1.794
PU3	0.195***	1.791
PU4	0.171***	1.765
PU5	0.184***	2.025
PU6	0.244***	1.891

Note:
***$p < 0.001$.

thus H1a and H1b are supported. Additionally, perceived usefulness of agile methodologies has a positive effect on satisfaction with agile use ($\beta = 0.402$, $p < 0.001$) and agile CI ($\beta = 0.526$, $p < 0.001$), thus confirming hypotheses H2a, and H2b. Moreover, our results indicate that hypothesis H3 is also supported ($\beta = 0.213$, $p < 0.01$), suggesting that satisfaction with agile methodologies has a positive effect on agile continuance intention. The analysis also shows that perceived usefulness partially mediates the relationship between confirmation and satisfaction ($\beta = 0.265$, $p < 0.001$) and between confirmation and continuance intention ($\beta = 0.347$, $p < 0.001$). Furthermore, satisfaction partially mediates the relationship between perceived usefulness and CI ($\beta = 0.086$, $p < 0.01$) and between confirmation and CI ($\beta = 0.095$, $p < 0.050$).

Moreover, we suggested that perceived usefulness partially mediates the relationship between users' confirmation and satisfaction with agile methodologies (H4) and that satisfaction with agile methodologies partially mediates the relationship between perceived usefulness of agile methodologies and agile continuance intention (H5). The indirect effect of users' confirmation on satisfaction through perceived usefulness was significant since the bias-corrected confidence 95% interval did not include the zero value (Preacher and Hayes, 2008). The results were similar regarding the indirect effect of perceived usefulness on agile continuance intention through users' satisfaction. Partial mediation is indicated when both the direct and indirect effects are significant (Nitzl et al., 2016). Thus, hypotheses 4 and 5 are also supported, as presented in Table 8.

6. Discussion

The main purpose of this study was to examine the factors that influence software development team members to continue using agile methodologies in large-scale projects. We employed ECM as the theoretical basis and empirically tested the research framework through PLS-SEM using SmartPLS v. 3.3.7.

Confirmation was found to have a positive effect on individuals' perceived usefulness of agile methodologies and satisfaction,

Table 7
Hypotheses testing results.

Hypotheses	Path coefficient	SD	t-value	Decision
H1a. Confirmation -> Perceived usefulness	0.661***	0.052	12.810	Supported
H1b. Confirmation -> Satisfaction	0.447***	0.057	7.879	Supported
H2a. Perceived usefulness -> Satisfaction	0.402***	0.057	7.126	Supported
H2b. Perceived usefulness -> Agile continuance intention	0.526***	0.082	6.421	Supported
H3. Satisfaction -> Agile continuance intention	0.213**	0.081	2.621	Supported

Note:
**p < 0.01.
***p < 0.001.

Table 8
Hypotheses testing results for indirect effects.

Hypotheses	Indirect effect	Direct effect	Total effect	Lower bound	Upper bound	Decision
H4. Confirmation -> Perceived usefulness -> Satisfaction	0.265***	0.447***	0.712***	0.187	0.354	Supported
H5. Perceived usefulness -> Satisfaction -> Agile continuance intention	0.086**	0.526***	0.612***	0.021	0.144	Supported

Note:
**p < 0.01.
***p < 0.001.

suggesting that consistency between expectations and actual experience will make ASD team members consider the adopted methodologies as useful and satisfactory. Since most individuals do not have the chance to choose the agile SD method used in the project they are working on, their initial expectations could be relatively low. When these anticipated expectations are met or even surpassed, team members become satisfied with the agile method used and recognize it as useful for their work. These findings are in line with previous studies that report confirmation as an antecedent of perceived usefulness and satisfaction (Bawack and Ahmad, 2021; Bölen, 2020).

Apart from confirmation of expectations, satisfaction was also found to be affected by perceived usefulness. As expected, team members who consider that the agile SD methods used were enhancing their effectiveness and productivity, while making their job easier, enabling them to adopt changes more quickly, and improving the team's performance, become overall satisfied. These results echo previous findings reported in ECM studies (Franque et al., 2020; Hew et al., 2017). In a similar vein, perceived usefulness is the factor that contributes the most to users' intention to continue using agile methods in SD projects, complementing existing work (Bawack and Ahmad, 2021; Hong et al., 2011). Satisfaction was also found as a significant predictor of continuance intention, confirming the work of previous researchers (Cheng, 2014; Zheng, 2019).

Moreover, this research surpassed traditional ECM studies and examined the mediation role of perceived usefulness on the relationship between confirmation and satisfaction, as well as the mediation role of satisfaction on the relationship between perceived usefulness and continuance intentions. The results indicated the existence of partial mediation in both cases. These findings are in line with previous studies that have also found that perceived usefulness plays a mediating role in the relationship between confirmation and satisfaction (Limayem et al., 2007). Therefore, organizations or team leaders should focus on increasing the perceived usefulness of the chosen agile methodologies, in order to enhance satisfaction among team members. Moreover, the results suggest that user satisfaction plays a key role in mediating the relationship between perceived usefulness and continuance intentions by influencing the users' perceptions of the agile methodology, their attitudes towards it, and their intentions to continue using it.

This paper focused not only on the understanding of the causal relationships between the constructs derived from ECT theory but also on the model's predictive power, which is fundamental for establishing its practical relevance (Hair and Sarstedt, 2021). The findings indicate the existence of both in-sample (R^2) and out-of-sample ($Q^2_{predict}$) predictive power of the model.

Finally, as already discussed, it is important to indicate that the specific agile method used by team members, as well as the bank institution they were working for, did not influence their responses regarding continuance intentions.

6.1. Theoretical implications

The rising adoption of agile software development methods, along with the problems that arise from project failures (Gupta et al., 2019a), calls for research regarding the factors that affect continuance intentions in agile SD projects. This study enriches the literature by making the following theoretical contributions. First, to the best of our knowledge, this is one of the first attempts to empirically examine the post-adoption of agile SD methods from the team members' perspective. Previous studies have explored the success factors of agile SDPs (Tam et al., 2020a), the user acceptance of agile information systems (Hong et al., 2011), and the drivers of agile software development use (Vijayasarathy and Turk, 2012), but there was a literature gap on the investigation of the antecedents of agile methods continuance intentions. Our work tried to fill this gap by building on the current knowledge of IS continuance intention and setting a baseline on how ECM can be applied in the context of agile methods post-adoption. The results indicate that the proposed model is applicable in understanding SDP members' intentions to continue using agile methods for large-scale projects.

Second, our research attempt is among the few to discuss the continuous usage of agile software development methods in the banking industry, a sector with long-term, large-scale projects that call for strategic changes and caution against failure (Bilal et al., 2020). Although previous studies have discussed the benefits of agile SD methods in the banking sector (Indriasari et al., 2021; Munteanu and Dragos, 2021), the reasons that lead to agile transformation in large organizations (Berkani et al., 2019) and the critical success factors of agile software development in the banking industry (Gupta et al., 2019b), none of these studies have examined the factors that drive team members to continue using agile methods in SD banking projects.

6.2. Practical implications

This study also offers some important guidelines to companies and project leaders who are to decide on the use of specific agile software development methods. It should be clear that not all

agile methods are suitable for all kinds of SD projects and careful selection and implementation should be made to have the desired results. Team members are the users of the chosen methodologies and the confirmation (or not) of their expectations will affect their satisfaction and perceived usefulness of the specific agile method. The results of their evaluation will influence their intentions regarding the re-use of these methods. Since most team members do not take part in the ASD decision-making process, it is crucial to take all necessary measures and to determine the best choice after careful assessment, considering the profile of the team members and the scope of the ASD project.

6.3. Limitations and future research

This study has some limitations. First, this research is confirmed to Greece at one point in time, during a high increase in the COVID-19 pandemic. That made data collection quite challenging, as employees were usually difficult to find. Thus, the results are bound to the country and the period. Expanding the sample to other countries and under different circumstances could provide a better generalization of the results. Second, the research suffers the limitations of all questionnaire-based studies, where the integrity and truthfulness of responses cannot be verified. Third, our results were produced using solely a quantitative method. A combination of quantitative and qualitative methods could probably provide more comprehensive and generalized results. Fourth, the research model was tested using team members working on agile software development projects in the banking sector. Future research could focus on examining the fitness of ECM in other sectors working on both small and large-scale projects. Finally, the proposed model could be enhanced with the addition of constructs related to technological, organizational, and behavioral factors.

7. Conclusion

This study tried to examine the factors that influence team members of agile SDPs to continue using agile methods, from a causal-prediction modeling perspective. The research focused on large-scale agile projects in the banking sector in Greece. ECM was chosen as the research framework and the model was tested through PLS-SEM. The results validated the model and found it suitable for identifying individuals' post-acceptance of ASD methods, highlighting its high predictive power. The findings indicated that confirmation of expectations positively affects the team members' satisfaction and perceived usefulness of agile methods. Moreover, they suggest that perceived usefulness has the strongest effect on continuance intention, it influences the members' satisfaction and acts as a mediator in the relationship between confirmation and satisfaction. Finally, satisfaction was also found to have a positive association with the intention to continue using ASD methods, while mediating the relationship between perceived usefulness and continuance intention. In summarizing, this research demonstrates that confirmation of expectations regarding perceived usefulness and satisfaction are key determinants of agile continuance intentions in SD projects. The study has both theoretical and practical implications and calls for further research in the field of agile post-adoption.

CRediT authorship contribution statement

Xenia J. Mamakou: Conceptualization, Methodology, Formal analysis, Investigation, Data curation, Resources, Writing – original draft, Writing – review & editing, Visualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data available at: https://data.mendeley.com/datasets/n2ycpdsgws/1

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Appendix

Measurement scales used in the questionnaire.

Constructs	Items	Sources
Continuance Intention (CI)	I intend to continue using the agile SD methods rather than the traditional ones (CI1)	Bhattacherjee (2001)
	If I could, I would like to continue using the agile SD methods in my work (CI2)	Bhattacherjee (2001)
Satisfaction (SAT)	I am very satisfied with the performance of the agile SD methods I used (SAT1)	Lee (2010)
	I am satisfied with the experience of using agile SD methods in my work (SAT2)	Bölen (2020), Hsiao et al. (2016) and Vila and Kuster (2011)
	Overall, I am satisfied with the agile SD methods I used (SAT3)	Cheng (2014) and Zheng (2019)
Perceived usefulness (PU)	Agile SD methods are useful for my work (PU1)	Zhou (2014) and Davis (1989)
	Using agile SD methods enhances my effectiveness (PU2)	Davis (1989) and Bhattacherjee (2001)
	Using agile SD methods makes it easier to do my job (PU3)	Davis (1989)
	Using agile SD methods enables me to adapt to changes more quickly (PU4)	Davis (1989) and Chong (2013)
	Using agile SD methods increases my productivity (PU5)	Davis (1989) and Kim et al. (2010)
	Using agile methods in SDPs improves the team's performance (PU6)	Davis (1989)

Constructs	Items	Sources
Confirmation (CONF)	My experience with agile SD methods was better than I expected (CONF1)	Bhattacherjee (2001)
	Working with agile SD methods was more efficient and effective than I expected (CONF2)	Bölen (2020) and Hsu and Lin (2015)
	Overall, most of my expectations from using agile SD methods were confirmed (CONF3)	Bhattacherjee (2001) and Bölen (2020)
	The agile SD methods can meet demands in excess of what I require when working in ASDPs (CONF4)	Cheng (2014)

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