Understanding business analytics continuance in agile information system development projects: an expectation-confirmation perspective

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Abstract

Purpose – This paper seeks to examine how expectations from business analytics (BA) by members of agile information systems development (ISD) teams affect their perceptions and continuous use of BA in ISD projects.

Design/methodology/approach – Data was collected from 153 respondents working in agile ISD projects and analysed using partial least squares structural equation modelling techniques (PLS-SEM).

Findings – Perceived usefulness and technological compatibility are the most salient factors that affect BA continuance intention in agile ISD projects. The proposed model explains 48.4% of the variance for BA continuance intention, 50.6% of the variance in satisfaction, 36.7% of the variance in perceived usefulness and 31.9% of the variance in technological compatibility.

Research limitations/implications – First, this study advances understanding of the factors that affect the continuous use of BA in agile ISD projects; second, it contextualizes the expectation-confirmation model by integrating technological compatibility in the context of agile ISD projects.

Originality/value – This is the first study to investigate BA continuance intention from an employee perspective in the context of agile ISD projects.

Keywords Business analytics, Information system development, Agile project, Expectation-confirmation model

Paper type Research paper

1. Introduction

In the past few years, there has been a significant rise in the adoption of business analytics (BA) in business organizations (Nam *et al.*, 2019a). These organizations seek to leverage BA to maximize business value and gain a competitive advantage (Wang *et al.*, 2019; Wixom *et al.*, 2013). Consequently, researchers have shown a keen interest in the value BA can create for organizations (Chen *et al.*, 2012; Mikalef *et al.*, 2020; Seddon *et al.*, 2017). Today, BA is essentially the use of statistical models and advanced algorithms to derive business insights from data to support decision making. Although BA has been shown to help improve firm

agility and performance (Ashrafi *et al.*, 2019; Chiang *et al.*, 2018), little is known about the factors that promote or inhibit the value of BA investments (Mikalef *et al.*, 2020). Furthermore, current studies mostly focus on BA tools and pay little attention to their users or context in which it is used (Conboy *et al.*, 2020; Mikalef *et al.*, 2019). Yet, there is evidence that maximizing the value of BA investments requires the pervasive use of BA by employees which entails meeting their expectations regarding aspects like speedy insights, visualization, mobility and user engagement (Wixom *et al.*, 2013). Against this backdrop, this paper seeks to examine how expectations from BA by members of agile information systems development (ISD) teams affect their perceptions and continuous use of BA.

The information systems (IS) discipline has accumulated a significant body of knowledge on ISD project failure and success (Baghizadeh *et al.*, 2020; Jenkin *et al.*, 2019; Saba *et al.*, 2018). Due to increasing demands and high expectations from business organizations in terms of delivery time and output quality, ISD agility has become an unavoidable part of ISD projects (Börjesson and Mathiassen, 2005; Griva *et al.*, 2020; McAvoy *et al.*, 2013). Also, employees in ISD projects show more motivation and job satisfaction when agile project management and software development practices are used (Tripp *et al.*, 2016). Thus, practices that can make ISD projects more agile are essential for ISD teams (Larson and Chang, 2016). Agile ISD projects are increasingly using BA due to its assimilation to increased productivity, better collaboration, improved service quality and enhanced decision making (Wixom *et al.*, 2013). This is essential for project success given the importance of collaboration and mutual understanding among key stakeholders across and within ISD projects (Jenkin *et al.*, 2019; Liu *et al.*, 2018).

However, little is known about what employees in ISD projects expect from BA and the effect this has on their desire to continue using BA. Understanding the relationship between these factors could reveal latent project situations that are difficult to identify, resolve and understand in ISD projects, which may lead to project failure (Baghizadeh *et al.*, 2020; Ochara *et al.*, 2014). This includes issues like misfits between BA and organizational values, and dissonance between stakeholders regarding expectations and outputs. Understanding user expectations has proven to be an effective means of assessing and predicting IS success or failure and the continuance of IS use (Bhattacherjee, 2001; Szajna and Scamell, 1993). Therefore, this study seeks to answer the question: *what are the factors that affect BA continuance in agile ISD projects?* To answer this question, the expectation-confirmation model (ECM) (Bhattacherjee, 2001) was used as the theoretical framework to hypothesize on the behaviours of employees in agile ISD projects vis-à-vis their expectations from BA investments made by their organizations. Data was collected from 153 respondents working in agile ISD projects and analysed using partial least squares structural equation modelling techniques (PLS-SEM). The results show that expectation confirmations regarding perceived usefulness and technological compatibility are key determinants of BA continuance in agile ISD projects.

This study contributes to calls for studies on how BA can support the management of ISD projects (Dennehy *et al.*, 2020; Elhoseny *et al.*, 2020). Specifically, it makes two main theoretical contributions: (1) this study advances understanding of the factors that affect the continuous use of BA in agile ISD projects; (2) it contextualizes the ECM model by integrating technological compatibility in the context of agile ISD projects. It also contributes to practice by highlighting the importance of managing user expectations during BA projects to ensure BA continuance in ISD projects.

2. Theoretical background
2.1 Business analytics
BA refers to the analytical component of business intelligence (BI), that is, the analytics and reporting processes and technologies used in BI (Chen *et al.*, 2012). BI is the process of

combining insights from data with business knowledge to support decision-making processes (Larson and Chang, 2016). Today, BA spans several technical areas including (big) data analytics, text analytics, web analytics, network analytics, social media analytics and mobile analytics. All these areas rely on data mining, statistics and artificial intelligence (AI) techniques like machine learning (ML) and natural language processing (NLP) (Chen *et al.*, 2012; Larson and Chang, 2016). BA investments are very resource-intensive and risky (Wang *et al.*, 2019). Thus, *value* is the most important of all the Vs used to characterize (big) data used for BA (Acito and Khatri, 2014; Ashrafi *et al.*, 2019; Fosso Wamba *et al.*, 2015). Business organizations need to capitalize on the value generated from speedy actionable insights and the pervasive use of BA by employees (Wixom *et al.*, 2013) to gain competitive advantages, enhance firm performance and create strategic value. This value is created by uncovering hidden knowledge, improving decision making and supporting strategic planning based on data (Chae, 2014; Chiang *et al.*, 2018). Furthermore, maximizing value from BA investments requires *aligning strategy and desirable behaviours to business performance management in conjunction with analytic tasks and capabilities* (Acito and Khatri, 2014, p. 566). Analytical tasks include producing, consuming or enabling the creation of insights while capabilities refer to the tools, methods and technologies that support decision making, data analysis and information management.

Recent studies have mostly focused on how BA adoption affects competitiveness, agility and firm performance. Firm agility refers to the ability of a firm to quickly sense changes in an environment (opportunities or threats) and adapt to such changes quickly enough to take advantage of the situation (Ashrafi *et al.*, 2019; Kitchens *et al.*, 2018). BA improves firm agility by enhancing information quality and innovative capabilities (Ashrafi *et al.*, 2019). High-quality information will enable firms to better sense changes in their environments and enable them to make timely decisions needed to adapt to the changes. BA provides such timely information, allowing firms to innovatively adapt to changes and outsmart their competitors. Firm agility enhances firm performance, especially in technologically turbulent environments. The adoption of BA has no direct effect on firm performance but it helps improve business process performance which in turn influences firm performance (Aydiner *et al.*, 2019). However, analytics resources (analytics technology assets and BA capabilities) have a direct effect on business performance (Krishnamoorthi and Mathew, 2018). The relationship between BA and firm performance is mediated by business process change (Torres *et al.*, 2018).

Nevertheless, the adoption of BA depends on technological, organizational or environmental factors related to individual perceptions within the organization and could vary with the stage of adoption. Technological factors (data infrastructure, data quality management) influence all stages of the innovation diffusion process, organizational factors (managerial obstacles, analytics centralization) influence the adoption and assimilation stage, while environmental factors (competition intensity) influence the initial stage (Nam *et al.*, 2019a). IT competence (IT infrastructure, IT business spanning, IT proactive stance) influences data management capabilities (data quality, data integration) which then affects the use of BA for customer relationship management (CRM) and eventually the CRM performance (Nam *et al.*, 2019b). Meanwhile, BA competency and organizational absorptive capacity influence BA assimilation which in turn helps firms improve competitive advantage (Wang *et al.*, 2019). This confirms that firms can only benefit from their BA investments if their users adopt and use them effectively (Jaklič *et al.*, 2018).

However, aligning BA processes and software with the work styles, changing needs and expectations of users is a challenge that affects user perceptions of how well BA fits their jobs. Compatibility directly affects the intention to use BA and mediates the effect of performance perceptions on intention to use. However, the issue of how well BA fits with user expectations has not been thoroughly researched (Jaklič *et al.*, 2018). This line of thought has led to several calls for studies that can help researchers and practitioners understand the behavioural

decisions of BA users regarding the (continuous) use of BA in organizational contexts (Dennehy *et al.*, 2020; Elhoseny *et al.*, 2020). This is the research gap this study seeks to fill by examining what employees in agile ISD projects expect from BA and how this affects their intentions to continue using the BA technologies adopted by their organization.

2.2 Agile information system development projects

The IS discipline has accumulated a significant body of knowledge on ISD that significantly complements ISD literature in software engineering and project management disciplines (Hassan and Mathiassen, 2018). A major organizational concern today is the failure of ISD projects. However, the extant literature pays little attention to the conditions and situations that occur during ISD projects that lead to their failure (Baghizadeh *et al.*, 2020). Understanding such conditions and situations could lead to early detection and timely responses towards avoiding project failures. A mutual understanding between key project stakeholder groups regarding project planning and control mechanisms is critical for project success (Jenkin *et al.*, 2019). Furthermore, control type, control degree, control style and control execution affect the development of mutual understanding between the stakeholders (Gregory *et al.*, 2013). ISD projects are inherently complex because they involve dealing with organizational and technological issues (Benbya and McKelvey, 2006; Xia and Lee, 2005) like increasing dependence on a particular IS or limited IT infrastructure to accommodate evolving technologies. Furthermore, there are considerable inherent risks in ISD projects regarding differences between expectations and perceptions which are specific to each actor's knowledge, goals and values (Öbrand *et al.*, 2019). Coping with diversity, knowledge and structure are the most persistent problems and challenges faced by developers in ISD projects at the organizational, environmental and individual levels (Bergvall-Kåreborn and Howcroft, 2014).

A growing methodological approach adopted in ISD projects today is the agile methodology. ISD agility is *the continual readiness of an ISD method to rapidly or inherently create change, proactively or reactively embrace change and learn from change while contributing to perceived customer value (economy, quality and simplicity), through its collective components and relationships with its environment* (Conboy, 2009, p. 340). This methodology was developed to overcome challenges related to change management, project visibility, transparency, productivity, time-to-market and cost reduction in fast-paced project environments (Alaa and Fitzgerald, 2013; Baham *et al.*, 2017; Kautz, 2011). In ISD projects, agile methodologies can be used for project management and software development practices. In either case, this methodology positively affects employees' perceptions of job satisfaction and job characteristics like job autonomy and task significance (Tripp *et al.*, 2016; Werder and Maedche, 2018). Team diversity, team capabilities, team perceptions, project communication, project technology and project setting are categories of knowledge sharing risks across agile software development teams (Ghobadi and Mathiassen, 2017). Within these teams, project managers are more concerned about project setting barriers while other team members like developers, testers and user representatives are more concerned about project organization and team capability barriers (Ghobadi and Mathiassen, 2016; Taylor, 2016).

Regarding BA usage in ISD projects, current literature mostly focuses on the role of agile methodologies in BA projects. It mostly examines how organizations have successfully adopted agile principles and practices in their BI/BA projects, and how this has altered agile methodologies (Larson and Chang, 2016). The agile principles and practices used for ISD align with the nature of BA projects and significantly decrease the chances of project failure (Larson, 2019; Vidgen *et al.*, 2017). This has led to the creation of a development style called *agile analytics*, which describes how agile principles and practices can lead to agility in BI projects (Collier, 2012). To successfully implement agile analytics, a strong customer involvement, a methodical project definition process and effective agile implementation

methods are required (Batra, 2018; Kisielnicki and Misiak, 2016; Tsoy and Staples, 2020). Nevertheless, BA and agile methodologies when used together improve the productivity of ISD teams. It can support every step of the ISD life cycle, including code repository analytics, project management analytics and application usage analytics (Biesialska *et al.*, 2020). It also helps ISD projects achieve greater agility through improved speed and flexibility (Stodder, 2013). For example, it makes translating business requirements into BA products and services much easier and faster for agile ISD teams than for teams that do not use agile methodologies (Wixom *et al.*, 2013). Nevertheless, no research examines the reasons why ISD project members would continue using.

3. Research model and hypotheses

The rationale behind this study is the rising need to manage big data required to provide actionable insights needed to meet the complex and changing needs of business customers when managing ISD projects. With the rising adoption of BA software in ISD projects as well as the increase in project failure (Shah *et al.*, 2019), it is important to investigate the factors that affect BA continuance in ISD projects. ECM is used to investigate BA continuance intention in agile ISD projects because the model theorizes on the cognitive beliefs that influence users' intentions to continue using IS (Bhattacherjee, 2001). Understanding IS user expectations and their effects on user perceptions of performance (decision quality) and satisfaction (with the IS) has been of interest to IS research since the 90s (Szajna and Scamell, 1993). Based on this accumulated body of knowledge on the expectation-confirmation theory (ECT), an ECM was proposed. ECM suggests that the intention to continue using IS is determined by the user's satisfaction with the system and the perceived usefulness of the continued use of the system. However, the user's satisfaction with the IS is influenced by the confirmation of expectations before system use and the perceived usefulness of the system. In ECM, perceived usefulness represents the expected (performance) benefits of IS use (post-implementation) while confirmation represents the perception of congruence between expectations and actual performance. Since its existence, ECM has been extended and validated in several contexts like online shopping and healthcare (Brown *et al.*, 2014; Gupta *et al.*, 2020; Wang *et al.*, 2020; Wu *et al.*, 2020). This shows that ECM forms a solid theoretical foundation that can be used to explain the expectation-confirmation behaviours of IS users at the organizational level.

BA continuance intention is the extent to which a user intends to continue using BA. ECM suggests that the intention to continue using IS is mainly determined by the user's satisfaction with prior system use (Bhattacherjee, 2001). *Satisfaction* refers to the extent to which a user feels affected by the prior use of a system (Bhattacherjee, 2001). This association has been confirmed several times in the extant literature. Studies show that prior satisfaction with technology positively affects a user's intention to continue using the technology (Cheng, 2020; Gupta *et al.*, 2020). Similarly, in agile ISD projects, we expect employees to intend to continue using BA if they are satisfied with the BA tools and processes adopted for their projects. Figure 1 summarizes the proposed conceptual model for BA continuance in agile ISD projects.

Therefore, we hypothesize that:

H1. User satisfaction with BA use will have a positive effect on BA continuance intention.

Confirmation refers to the degree to which a user perceives the actual performance of a system to match their anticipated performance levels after using the system (Bhattacherjee, 2001). Confirmation of expectations is a key determinant of user satisfaction. The more user expectations from a system are confirmed, the more satisfied they are with the system and vice versa (Bhattacherjee, 2001). This association has also been empirically confirmed in several studies (Brown *et al.*, 2014; Cheng, 2020; Zheng, 2019). We argue that this is also true in agile ISD projects. Given that agile ISD projects seek effective and efficient ways of quickly

Figure 1.
A proposed conceptual
model for BA
continuance in agile
ISD projects
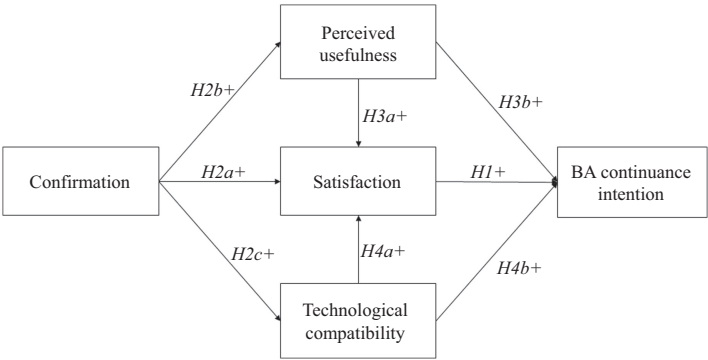
adapting to changing environments while providing business value (Conboy, 2009), satisfaction with BA in an agile ISD project means employees must perceive these abilities when using BA tools and processes. Also, since people form intentions to use a system if they believe it will help enhance their job performance, ECM ascertains that perceived usefulness influences the IS continuance (Bhattacherjee, 2001). This implies that employees will continue using BA tools and processes as long as they perceive it to be useful for their jobs. Moreover, if managers expect the use of BA to be highly beneficial for their teams, they are more likely to invest the necessary resources to make sure it is perceived as beneficial for its users (Chana and Chong, 2013; Chen *et al.*, 2015). Moreover, organizations are shown to be more likely to use BA if it is found compatible with their existing organizational values and work practices (Chen *et al.*, 2015). Therefore, we hypothesize that:

H2a. Employee confirmation will have a positive effect on satisfaction with BA use.

H2b. Employee confirmation will have a positive effect on the perceived usefulness of BA use.

H2c. Employee confirmation will have a positive effect on technological compatibility.

Perceived usefulness or expected benefits refers to the extent to which one expects to gain an operational or strategic advantage from using IS (Bhattacherjee, 2001; Chen *et al.*, 2015). Perceived usefulness has been theorized to be the most important expectation influencing user satisfaction with IS. This is because the IS is perceived as an instrument that should enhance the performance outcomes of its user (Cheng, 2020). ECM established that user expectations of the perceived usefulness of IS influence their satisfaction with the system. We argue that in agile ISD projects, users will also be satisfied with BA if they perceive it as useful and vice versa. The objectives of analytics in the big data era are evolving from decision support and performance management to data-driven businesses wherein employees are expected to acquire, transform and visualize data quickly, especially when using agile methodologies (Daradkeh, 2019; Larson and Chang, 2016; Mandal, 2019; Persaud, 2020). Thus, employees in agile ISD projects are more likely to perceive BA as useful if it can help them meet their prescriptive and predictive analytics goals through the rapid acquisition, transformation and visualization of data. Therefore, we hypothesize that:

H3a. Perceived usefulness of BA will have a positive effect on satisfaction with BA use.

H3b. Perceived usefulness of BA will have a positive effect on BA continuance intention.

Technological compatibility refers to the extent to which a technology consistently aligns with the needs, values and past experiences of its user (Chen *et al.*, 2015). Organizations are shown to

be more likely to use BDA if it is found compatible with their existing organizational values and work practices (Chen *et al.*, 2015). Employees are also more likely to use IS if the data captured by the system matches their current data needs, data processing procedures, organizational values and IT infrastructure (Awa *et al.*, 2017; Rossi *et al.*, 2012). In agile ISD teams, we argue that employees' perceptions of technological compatibility significantly affect their satisfaction with BA use as well as their continuance intentions. Agile ISD projects usually consist of very diverse teams with people from different technical backgrounds and work ethics. For each team member to be satisfied with BA, the BA tools and processes not only need to be aligned with the shared values of the team but also with the individual characteristics and expectations of team members. Thus, the more compatible the BA is with the ISD project teams, the more satisfied they will be with the system. Therefore, we hypothesize that:

H4a. Technological compatibility will have a positive effect on satisfaction with BA use.

H4b. Technological compatibility will have a positive effect on BA continuance intention.

4. Methodology
4.1 Data collection
To test the proposed research model, an online questionnaire-based survey was used to collect data from employees working in agile ISD projects. This approach was chosen because it is easy to replicate, facilitates the investigation of multiple constructs simultaneously and easy to generalize the results during exploratory studies based on predictive models (Boudreau *et al.*, 2001; Pinsonneault and Kraemer, 1993). Well-established measurement items were used to measure each construct used in the model. All constructs were measured using a 7-point Likert scale. A pre-test was conducted on 20 employees working on ISD projects to assess the face and content validity of the items used in the study as well as the clarity of the questionnaire.

The study was sent to 400 employees working on agile ISD projects in companies in Ireland and Sweden, two of the most globally competitive countries worldwide in terms of productivity (Klaus, 2019). Respondents were contacted either directly through phone calls and emails or via LinkedIn groups. At the end of the questionnaire, participants were also offered the opportunity to comment on the questionnaire and to provide additional comments on their perceptions of BA use, especially regarding their intention to continue/discontinue using BA software or techniques in their projects. The data collection process lasted three months (June 2020–August 2020) and the average completion time of the questionnaire was 10 min. From the 161 responses collected, 153 responses were retained for further analysis.

Table 1 presents a description of the sample. Most of the respondents were from Europe (74%) from technology-oriented companies including software and services development (56%). The remaining respondents work in various business sectors such as IT consulting (13%), e-commerce (9%) and others.

Summarily, most respondents had at most 4 years of experience with BA (60%). The respondent has worked in small teams (1–9 (31%) or 10 to 49 (28%)) and occupied mostly team lead (25%), developer (23%) or business analyst (18%) positions (see Table 2).

4.2 Data analysis
To avoid measurement errors due to common method bias (CMB), the following measures were taken (Podsakoff *et al.*, 2003): (1) questions in the survey were juxtaposed to create a psychological separation of measurements; (2) to ensure that respondents provided honest answers, they were informed that the study was for academic research purposes, their participation will remain anonymous and there were no wrong or right answers; (3) scale items were improved after the pre-test by rewording some terms to make the questionnaire

Factor	Sample (N = 153)	Proportion (%)
Office location		
North America	1	1
Europe	113	74
Australia/New Zealand	2	1
Asia	18	12
South/Central America	9	6
Africa	8	5
Other	2	1
Business industry		
Technology (incl. Software)	85	56
Financial services	6	4
IT consulting	20	13
E-commerce	14	9
Government	10	7
Manufacturing	4	3
Other	14	9
Experience in ISD projects		
1 year or less	20	13
2 years	32	21
3 years	21	14
4 years	18	12
Over 4 years	62	41
Experience with BA		
1 year or less	33	22
2 years	45	29
3 years	27	18
4 years	26	17
Over 4 years	22	14

Table 1.
Respondent's
demography and
business sector

Factor	Sample	Proportion (%)
Role in project		
Team lead (i.e., scrum master, team coach, etc.)	39	25
Development team (i.e., programmer, developer, tester, etc.)	35	23
Architect/architecture owner	12	8
Stakeholder (i.e., operating staff, on-site customer, senior staff, etc.)	8	5
Independent specialist/Technical expert	16	10
Product owner	6	4
Business analyst	27	18
Other	10	7
Number of employees in the project		
1 to 9	47	31
10 to 49	43	28
50 to 100	25	16
101 to 150	10	7
150+	19	12
Other	9	6

Table 2.
Respondent's role and
employees in a project

easy to understand thereby reducing biases related to the ambiguity of items; (4) Harman's single-factor test was performed to determine whether most of the variance in the model can be accounted for by a single factor. The test showed that there is no threat of CMB in this study since the maximum variance explained by a single factor was 28.8% which is below the 50% threshold value.

To evaluate the model proposed in this study, partial least squares structural equation modelling (PLS-SEM) approach was used with the help of the SmartPLS 3.2.9 software package. The PLS-SEM approach is a well-established approach used in quantitative research to understand relationships between variables and the predictivity of models in exploratory studies (Hair *et al.*, 2014; Hair *et al.*, 2016; Leguina, 2015). It is a variance-based SEM technique which is more appropriate for exploratory studies where the aim is to examine relationships between variables based on theory (Reinartz *et al.*, 2009). This approach involves two main phases: (1) evaluating the measurement model and (2) evaluating the structural model (Hair *et al.*, 2017).

5. Results
This section discusses the results of our study that include the measurement model, the structural model and hypothesis testing.

5.1 Measurement model
Evaluating the measurement model involves assessing the reliability and validity of the constructs and their corresponding items. Based on Hair *et al.* (2016), items are reliable if the item loadings are greater than 0.70. For constructs to be reliable, they should have composite reliability (CR) and Cronbach's alpha (α) values above 0.60. To ensure that the constructs significantly explain the variance of its items, the average variance extracted (AVE) should be greater than 0.50. Finally, the Fornell–Larcker criterion can be used to assess the discriminant validity of the constructs. Discriminant validity is verified if the square root of the AVE for each construct is greater than the correlation between the constructs (Fornell and Larcker, 1981).

The items used to measure each construct were obtained from existing measurement scales that have been empirically tested and validated in previous studies (Bhattacherjee, 2001; Chen *et al.*, 2015). Table 3 presents the constructs, their operational definitions, measurement items and the results of the measurement model evaluations. All item loadings, Cronbach's alpha and composite reliability values are greater than the 0.70 thresholds, indicating the reliability of the constructs and items used in the measurement model. Also, all AVE values are greater than the 0.50 threshold value indicating convergent validity.

According to Fornell and Larcker (1981), convergent validity is satisfactory when constructs have an AVE of at least 0.5. Table 4 presents the results of the discriminant validity, which is based on the Fornell–Larcker criterion with correlations, and the square root of AVE values on the diagonal.

5.2 Structural model
Evaluating the structural model involves assessing the predictability of the model and the significance of the relationships that exist between variables in the model. According to Hair *et al.* (2016), there should be no collinearity among the constructs to avoid biasing the regression results. Thus, the variance inflator factor should be less than five to show the absence of collinearity. *p-values* of less than 5% indicate significant path coefficients between variables. Finally, R^2 values of 0.75, 0.50 and 0.25 indicate substantial, moderate and weak predictive accuracy of the model respectively. Figure 2 summarizes the results of the PLS structural model analysis.

Constructs, operational definitions and item	Item loadings
BA continuance intention–BA_CI (Bhattacherjee, 2001) (α = 0.792, CR = 0.878, AVE = 0.706)	
The extent to which a user intends to continue using BA	
I intend to continue using BA rather than discontinue its use	0.857
I intend to continue using BA than any alternative means	0.851
I would like to continue my use of BA	0.812
Confirmation–BA_TC (Bhattacherjee, 2001) (α = 0.748, CR = 0.855, AVE = 0.664)	
The degree to which a user perceives the actual performance of BA to match their anticipated performance levels after BA use	
My experience with using BA was better than what I expected	0.777
The service level provided by BA was better than what I expected	0.823
Overall, most of my expectations from using BA were confirmed	0.842
Satisfaction–BA_S (Bhattacherjee, 2001) (α = 1, CR = 1, AVE = 1)	
The extent to which a user feels affected by prior BA use	
How do you feel about the overall experience of BA use?	1.000
Perceived usefulness–BA_PU (Bhattacherjee, 2001) (α = 0.855, CR = 0.902, AVE = 0.698)	
The extent to which one expects to gain an operational or strategic advantage from using BA	
Using BA improves my job performance	0.752
Using BA increases my job productivity	0.864
Using BA enhances my effectiveness in my job	0.884
Overall, BA is using in my job	0.836
Technological compatibility – BA_TC (Chen *et al.*, 2015) (α = 0.769, CR = 0.866, AVE = 0.684)	
The extent to which a BA consistently aligns with the needs, values and past experiences of its user	
Using BA is consistent with our business practices	0.839
Using BA fits our organizational culture	0.854
Overall, it is easy to incorporate BA into our agile practices	0.788

Table 3.
Reliability and validity of measurement model constructs and items

Constructs	BA_CI	BA_C	BA_PU	BA_S	BA_TC
BA_CI	*0.840*				
BA_C	0.594	*0.815*			
BA_PU	0.611	0.606	*0.836*		
BA_S	0.455	0.633	0.635	*1.000*	
BA_TC	0.624	0.565	0.576	0.504	*0.827*

Note(s): The square roots of AVEs of the constructs are shown in Italic in diagonal. The off-diagonal values are correlations between constructs

Table 4.
Discriminant validity (Fornell and Larcker Method)

Figure 2.
Estimated paths of the structural model
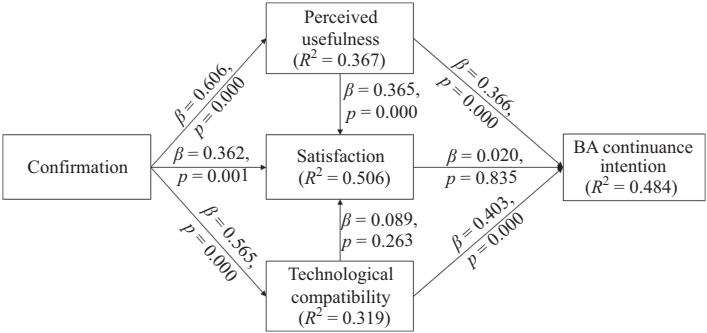
The structural model was evaluated by running 5,000 bootstrap subsamples. There was no collinearity biasing the regression results of our model since the maximum VIF value among all items used in the model was 3.818, which is below the 5.0 threshold value. Based on R^2 values, the structural model explains 48.4% of the variance for BA continuance intention, 50.6% of the variance in satisfaction, 36.7% of the variance in perceived usefulness and 31.9% of the variance in technological compatibility. These coefficients of determination indicate the moderate to substantial predictive power of the model. By analysing the significance of the path coefficients (β) using p-values (p), the model shows that perceived usefulness ($\beta = 0.366$, $p = 0.000$) and technological compatibility ($\beta = 0.403$, $p = 0.000$) significantly affect BA continuance. Also, confirmation significantly affects perceived usefulness ($\beta = 0.606$, $p = 0.000$), technological compatibility ($\beta = 0.565$, $p = 0.000$) and satisfaction ($\beta = 0.362$, $p = 0.001$). Additionally, perceived usefulness significantly affects satisfaction ($\beta = 0.365$, $p = 0.000$). Contrary to what was expected, technological compatibility had no significant effect on satisfaction ($\beta = 0.089$, $p = 0.263$), and satisfaction had no significant effect on BA continuance ($\beta = 0.020$, $p = 0.835$). The analysis also shows that perceived usefulness had a mediating effect between confirmation and BA continuance intention ($\beta = 0.0.222$, $p = 0.000$) and between confirmation and satisfaction ($\beta = 0.221$, $p = 0.001$). Technological compatibility also mediated the relationship between confirmation and BA continuance ($\beta = 0.228$, $p = 0.000$). Table 5 summarizes the findings of the structural model evaluation.

6. Discussion
This study sought to examine what employees in agile ISD projects expect from BA and how this affects their intentions to continue using the BA technologies adopted by their organization. The motivation for this study is that extant research in the area mostly focuses on how BA adoption affects firm competitiveness, agility and performance. Some focus on the successful implementation of BA technologies but pay little attention to its users or context of use (Conboy *et al.*, 2020; Dennehy *et al.*, 2020; Mikalef *et al.*, 2019). Such studies have established that successfully implementing BA requires identifying business needs, building BA teams, identifying talents, identifying skills and certifications needed, involving stakeholders and creating a BA culture (Larson and Chang, 2016; Liu *et al.*, 2018). However, no study explains what would make users continue using BA after successful implementation. Addressing this issue in the specific context of agile ISD projects, this study used ECM to provide a theoretical understanding of the mechanisms that explain this phenomenon. Specifically, the findings of this study reveal that BA continuance is influenced by the confirmation of expectations, perceived usefulness and technological compatibility.

These findings are consistent with existing literature on ECM and highlight technological compatibility as a key technological driver of BA continuance. By showing the effect of

Hypothesis		Path coefficient	p values	Hypothesis validation
H1	Satisfaction - > BA continuance	0.020	0.255	Not supported
H2a	Confirmation - > Satisfaction	0.362***	0.001	Supported
H2b	Confirmation - > Perceived usefulness	0.606***	0.000	Supported
H2c	Confirmation - > Technological compatibility	0.565***	0.000	Supported
H3a	Perceived usefulness - > Satisfaction	0.365***	0.000	Supported
H3b	Perceived usefulness - > BA continuance	0.366***	0.000	Supported
H4a	Technological compatibility - > Satisfaction	0.089	0.269	Not supported
H4b	Technological compatibility - > BA continuance	0.403***	0.000	Supported
Note(s): ***$p < 0.01$				

Table 5.
Summary results of structural model evaluation

expectation confirmation on perceived usefulness, satisfaction and technological compatibility, our findings support existing literature that emphasizes the importance of managing the expectations of BA users. Explaining and managing the expectations of stakeholders remains a major challenge for BA project managers. BA users expect BA technologies to be very robust and highly responsive to user interactions (Larson and Chang, 2016; Viaene and Van Den Bunder, 2011). However, the users do not always get to choose the BA technology adopted for the project, thereby making them develop low initial usefulness perceptions yet to be confirmed as they use the technology. In line with ECM, agile ISD project team members who perceive BA implemented as meeting or surpassing their anticipated expectations would be satisfied with the BA technology and perceive it as useful for their jobs. Furthermore, the team members would continue using the BA implemented if they confirm that it is consistently compatible with their needs, values and past experiences. Thus, our findings confirm the importance of adopting BA technology that is compatible with the culture and practices of agile ISD teams (Chen *et al.*, 2015).

Surprisingly, BA continuance is not affected by satisfaction. However, it is strongly affected by perceived usefulness and technological compatibility. Nevertheless, perceived usefulness affects satisfaction, while technological compatibility does not. In other words, BA users seemed to tell their intentions to continue using BA systems based on their perceptions of usefulness and technological compatibility rather than overall satisfaction. This implies that BA continuance is affected by actual gains in operational or strategic advantage and alignment with user needs, values and work experience rather than overall satisfaction. However, confirmation of expectations and perceived usefulness of BA systems affect user satisfaction as theorized. This implies that the overall satisfaction with the BA system is not affected by the extent to which the system consistently aligns with the needs, values and past experiences of its users. Rather, it is based on the psychological and emotional state of satisfaction derived from the user's confirmation of expectations regarding their subjectively expected standards and performance levels (Yi, 1990). These findings suggest that satisfaction is important to BA users but it is not a reason why they would continue using BA. Furthermore, satisfaction has no mediating effect on BA continuance. Therefore, BA continuance should be regarded as an extension of satisfaction rather than a reason for BA continuance. This is in line with previous studies that show that satisfaction is not always a reason for continuance (Um *et al.*, 2006).

Existing literature suggests that technological compatibility is relevant for managers who decide on technological innovations to be adopted by their organizations (Chen *et al.*, 2015). Since employees generally do not make such strategic decisions, this could explain why technological capability had no significant effect on satisfaction in this study. Nevertheless, technological compatibility remains significant and relevant for BA continuance in agile ISD project teams. This shows that although it does not affect their satisfaction, team members still need the BA to be compatible with their organizational values and work practices. As opposed to predictions made based on ECM, satisfaction has no significant effect on BA continuance in agile ISD projects. This could be because like with many other technologies implemented in organizations (Venkatesh *et al.*, 2012), using BA might be mandatory in agile ISD projects. Thus, team members would have to use the BA technology adopted by the organization whether they are satisfied with it or not. From this perspective, it is obvious that their satisfaction with the BA system does not affect continuance. Rather, objective factors like PU and TC affect continuance. Therefore, it is important to identify other rational and objective factors that influence BA continuance.

To conclude this section, expectation confirmation of the perceived usefulness and technological compatibility of BA technologies are key determinants of BA continuance in agile ISD projects. As opposed to perceived usefulness and technological compatibility, satisfaction is highly subjective. Therefore, BA continuance is highly dependent on rational,

objective and verifiable factors or arguments such as technological compatibility and usefulness.

6.1 Theoretical implications
With the rising adoption of BA software in ISD projects as well as the increase in project failure (Shah *et al.*, 2019), it is important to investigate the factors that affect BA continuance in ISD projects. This study has two major implications for research. First, it uses a theoretical perspective to empirically examine the antecedents of BA continuance. Prior studies have mostly focused on BA adoption and not on its continuous use, even less in agile ISD project contexts (Daradkeh, 2019). This study extends the existing body of knowledge on BA adoption at the organizational level. Specifically, the research model, which is grounded in ECM, is readily applicable and generalizable to future studies on BA continuance. This study also highlights confirmation of expectations regarding the perceived usefulness and technological compatibility of BA as key determinants of BA continuance. However, the methodology used does not explain the nature of the relationship between these factors. Thus, future research should examine the nature of the relationship between the factors and how this affects organizational performance. Also, future research should replicate this study in other ISD environments to determine whether new contexts could reveal new factors that affect BA continuance at the organizational level. Furthermore, this study suggests that technological factors have a direct effect on BA continuance. Thus, future research should integrate complementary theoretical perspectives to further identify factors and explain this phenomenon.

Second, this study contributes to big data research on the potential outcomes of big data initiatives for relevant stakeholders (Abbasi *et al.*, 2016; Mandal, 2019). Specifically, this study assesses the outcomes of BA initiatives in agile ISD projects and its outcomes for project team members. It provides a more holistic understanding of BA continuance in agile ISD projects and the salient factors to be considered at the project team level by explaining how BA contributes to the management of agile ISD projects (Dennehy *et al.*, 2020). By extending the ECM with technological compatibility, this study also provides a more contextualized understanding of the motivations behind the continuous use of BA in agile ISD projects. Thus, it contributes to the understanding of factors in agile ISD projects that lead to project success or failure (Baghizadeh *et al.*, 2020) and how well BA fits with user expectations (Jaklič *et al.*, 2018).

6.2 Practical implications
The results of this study also have important managerial implications. Since maximizing the value of BA requires its pervasive use by employees, understanding their expectations is crucial for BA continuance in organizations (Wixom *et al.*, 2013). Furthermore, understanding BA continuance in this context is becoming indispensable as agile processes and methodologies are arguably becoming the norm in ISD projects (McAvoy *et al.*, 2013; Tripp *et al.*, 2016). Thus, this study could serve as evidence of the importance of managing user expectations in BA projects to ensure BA continuance. The results of this study show that BA project managers need to focus on managing user expectations regarding the usefulness and compatibility of the BA implemented to ensure continuance. Based on existing literature reviewed in this study, these managers should prioritize BA solutions that favour change management, project visibility, transparency, productivity, time-to-market and cost reduction because agile teams work in fast-paced project environments. Furthermore, the findings of this study provide insights for managers on how to assess and ensure BA continuance. In agile ISD projects, for example, agile principles and practices would have to evolve to meet new BA trends like fast analytics and data science (Larson and Chang, 2016). Thus, managers in charge of choosing the BA to be adopted by their

organizations should ensure that the BA chosen is compatible with their organizational values and work practices of the users. Project managers also need to focus on the expectations of BA users regarding the usefulness of the BA for individual tasks, especially how BA would affect their operational efficiency and job performance. Through this approach, managers would be able to identify, resolve, understand and anticipate BA discontinuance, thereby prevent BA project failure. This includes avoiding misfits between the BA adopted, organizational values and work practices.

6.3 Limitations and future direction

This study has some limitations which are also opportunities for future research. First, some respondents were LinkedIn contacts and members of groups specialized in BA. Thus, there was limited control over the type of participants. However, such limitations could be alleviated by the fact that respondents worked in different projects, thereby showing significant diversity in our dataset. Second, it is important to consider that respondents were individuals who represented different organizations. Consequently, a single person cannot answer on behalf of the whole business unit/organization. Further, getting respondents from companies was quite challenging especially given the strict criteria of this study that required participants to be part of an agile ISD project and current BA users in the project. Since respondents were current and continuing users of BA, they may also have been biased in their perceptions. Third, this study collected data only at one point in time (cross-sectional study). It would have been ideal to perform a longitudinal study to compare the pre-acceptance and post-acceptance perceptions of respondents. However, this was too challenging for this study especially given the ongoing coronavirus disease (COVID) pandemic that made data collection very challenging as employees were usually inaccessible and some projects had to close down temporarily. Additionally, a majority of the respondents are from European-based companies. In the future, it would be worth having an in-depth investigation in various companies, countries or business sectors. This would enable a more in-depth analysis of changes in perceived usefulness, technological compatibility and satisfaction over time. These limitations present potential ways of extending the current research and validating our model in other settings.

7. Conclusion

This study sought to understand what employees in agile ISD projects expect from BA and how this affects their intentions to continue using the BA technologies adopted by their organization. The results show that ISD project managers need to ensure that their team members perceive the BA system adopted as useful to their jobs and compatible with all other technologies they use to perform their daily tasks. This would help ISD projects to obtain maximum value from their BA investments, especially regarding agility and performance. From a theoretical standpoint, IS continuance is contingent on the confirmation of expectations from its users. While this is broadly recognized in the ISD literature, prior research has not evaluated this claim in the context of BA continuance in agile ISD projects. Consequently, there has been a gap in the existing literature on the success and failure of BA initiatives in ISD projects. Using ECM as a theoretical lens, this study shows that confirmation of expectations regarding perceived usefulness and technological compatibility are key determinants of BA continuance intentions in agile ISD projects. This study contributes to current research efforts towards improving the management of ISD projects using BA, with emphasis on the BA users and the agile ISD context rather than on the BA technology used. Thus, this study is expected to stimulate further research on BA continuance in agile ISD contexts, especially in identifying other rational, objective and verifiable BA continuance factors.

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