Full length article

Enterprise resource planning adoption and satisfaction determinants

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ABSTRACT

Enterprise Resource Planning (ERP) systems are at the core of every firm. Making people use this costly and time-consuming investment is one of the most important issues to deal with. The main objective of the present study is to find the key determinants that open the door to user satisfaction and adoption. A theoretical model was set and an online survey was conducted to understand ERP users' perspective on such matters. The outcome was the model validation and the understanding that top management support, training, and the system quality are important constructs to assess adoption and user satisfaction. In fact, the latter (system quality) has a significant influence on the behavioural intention to use and also in the overall user satisfaction. As management support is a very relevant determinant to ERP usage. Accordingly, this study enlightens theory, by contributing to a new model of ERP adoption and satisfaction. It also provides relevant evidence to companies involved in the ERP implementation process.

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1. Introduction

In an increasingly competitive globalized market, the key to organization's success is the ability to maintain and increase that competitive advantage (Porter, 1991).

In this new paradigm, organisations cannot compete on their own. Success can only be achieved through cooperation with other organisations like truly integrated and flexible supply chains (Lambert & Cooper, 2000).

Enterprise Resource Planning (ERP) is a natural evolution of the 80's manufacturing resource planning (MRP II), inheriting all the concepts and theories that date back to the 60's with first attempts to rationalise lead times and possession stock costs. ERP rapidly became the standard enhancing operational efficiency with the integration of business processes throughout all organization (Akkermans, Bogerd, Yücesan, & van Wassenhove, 2003; Davenport, 1998).

In the past decades, ERP systems' usage numbers have increased tremendously, and the worldwide ERP market summed 22.4 billion euros by 2013. The competition is fierce, and the top five companies represent half of the market (SAP: 24%; Oracle: 12%; Sage: 6%; Infor: 6%, and Microsoft: 5%) (Pang, Dharmasthira, Eschinger, Brant, & Motoyoshi, 2013).

After first failures of enterprise resource planning (ERP) systems in mid-1990's, the IS research community became intrigued by the factors in such "productivity paradox" (Brynjolfsson, 1993). Making people adopt a new system was no easy process but is vital to the success of every organization (Basoglu, Daim, & Kerimoglu, 2007).

Various studies were developed to understand the main drivers that led users to adopt a certain ERP system (e.g., Bradley, 2008; Chien & Tsaur, 2007; Gorla, Somers, & Wong, 2010; Nwankpa & Roumani, 2014; Nwankpa, 2015; Pan & Jang, 2008; Rajan & Baral, 2015; Sternad & Bobek, 2013; Tsai, Lee, Shen, & Lin, 2012; Youngberg, Olsen, & Hauser, 2009). Although the conclusions were very significant, reviewed studies are usually centred on a specific model or framework and fail to explain the relations between ERP user's adoption and user's satisfaction.

Hence, through the review of scoped literature in the area, the state of the art about ERP Adoption and satisfaction is assessed. Founded on this review, a model proposal is built to have a structural body for validation. A survey is conducted to gather data, which is used as a base for model validation by the quantitative statistical method of PLS-SEM.

The research contributions are threefold. Firstly, this study explains the relationship between ERP adoption at an individual level and user satisfaction. Secondly, this research extends the ERP

adoption model with the inclusion of three constructs: management support, training, and system quality. Thirdly this model explains 70% of ERP usage satisfaction.

2. Literature review

2.1. Enterprise resource planning (ERP)

Enterprise resource planning (ERP) systems are defined as "comprehensive, packaged software solutions that seek to integrate the complete range of a business's processes and functions in order to present a holistic view of the business from a single information and IT architecture"(Klaus, Rosemann, & Gable, 2000, p. 141).

These systems assume a modular structure and provide information integration across every business area using a shared database (Davenport, 1998). ERPs started in the mid-1990s and were used to outline and organize business processes across all the organizational groups. This integrative approach guaranteed that tasks and processes were always performed in the same way in every place the organization is (McAfee, 2009).

Traditionally oriented for capital-intensive industries ERP systems achieved a maturity state of development. Tough in recent years, ERPs are being introduced to other sectors, such as retail, education, finance, insurance, healthcare and hotel chains (Shehab, Sharp, Supramaniam, & Spedding, 2004).

ERP is a multidisciplinary, and interdisciplinary field of study and the research community contribution is diverse and comprehensive (Moon, 2007). A study by (Esteves & Bohorquez, 2007) showed that the most investigated area is the implementation phase, in which success is by far the main topic. Although system usage and evolution are also addressed, other fields of study such as adoption still need more contributions.

The term ERP was coined in 1993 by the Gartner Group based in Stamford, CT. The company started to publish regular reports on the ERP technology where the inclusion criterion was the integration extent across the various functional modules (Jacobs & Weston, 2007).

Subsequently, research in ERP increased over the past years. To acquire a general idea of the evolution of published literature about ERP, main academic databases were scanned for the term *"Enterprise Resource Planning"* in the period 1990–2015. Fig. 1

summarizes the results of ERP bibliometric research (due to figures discrepancy, and to have an easier reading from the graphic, a factor of 0,1 was applied to Google Scholar search results).

These results reveal the growing interest in ERP over the past 25 years. The first relevant increase in the number of published work about ERP was in the year of 1997 with four times more hits than the previous year. Since then, the amount of work on ERP research has increased exponentially over the first decade of the 21st century with a considerable leap of 74% in 2000 (related to 1999) and an explicit growth of 346% at the end of the first decade (2009) when compared with 2000. Consistent with this growth, the numbers also show that ERP still is a prominent field in the research community, with about 6200 search results on average in the 2009–2014 period (Google, 2015).

2.2. Recent ERP empirical studies

As seen before, ERP research is vast and disperse. After a closer look at published literature, it is clear that the main focus has been the implementation phase success and system's technical aspects, neglecting themes like ERP system adoption (Esteves & Bohorquez, 2007; Moon, 2007; Pairat & Jungthirapanich, 2005; Shehab et al., 2004). This paradigm seems quite confusing when research indicates that software selection and preparation is the critical part of the implementation project (Shaul & Tauber, 2013). Therefore, stakeholder's adoption in ERP systems implementation can give a clearer insight on how to approach this early stages problematic (Hwang, 2005).

First, ERP adoption is mainly studied using several models and extensions mainly based on the contribution of psychology's Theory of Planned Behaviour (TRA) (Fishbein & Ajzen, 1975) in IS technologies research (Wu & Chen, 2005). Although there are various models that explain user's adoption, the Technology Acceptance Model (TAM) (Davis, 1986, 1989) is the most referenced in\ this area of research (Basoglu et al., 2007; Lee, Kozar, & Larsen, 2003; Venkatesh & Bala, 2008; Venkatesh, Thong, & Xu, 2012). Secondly, researchers working on ERP system's success in most cases apply the DeLone & McLean (D&M) IS success model (DeLone, 1988) as the main tool to evaluate the system's implementation success (Mardiana, Tjakraatmadja, & Aprianingsih, 2015). In this case, success is understood as net benefits for the individual and
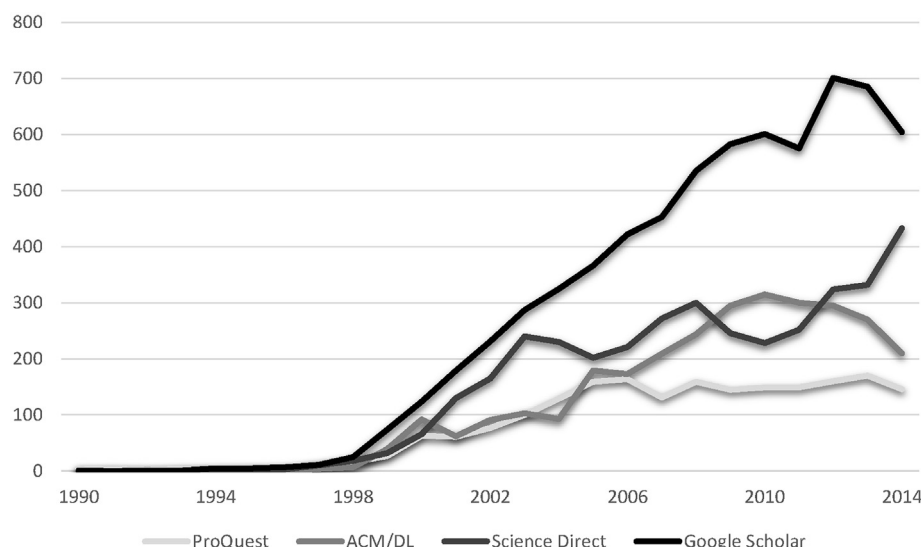

Fig. 1. Number of publications on "Enterprise Resource Planning" in major databases by year.

the organization, where user satisfaction and use are the main success drivers (Delone & McLean, 2003). Finally, other findings of the critical factors were taken into consideration to uncover the main determinants of ERP success and adoption (Al-Mashari, Al-Mudimigh, & Zairi, 2003; Larsen, 2003). Accordingly, a set of papers about ERP adoption, success, and the main influencing dimensions were selected, each from a different publication to have a wider perspective on the matter (Table 1).

As seen before, investigators often tend to use the Technology Acceptance Model when studying ERP system's adoption. This model for IS adoption was considered to have a good fit explaining user's adoption of IS and being a robust method for study's support (Rajan & Baral, 2015; Sternad & Bobek, 2013; Vathanophas & Stuart, 2009; Youngberg et al., 2009). Also, another approach by Pan & Jang (2008) was considered to assess the role of Technology, Organization, and Environment (TOE) in ERP adoption.

Consistent with Rajan and Baral (2015) findings, Pan & Jang's (2008) TOE study found a strong influence of top management support in ERP user's adoption behaviour. Strong evidence shows that having the commitment of top management encourages the effective ERP usage and increases the perception of usefulness by the end users (Bradley, 2008; J.; Nwankpa & Roumani, 2014).

Another important aspect is system quality. Prior studies (Chien & Tsaur, 2007; Gorla et al., 2010; Rajan & Baral, 2015; Sternad & Bobek, 2013; Tsai et al., 2012) found a strong explanatory capability of system quality dimension on both ERP adoption and success. For example, Tsai et al. (2012) find that system quality has the strongest impact on user satisfaction of all studied factors. Likewise, other reviewed researchers discovered that system quality often is among the most significant influences on behavioural intention and user's satisfaction (Chien & Tsaur, 2007; Tsai et al., 2012).

Although this dimension could not directly explain the organizational impact, Gorla et al. (2010) found that it is explanatory nature is more related to the indirect effect through user's perception of how easy/difficult it is to use the ERP system. So, regardless the study objective (adoption or success), this construct is found to be one of the main influencers of user's behaviour intention and perception of the ease of use (Chien & Tsaur, 2007; Rajan & Baral, 2015; Sternad & Bobek, 2013; Tsai et al., 2012).

Both Youngberg et al. (2009) and Rajan and Baral (2015) refer the significant role that training has on ERP system's usage, underlining the critical need to educate users in system skills and communication. Training is a determinant factor for ERP system's success. Bradley (2008), in his study on how management CSFs influence ERPs system success, found that all successful projects showed that training had a higher quality. Also, an earlier study by Amoako-Gyampah and Salam (2004), showed that training had a significant effect applied to adoption models, either directly on perceived ease of use or indirectly on perceived usefulness through the benefits of ERP system's shared beliefs.

According to the reviewed literature, adoption studies revealed a deeper understanding of user's IS adoption in the ERP field. Furthermore, when compared with the large amount of published work about ERP systems the contributions regarding ERP adoption are very scarce. Also, Wixom & Todd (2005) show that having the user satisfaction perspective in the assessment of ERP's usage helps to understand the direct consequence of adoption of user's perceptions.

Consequently, adoption models and user satisfaction will be addressed bellow in more detail.

2.3. Adoption models

As seen above, one of the most used model to study ERP adoption is the Technology Acceptance Model. This model is based on the principles of the Theory of Reasoned Action to explain and predict the behaviours of organization's individuals in a specific situation. According to Fishbein and Ajzen (1975), TRA identifies two major factors that explain behavioural intentions: "Attitude" and "Subjective Norms." This first factor is a consequence of a person's salient beliefs and the perceived outcome evaluation. The second-factor influencing behavioural intention is explained by the individual normative beliefs and the motivation to comply (Vallerand, Deshaies, Cuerrier, & Pelletier, 1992). This attitude theory from psychology (TRA) was later on successfully adapted to information systems (IS) by Davis. According to Davis (1989), many variables can explain the adoption of information technology, but previous research identified two important constructs: perceived usefulness (PU) and perceived ease of use (PEOU). Therefore, in the particular case of IS, the system design features (external variables) indirectly influence the attitude toward using the system through the direct impact on PU and PEOU.

Another theoretical model used to explain the adoption is the theory of planned behaviour (TPB) introduced by (Ajzen, 1991). Ajzen postulated that attitude could not totally explain one's behaviour. Therefore, based on TRA, Ajzen showed that the subjective norms (social factor) and the perceived behavioural control also had an important role explaining adoption.

Table 1
Recent studies on ERP.

Author	Journal	Study purpose	Method/Model
(Youngberg et al., 2009)	International Journal of Information Management	Analyse the perceptions of selected ERP aspects on perceived usefulness and intention to use.	2 TAM adoption model extensions
(Sternad & Bobek, 2013)	Procedia Technology	Identify external factor that influence the ERP adoption among companies in maturity phase of the system use.	TAM adoption model adaptation
(Rajan & Baral, 2015)	IIMB Management Review	Determine the CSFs that influence ERP adoption.	TAM model and individual impact
(Pan & Jang, 2008)	Journal Of Computer Information Systems	Examine the TOE factors that affect ERP adoption in the communication's industry.	TOE adoption framework
(Chien & Tsaur, 2007)	Computers in Industry	Assess ERP system's success at three high-tech firms.	Revised D&M IS Success model
(Gorla et al., 2010)	The Journal of Strategic Information Systems	Understand the impact of three quality dimensions (information, system, and service) on enterprise systems	D&M success model. Organization impact of selected dimensions
(Tsai et al., 2012)	Information & Management	Understand how ERP selection criteria are linked with system and service quality influencing ERP system success.	Balanced Scorecard (SERVQUAL & D&M IS success model)
(J. Nwankpa & Roumani, 2014)	Computers in Human Behavior	Understand how the concept of Organizational Learning Capability (OLC) influences ERP use.	OLC/D&M success model adaptation (no net benefits were studied)
(Bradley, 2008)	International Journal of Accounting Information Systems	Determine how ten management based critical success factors impact in ERP system's implementation success.	Multiple case study and related organizational impact.

Even though, both TAM and TPB are solid models to assess individual's intention to use an information system, Davis' adoption model proven to be a more useful model for empirical research (Mathieson, 1991).

Due to the parsimonious nature of the Technology Acceptance Model, Venkatesh, and Davis (2000) introduced a complete model. The so-called Technology Acceptance Model 2 provides a detailed insight on how both social influence and cognitive instrumental processes influence usage intentions (up to 60%) (Venkatesh & Davis, 2000). Taking the previous model into consideration (TAM2), Venkatesh and Bala (2008) suggested an enhanced new model: TAM3. Having a more comprehensive approach, a new set of constructs were introduced and related to PEOU (anchor and adjustment). Also, new hypotheses were considered such as the moderation effect of experience on key relationships (Venkatesh & Bala, 2008).

In an effort to integrate the most prominent eight theories (TRA; TAM/TAM2; MM; TPB/DTPB; C-TAM-TPB; MPCU; IDT; SCT) on the IS acceptance field, Venkatesh, Morris, Davis, & Davis (2003) presented a Unified Theory of Acceptance and Use of Technology (UTAUT). UTAUT postulates that there are three direct determinants of behavioural intention (performance expectancy, effort expectancy, and social influence) and two of the usage behaviour (behavioural intention and facilitating conditions). Also strong moderating influences were found and integrated into UTAUT model (experience, voluntariness, gender, and age) (Venkatesh et al., 2003). It is also important to mention that this extension was introduced to UTAUT in a consumer study context. UTAUT2 incorporates three new constructs specifically oriented to understand the consumer acceptance and use of technologies: hedonic motivation, price value, and habit.

All in all, the literature review showed that Technology Acceptance Model is the most suitable model to study adoption in IS. Therefore, numerous IS investigators apply this method to ERP research. Future research directions suggest that this model will continue to be the reference model although adjusted with particular extensions according to the technology specificity in the analysis (Chen, Li, & Li, 2011; Mardiana et al., 2015).

2.4. User satisfaction

Another course of IS research is the investigation of user satisfaction. The DeLone & McLean (D&M) model for IS success is the most cited model to assess on how system's usage affects user's satisfaction (Lowry, Karuga, & Richardson, 2007). D&M IS Success model assumes that system and information quality indirectly affect individual and organizational impact through the reciprocally independent dimensions of use and user satisfaction (DeLone & McLean, 1992). An update to the original model took place ten years after by the same authors and showed a new external construct: "Service Quality". The authors felt the need to underline the importance of "Intention to Use" and "Use" aspects inside the former model's "Use" construct, creating new visible relations for research. Finally, individual and organizational impact were merged into "Net Benefits" to have a better perspective of the final success variable (Delone & McLean, 2003). This multidimensional and interdependent model has proven to be solid when explaining various constructs, including user's satisfaction (Mardiana et al., 2015; Petter, DeLone, & McLean, 2008). Interestingly, although net benefits are directly explained by use and user satisfaction, this last construct is found to be the main driver of these same net benefits in various empirical applications of this model. Wixom & Todd (2005) found that both acceptance and user satisfaction theories should be considered when researching user perceptions on any IS. The authors empirically confirmed that user satisfaction,

in both perspectives, had solid explanatory capabilities.

User satisfaction is, therefore, one of the most important factor when addressing IS success (Mardiana et al., 2015; Tsai et al., 2012).

3. Model proposal

3.1. ERP adoption and satisfaction

According to the literature review, a question subsists: how do the identified three main external dimensions (System Quality (SYSQ), Management Support (MANS) and, Training (TRAI)) influence ERP system use and user satisfaction?

To address this question, and based on previous modelling research (Davis, 1989; Delone & McLean, 2003; Urbach, Smolnik, & Riempp, 2010; Venkatesh & Davis, 2000; Venkatesh et al., 2012), a theoretical model is presented (Fig. 2) to assess the impact of management support (MANS), training (TRAI) and system quality (SYSQ) on ERP systems use (USE) and user satisfaction (USS) through the construct's effect on perceived usefulness (PU), perceived ease of use (PEOU) and the behavioural intention (BI).

3.2. Model constructs

Following above literature review about ERP system's adoption and success, three relevant external factors were identified: Training (TRAI), Management Support (MANS) and System Quality (SYSQ) (Bradley, 2008; Chien & Tsaur, 2007; Gorla et al., 2010; J.; Nwankpa & Roumani, 2014; Pan & Jang, 2008; Rajan & Baral, 2015; Sternad & Bobek, 2013; Tsai et al., 2012; Youngberg et al., 2009).

To measure these dimension's impact on ERP adoption and success, critical constructs were included for IS adoption evaluating: Perceived Usefulness (PU), Perceived Ease Of Use (PEOU), Behavioural Intention (BI) and, actual Use (USE) (Davis, 1989); and User Satisfaction (USS) to weigh this adoption impact on the individual user (DeLone & McLean, 1992). Main references to these constructs are shown on Table 2.

Perceived usefulness (PU) is defined as "the extent to which a person believes that using a particular system would enhance his or her job performance" (Venkatesh & Davis, 2000, p. 187) (Davis, 1989, p. 320) (Davis, 1989, p. 320) (see Table 3). According to the same authors, perceived ease of use (PEOU) is understood as "the extent to which a person believes that using a particular system would be free of effort." Behavioural intention (BI), which is directly influenced by PU and PEOU, is found as a mediator for the actual system's usage. This construct (BI) is comprehended as "the degree of evaluative affect that an individual associates with using the target system in his or her job" (Davis, 1993, p. 473) and has proven to be a strong predictor toward actual use (Sheppard, Hartwick, & Warshaw, 1988). Use, in turn, is the target dimension in most adoption models and measures the behavioural response to an individual's intention to use the system (Davis, 1993).

Previous research showed that after various empirical applications, PU and PEOU have proven to be good predictors of the behaviour intention and the attitude toward actually use an IS (Bueno & Salmeron, 2008; Legris, Ingham, & Collerette, 2003).

Research shows that to ensure a successful ERP system, an overall organization commitment driven by management is fundamental. This management commitment is crucial to resolve conflicts and to help to ensure that everybody cooperates towards the same goal (Bingi, Sharma, & Godla, 1999). Encouragement to use and support for usage are key factors to management support and help to build a perception of the system's usefulness (Urbach et al., 2010).

Another relevant factor that cannot be dissociated from adoption is the system quality. System quality is defined as "the degree to
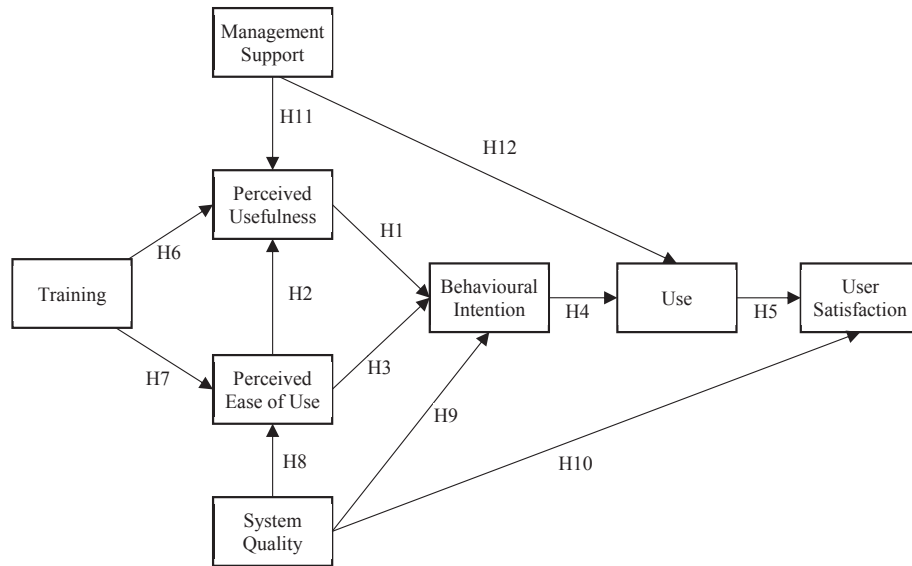
Fig. 2. Proposed model.

Table 2
Constructs and main references.

Construct	Concept	Reference
Perceived usefulness (PU)	The extent to which a person believes that using a particular system would enhance his or her job performance	(Davis, Bagozzi, & Warshaw, 1992; Venkatesh & Davis, 2000)
Perceived Ease of Use (PEOU)	The extent to which a person believes that using a particular system would be free of effort	(Davis et al., 1992; Venkatesh & Davis, 2000)
Behavioural Intention (BI)	The degree of evaluative affect that an individual associates with using the target system in his or her job	(Venkatesh & Davis, 2000)
Use (USE)	Behavioural response to an individual's intention to use the system	(Davis et al., 1992)
Training (TRAI)	A measure of how easy it is for users to be trained on the system, to understand the content material, and to navigate through topics applied to daily tasks	(Ruivo et al., 2014)
Management Support (MANS)	The effort on encouragement to use and support for usage driven by management	(Urbach et al., 2010)
System Quality (SYSQ)	The degree on which the system is easy to use and complies with functionality, reliability, flexibility, data quality and integration needs to accomplish some task.	(Delone & McLean, 2003; Urbach et al., 2010)
User Satisfaction (USS)	Recipient response to the use of the output of an information system	(Delone & McLean, 2003; Urbach et al., 2010)

which the system is easy to use for accomplishing some task" (Schaupp, Weiguo Fan, & Belanger, 2006, p. 3). Urbach et al. (2010), found further evidence of the importance of system quality when assessing an IS. In their empirical survey, system quality proven to be one of the most important constructs and exhibited the highest score among the external factors effect on the model.

Due to the complexity of ERP systems, the *"knowledge transfer"* can be challenging. Training is critical for users to cope adequately with all the functionalities and responsibilities (Bingi et al., 1999). According to Ruivo, Oliveira, and Neto (2014, p. 170), assessing perceived training *"is a measure of how easy it is for users to be trained on the system, to understand the content material, and to navigate through topics applied to daily tasks."* This particular construct is relevant because also offers some insight into organization's culture toward human resources.

Summarizing, these three dimensions were considered the most relevant for assessing the external stimulus: Management support (MANS), System quality (SYSQ) and Training (TRAI).

Originally seen as the most used single measure to assess IS success, user satisfaction is defined as the *"recipient response to the use of the output of an information system"* (DeLone, 1988, p. 68). For example, Urbach et al. (2010) identifies user satisfaction as the main determinant of the model with a large effect on individual

impact and therefore on IS success.

3.3. Hypotheses to explain ERP use and user satisfaction

According to Davis (1989), Perceived Usefulness (PU) showed to be a strong influencer when studying user intentions and should never be rejected. Although this construct has seen some mixed results, in general, has been validated by various researchers in the MIS area as one important predictor of user's behaviour intention (BI) (Petter et al., 2008).

Also, several empirical studies used this relation to evaluate user's adoption of ERP systems. Youngberg et al. (2009), in their study to analyse user perceptions of a particular ERP component, found a strong linkage between these two constructs. Other studies also discovered a very significant relationship when using perceived usefulness to explain user's behavioural intention (BI) (Rajan & Baral, 2015; Sternad & Bobek, 2013).

Thus, we believe that perceived usefulness (PU) is a good predictor of user's behavioural intention (BI) towards ERP system use.

H1. Perceived ERP Usefulness has a positive effect on users Behavioural Intention.

As Davis (1989) demonstrated, perceived ease of use is a direct

Table 3
Sample characterization.

Sample characteristics	(n = 155)	
Gender		
Female	61	39%
Male	94	61%
Instruction level		
Lower than bachelor	47	30%
Bachelor	82	53%
Master or Higher	26	17%
Organization size		
Less than 20 workers	43	28%
21–100 workers	58	37%
101–500 workers	37	24%
More than 500 workers	17	11%
Used ERP functional modules		
Sales	72	15%
Orders	63	13%
Accounting	61	13%
Inventory	54	11%
Treasure	52	11%
Human Resources	51	11%
Customer Relationship Management	40	8%
Production	40	8%
Business Intelligence	36	7%
Others	13	3%
ERP experience		
Less than five years	68	44%
5–10 years	37	24%
More than ten years	50	32%

influence of perceived usefulness. In his research, the author found that the influence PEOU had on behaviour was largely mediated by PU. This is mainly explained because *"users are driven to adopt an application primarily because of the functions it performs for them, and secondarily for how easy or hard it is to get the system to perform those functions"* (Davis, 1989, p. 333). In the elaboration of a very comprehensive study, Venkatesh & Davis (2000) confirmed, with a very significant statistical validation, the influence of perceived ease of use on perceived usefulness.

Rajan and Baral (2015), Applying this relation to the specific case of ERP's area of research, found strong support in this relation. Also, other researchers confirmed that perceived ERP ease of use has a direct positive effect on user's ERP perceived usefulness (Sternad & Bobek, 2013; Youngberg et al., 2009).

Therefore, we hypothesize that ease of use is a reliable predictor of the perceived usefulness.

H2. Perceived ERP Ease of Use of has a positive effect on its Perceived Usefulness.

Influencing behavioural intention directly and indirectly (through PU), the perceived freeness of effort that a user experiences from IS usage, partially explains the behavioural intention (Davis, 1989). PEOU has shown a lower significance level than PU in past studies (Petter et al., 2008). Nevertheless, there is a strong theoretical basis for this relation, and the direct impact relevance cannot be disregarded (Venkatesh & Davis, 2000).

On the subject of ERP studies, this impact is also evident. In recent studies made including this particular relation, researchers found support for this relation (Rajan & Baral, 2015; Sternad & Bobek, 2013).

Hence, we believe that perceived ease of use will have a positive effect on behavioural intention.

H3. Perceived ERP Ease of Use has a positive effect on users Behavioural Intention.

Previous research showed that the behavioural intention (BI) has a significant impact on the actual system's usage (USE) (Davis et al., 1992). Also, Venkatesh & Davis (2000) found that the user's

behavioural intention fully mediated the PU, PEOU and subjective norm on actual system use. Further on, Legris et al. (2003) in a meta-analysis of empirical research made with adoption models found that almost all studies that tested the BI-USE relation found a positive relation to report.

Confirming previous findings in other IS fields, ERP systems studies also found a strong relation between user's behavioural intention (BI) and actual ERP use (USE) (Sternad & Bobek, 2013; Youngberg et al., 2009).

For this reason, we expect that the behavioural intention in using ERP systems may have a significant and positive effect on actual use of enterprise resource planning systems.

H4. User Behavioural Intention has a positive effect on ERP Use.

According to Delone & McLean (2003), the study of usage (USE) impact on the user satisfaction (USS) is a determinant relation to assess the success with any IS. This construct (USS) has been found to be the most important dimension influencing net benefits when evaluating IS success (Mardiana et al., 2015; Tsai et al., 2012).

Although theory underlines the importance of usage (USE) influence on user satisfaction (USS) when studying ERP, the most recent contributions are scarce.

Therefore, we predict that ERP system use (USE) may have a positive on user satisfaction (USS).

H5. ERP system Use has a positive effect on User Satisfaction.

As seen above, training assumes a very important role in a successful implementation and maintenance of an ERP system. People need to understand how the right flow of information can help the organization as well as their own tasks (Bingi et al., 1999).

Various ERP studies also show that this fact is mainly explained by the direct influence of training on the perceived ERP usefulness (PU) (Bradley, 2008; Rajan & Baral, 2015; Youngberg et al., 2009).

Thus, we hypothesize that user training (TRAI) will have a positive effect on both perceived ERP usefulness (PU) and ease of use (PEOU).

H6. User Training has a positive effect on Perceived ERP Usefulness.

Having a perfect understanding of the system, as a result of a good training programme largely enhances user's perceptions about how easy is to use the system (Ruivo et al., 2014). Also, Amoako-Gyampah and Salam (2004) found strong evidence that user training (TRAI) strongly influences the perceived ERP ease of use (PEOU).

H7. User Training has a positive effect on Perceived ERP Ease of Use.

System quality (SYSQ) is often found to be one of most relevant constructs and is always found strong support when assessing matters of IS adoption (Schaupp et al., 2006; Urbach et al., 2010). This particular construct is widely considered as one of the best explanatory construct and is often considered in ERP research (Chien & Tsaur, 2007; Gorla et al., 2010; Rajan & Baral, 2015; Sternad & Bobek, 2013; Tsai et al., 2012). In recent studies, a significant impact on System quality on the perceived ERP ease of use was also found to be very relevant (Gorla et al., 2010; Sternad & Bobek, 2013).

According to these evidence, we postulate that system quality has a positive effect on the perceived ERP system ease of use.

H8. ERP System Quality has a positive effect on Perceived ERP Ease of Use.

An important relation that literature indicates is the influence that the system quality has on users behavioural intentions.

This fact also applies to ERP research, Chien and Tsaur (2007) when assessing the implementation of an ERP solution in three

firms found that the most significant influence of user behavioural intention was the ERP system quality.

Hence, we believe that the ERP system quality (SYSQ) may have a positive effect on user behavioural intention (BI).

H9. ERP System Quality has a positive effect on User Behavioural Intention.

According to (Petter et al., 2008) various researchers have been studying the effect of system quality in user satisfaction through a diversity of intermediate dimensions and using different IS types. A recent study in IS success found a significant relationship between these two dimensions, system quality was considered to be the most significant dimension to explain user satisfaction (Urbach et al., 2010).

In the case of ERP systems research, this relation is also found true. System quality is indeed an important determinant of user satisfaction with the ERP system (Chien & Tsaur, 2007; Tsai et al., 2012).

Therefore, we expect that the system quality (SYSQ) has a strong and positive effect on user satisfaction (USS).

H10. ERP System Quality has a positive effect on User Satisfaction.

According to Bingi et al. (1999), top management role is not only to fund the ERP system, all managerial levels must have full commitment during all stages and ensure that all process runs smoothly. Management support is decisive to build up user's perceptions on system usefulness (Urbach et al., 2010).

Moreover, recent studies show that management support is vital and forms user's perceptions of how useful the system is (Bradley, 2008; J.; Nwankpa & Roumani, 2014; Rajan & Baral, 2015). In fact, Nwankpa and Roumani (2014) say that management intervention"*educates*" users about ERP's usefulness.

Thus, we hypothesize that management support (MANS) influences positively the ERP usefulness.

H11. Management Support has a positive effect on Perceived ERP Usefulness.

According to Urbach et al. (2010), having management support is essential to motivate system's use.

With similar conclusions, several recent studies point out that this management encouragement can largely influence the use frequency of ERP systems (Bradley, 2008; J.; Nwankpa & Roumani, 2014; Pan & Jang, 2008).

Hence, we expect that the management support (MANS) may increase effective ERP use (USE).

H12. Management Support has a positive effect on ERP Use.

4. Empirical methodology

4.1. Measurement instrument

The research model was validated through the quantitative method using previously proven and tested scales to operationalize each construct and increase validity. Hence, in the development of the measurement instrument items were adapted from the previously confirmed empirical studies.

Considering the reviewed literature, a set of items was selected for each construct. After a thorough discussion, the most appropriate a group of items from previously validated empirical studies was chosen to have into consideration the validity and model's best fit.

Afterwards, a first draft was created and pre-tested with a panel of ten randomly chosen ERP end users from different organizations. The first part included an introduction and a set of sample characterization questions. On the second part, the chosen model's

construct were measured using a seven-point Likert-type scale (1- Completely disagree, (…) 7- Completely agree).

All inputs about appearance and instructions were taken into account, and the final survey instrument was then ready to send. Appendix A contains the final measurement items used for testing the structural model.

4.2. Sampling and data collection

The universe is composed of end users that work with ERP systems in their organization routine tasks. As sample strategy, and to guarantee the quality of the data and the responding end users' profile, we obtained a list from 1000 largest companies, then we added a list of small and medium enterprises (SMEs). Afterward, 260 companies were randomly selected. We acquired their public contacts and sent e-mails to obtain the permission to distribute the questionnaire to their employees.

The data was collected by the means of an online survey addressed by email to end-users that work with ERP systems in their organization's routine tasks, activities and business processes. Several ERP end-users from different industries were reached by email to aid this endeavour. Answers were collected between the beginning of June of 2015 and the 31st of August. In this three-month period, 157 answers were received. Two responses were found incomplete, and 155 were considered valid. We believe that no more than 60.4% of the end users' companies responded.

To test the non-response bias of the 155 responses, early respondents were confronted with the late respondents and then compared with the sample distributions using Kolmogorov-Smirnov (K-S) test (Ryans, 1974).The K-S test results showed that the sample distributions were the same across early and late respondents. To confirm that no factor explained individually the majority of the variance, a common method using the Harman's one-factor test was performed (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). The sample size was considered large enough and appropriate to conduct statistical tests (Cohen, 1992).

5. Data analysis & results

5.1. Assessment of the measurement model

To examine the relationship and causal effects of the proposed model (Fig. 2) the structural equation modelling (SEM) with partial least squares (PLS) method was used (Hair, Ringle, & Sarstedt, 2011; Ringle, Wende, & Will, 2005). The use of PLS is considered adequate to test the measurement model and to validate the causality of a structural model. PLS minimizes the residual variances of the endogenous constructs and requires smaller samples (Hair, Ringle, & Sarstedt, 2013; Hair et al., 2011; Henseler & Chin, 2010). Consistent with above, all constructs were operationalized with the contribution of previous studies in this area. Afterward, the measurement model was examined to evaluate the reliability and construct's validity (Ringle et al., 2005).

Table 4 indicates that items reliability are above 0.700 (Hair Jr., Hult, Ringle, & Sarstedt, 2013). This means that all items are equally reliable (see Appendix B). Furthermore, the convergent and discriminant validities are demonstrated in Table 4.

As presented in Table 4, all items converge and share a high proportion of variance. This fact is of particular importance as these constructs explain more than half of the variance of their indicators. Commonality shows that construct's outer loadings have much in common when measuring each of the latent variables (LV).

The empirical results on the discriminant validity show that each construct is distinct from other constructs. Considering a more liberal criterion (Hair Jr. et al., 2013), from Appendix A, it is inferred

Table 4
Measurement model results.

Construct	Item	Outer loading	Internal reliability	Composite reliability	Cronbach's alpha	AVE	Discriminant validity?
BI	BEHI1	0.956	0.913	0.977	0.964	0.933	Yes
	BEHI2	0.956	0.914				
	BEHI3	0.985	0.971				
MANS	MANS1	0.958	0.917	0.935	0.864	0.878	Yes
	MANS2	0.916	0.839				
PEOU	PEOU1	0.934	0.872	0.966	0.953	0.877	Yes
	PEOU2	0.915	0.837				
	PEOU3	0.946	0.896				
	PEOU4	0.951	0.904				
PU	PUSE1	0.970	0.941	0.980	0.973	0.924	Yes
	PUSE2	0.957	0.916				
	PUSE3	0.970	0.941				
	PUSE4	0.948	0.899				
SYSQ	SYSQ1	0.883	0.780	0.965	0.956	0.821	Yes
	SYSQ2	0.913	0.833				
	SYSQ3	0.929	0.863				
	SYSQ4	0.924	0.854				
	SYSQ5	0.873	0.761				
	SYSQ6	0.914	0.836				
TRAI	TRAI1	0.947	0.898	0.944	0.911	0.848	Yes
	TRAI2	0.967	0.935				
	TRAI3	0.844	0.712				
USE	USE1	1.000	1.000	Single Item			
USS	USS1	0.957	0.915	0.981	0.975	0.930	Yes
	USS2	0.964	0.929				
	USS3	0.967	0.934				
	USS4	0.970	0.940				

that each indicator is associated with only one construct. The cross-loading table shows that indicator's outer loadings are greater than all of their loadings on other constructs. An item loading is considered high if the loading coefficient is above 0.600 and considered low if the coefficient loading is below 0.400 (Gefen & Straub, 2005).

Since cross-loadings, indicators are considered a rather liberal criterion regarding discriminant validity, a more conservative approach to assessing discriminant validity was also taken into consideration. The Fornell-Larcker criterion validates constructs by comparing the square root of Average Variance Extracted (AVE) with the results of the latent variable correlation (Fornell & Larcker, 1981; Hair et al., 2011). This criterion is based on the idea that a construct shares more variance with its associated indicators than with any other construct, Table 5 reports that comparison. It shows that all the model's constructs are validated, and that measures of different constructs differ from one another.

The results of the measurement model show the item's reliability and convergent validity. In other words, the model's LV, behavioural intention (BI), management support (MANS), perceived ease of use (PEOU), perceived usefulness (PU), system quality (SYSQ), training (TRAI), use (USE), and user satisfaction (USS), are well represented by all the questions posed to ERP end-

Table 5
Interconstruct correlation and square root of AVEs.

	BI	MANS	PEOU	PU	SYSQ	TRAI	USE	USS
BI	**0.966**							
MANS	0.460	**0.937**						
PEOU	0.659	0.380	**0.937**					
PU	0.711	0.460	0.584	**0.961**				
SYSQ	0.689	0.327	0.750	0.592	**0.906**			
TRAI	0.557	0.301	0.611	0.485	0.604	**0.921**		
USE	0.451	0.401	0.366	0.433	0.320	0.257	**Single Item**	
USS	0.744	0.393	0.705	0.722	0.832	0.596	0.356	**0.964**

Notes: Diagonal elements are square roots of average variance extracted (AVE), Off-diagonal elements are correlations.

users. Once the measurement model is confirmed regarding reliability and validity using PLS, the next step is to assess the structural model.

5.2. Assessment of the structural model

Before the assessment of the structural model we tested all the constructs for multicollinearity, which is considered to be a threat to model experimental design (Farrar & Glauber, 1967), we calculated the variance inflation factor (VIF). Test results showed that multicollinearity does not exist, all variance inflation factors obtained were lower than 4.671, which is well below than the threshold of 10 (Diamantopoulos & Siguaw, 2006; Gujarati & Porter, 2009).

The structural model's quality was evaluated using bootstrapping, a resampling technique that draws a large number of subsamples retrieved from the original dataset. In this case, 5000 subsamples were used to determine the path's significance within the structural model (Henseler, Ringle, & Sinkovics, 2009). Structural model results can be observed in Fig. 3.

After establishing the validity of the structural model, the structural paths were assessed to test the research hypotheses. Training ($\hat{\beta} = 0.176$, p < 0.010), Management Support ($\hat{\beta} = 0.264$, p < 0.001), and Perceived Ease of Use ($\hat{\beta} = 0.377$, p < 0.001), explain 42.7% of the variation in Perceived Usefulness. In another hand, Training ($\hat{\beta} = 0.248$, p < 0.001) and System Quality ($\hat{\beta} = 0.600$, p < 0.001), explain 60.1% of the Perceived Ease of Use.
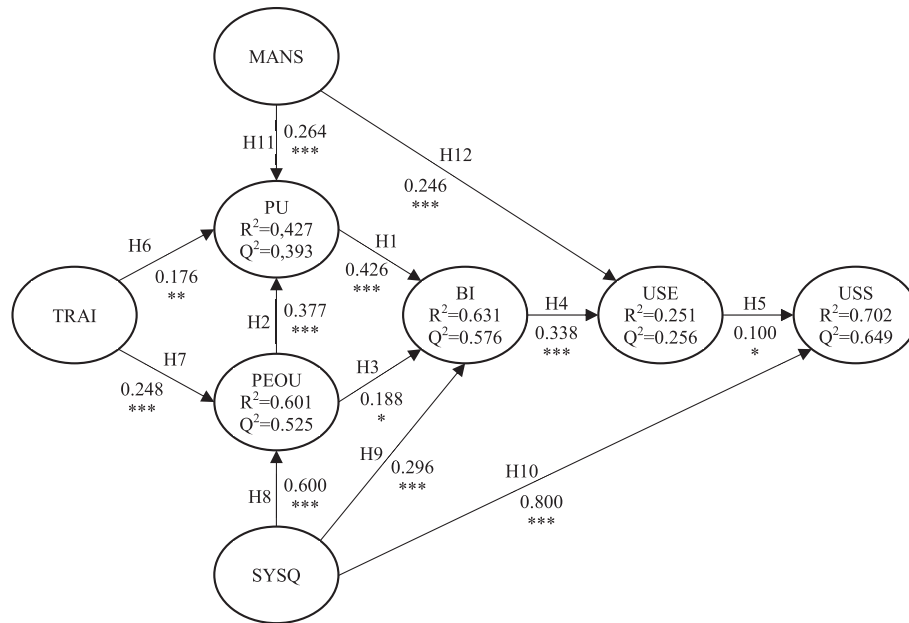
Behaviour Intention is explained in 63.1% by the constructs of Perceived Usefulness ($\hat{\beta} = 0.426$, p < 0.001), Perceived Ease of Use ($\hat{\beta} = 0.188$, p < 0.050) and System Quality ($\hat{\beta} = 0.600$, p < 0.001). Behaviour intention ($\hat{\beta} = 0.338$, p < 0.001) and Management Support ($\hat{\beta} = 0.246$, p < 0.001) explain 25.1% of the ERP system Use while the same Use ($\hat{\beta} = 0.100$, p < 0.010) together with System Quality ($\hat{\beta} = 0.800$, p < 0.001) explains 70.2% of the variation in User satisfaction. All paths are statistically significant and, therefore, all hypotheses are supported.

The presented model supported all paths having, at least, a small

Path * significant at p < .050; ** significant at p < .010; *** significant at p < .001.

Fig. 3. Structural model results.

predictive impact, as seen in Table 6. The five dependent latent variables are explained in more than half of the variances except PU and USE. User satisfaction (USS) with $R^2 = 0.702$, behavioural intention (BI) with $R^2 = 0.631$, and Perceived Ease of Use (PEOU) with $R^2 = 0.601$, present values that can be considered substantial. Q^2 is a measure of the predictive success, and positive values confirm the model's predictive relevance (Geisser & Eddy, 1979; Stone, 1974). Results show positive values for Use ($Q^2 = 0.256$), Perceived Usefulness ($Q^2 = 0.393$), Perceived Ease of Use ($Q^2 = 0.525$), Behavioural Intention ($Q^2 = 0.576$) and User Satisfaction ($Q^2 = 0.649$).

6. Discussion

6.1. Hypotheses discussion

All presented hypotheses were empirically supported for ERP systems. Though the given model shows predictive capacities supporting all hypotheses, results show different levels of support. These singularities will be addressed below.

Results show that the model's inner triangle, *i.e.* hypotheses 1, 2, and 3, show different effects. All effects are significant and positive but have different strengths. In the first hypothesis, perceived usefulness has a very significant influence on behavioural intention (p < 0.001) and also has medium effect explaining this relation ($0.350 > f^2 > 0.150$). The relation between perceived ease of use and

Table 6
Results of hypotheses tests.

Hypotheses	Independent variable	→ Dependent variable	Findings	Conclusion
H1	Perceived Usefulness (PU)	→ Behavioural Intention (BI)	Positively & statistically significant *** ($\hat{\beta} = 0.426$, p < 0.001)	Supported with medium effect
H2	Perceived Ease Of Use (PEOU)	→ Perceived Usefulness (PU)	Positively & statistically significant *** ($\hat{\beta} = 0.377$, p < 0.001)	Supported with small effect
H3	Perceived Ease Of Use (PEOU)	→ Behavioural Intention (BI)	Positively & statistically significant * ($\hat{\beta} = 0.188$, p < 0.050)	Supported with small effect
H4	Behavioural Intention (BI)	→ Use (USE)	Positively & statistically significant *** ($\hat{\beta} = 0.338$, p < 0.001)	Supported with small effect
H5	Use (USE)	→ User Satisfaction (USS)	Positively & statistically significant * ($\hat{\beta} = 0.100$, p < 0.050)	Supported with small effect
H6	Training (TRAI)	→ Perceived Usefulness (PU)	Positively & statistically significant ** ($\hat{\beta} = 0.176$, p < 0.010)	Supported with small effect
H7	Training (TRAI)	→ Perceived Ease Of Use (PEOU)	Positively & statistically significant *** ($\hat{\beta} = 0.248$, p < 0.001)	Supported with small effect
H8	System Quality (SYSQ)	→ Perceived Ease Of Use (PEOU)	Positively & statistically significant *** ($\hat{\beta} = 0.600$, p < 0.001)	Supported with large effect
H9	System Quality (SYSQ)	→ Behavioural Intention (BI)	Positively & statistically significant *** ($\hat{\beta} = 0.296$, p < 0.001)	Supported with small effect
H10	System Quality (SYSQ)	→ User Satisfaction (USS)	Positively & statistically significant *** ($\hat{\beta} = 0.800$, p < 0.001)	Supported with large effect
H11	Management Support (MANS)	→ Perceived Usefulness (PU)	Positively & statistically significant *** ($\hat{\beta} = 0.264$, p < 0.001)	Supported with small effect
H12	Management Support (MANS)	→ Use (USE)	Positively & statistically significant *** ($\hat{\beta} = 0.246$, p < 0.001)	Supported with small effect

Notes: Path Coefficient $\hat{\beta}$; NS = not significant; * significant at p < 0.010; ** significant at p < 0.050.; *** significant at p < 0.001.
Effect size: >0.350 large; >0.150 and ≤ 0.350 medium; >0.20 and ≤ 0.150 small (Chin, 1998; Cohen, 1988).

perceived usefulness (hypothesis 2) is very significant (p < 0.001) and has a medium explanatory effect (0.350 > f^2 > 0.150). Hypothesis 3 shows different results. The statistical significance of perceived ease of use impact on behavioural intention is low (p < 0.050), and the effect is small (0.150 > f^2 > 0.020). These results are all consistent with Sternad and Bobek (2013) and Rajan and Baral (2015) findings in ERP adoption studies about these three hypotheses.

Hypotheses influencing use (H4, H12) both show positive significant impact (p < 0.001) and a small effect (0.150 > f^2 > 0.020). As a matter of fact, the findings are in the same line with previous ERP studies that studied the same kind of relations (J. Nwankpa & Roumani, 2014; Rajan & Baral, 2015; Youngberg et al., 2009).

Hypothesis 11 shows management support impact on perceived usefulness. This relation is positive, highly significant (p < 0.001), and shows a small effect (0.150 > f^2 > 0.020) explaining perceived usefulness. Results are consistent with Bradley's (2008) qualitative study on how management support was required but wasn't the most important fact explaining project's success. Also Nwankpa and Roumani (2014) sustain that management support is important educating users about ERP system usefulness.

Considering reviewed literature, results on training effect on perceived usefulness and on perceived ease of use are somewhat disappointing. Model results show that training has a medium significance (p < 0.010) and a small effect (0.150 > f^2 > 0.020) towards perceived usefulness (hypothesis 6), and a high statistical significance (p < 0.001) but also small effect (0.150 > f^2 > 0.020) explaining perceived ease of use (hypothesis 7). Literature stresses the critical importance of this specific construct's contribution to IS adoption in general and in ERP systems in particular (Bradley, 2008; Rajan & Baral, 2015; Ruivo et al., 2014; Youngberg et al., 2009). Although is also positively and significantly related to the model, training is the weakest independent latent variable.

System quality is without a doubt the most influencing independent LV of the model. This construct impact on perceived ease of use is vast (p < 0.001) and has a large explanatory effect (f^2 > 0.350). This result is consistent with the previous ERP adoption study by Sternad and Bobek (2013). Hypothesis 9 shows a weaker link of system quality with behavioural intention, presenting a small explanatory effect (0.150 > f^2 > 0.020) and high statistical significance (p < 0.001). However, the system quality may be related to the extent of ERP implementation, as long as it can create the initial conditions for application integration and business process enhancements (J. K. Nwankpa, 2015). The ERP modularity characteristics can provide the possibility of a different scope and depth level of implementation. This relationship needs further studies.

In this study management support and system quality are key drivers to use and to user satisfaction, correspondingly. These dimensions can be related to change management and with ERP selection (Ranjan, Jha, & Pal, 2016), this is a relevant aspect needing to be studied.

Finally, the difference between hypotheses related with user satisfaction (H5 and H10) are quite revealing of system's quality weight in explaining user's perceptions about an ERP system. We have hypothesis 5 with a weak linkage between use and user satisfaction regarding statistical significance (p < 0.050), and in explanatory capabilities (small effect: 0.150 > f^2 > 0.020). In opposition to this result, system quality showed a very high statistical significance (p < 0.001) as well as a large effect (f^2 > 0.350) when explaining user satisfaction. Our results confirm what other ERP studies suggested: System quality (SYSQ) is a key component to take into consideration (Chien & Tsaur, 2007; Tsai et al., 2012).

6.2. Theoretical implications

The present research work has three main theoretical implications. First, is among the first works to empirically assess ERP system's adoption and user satisfaction under the same model. Secondly, the integration of dimensions from adoption models (Davis et al., 1992; Venkatesh & Davis, 2000), combined with the ones coming from the DeLone & McLean model (DeLone & McLean, 1992; Delone & McLean, 2003) and other mix approaches (Ruivo et al., 2014; Urbach et al., 2010), constitute a unique combination to consider.

Thirdly, results suggest that user satisfaction can be largely explained by system quality. System quality should be observed as a decisive construct when assessing an IS system, specifically ERP systems.

6.3. Practical implications

The presented model offers a mean of organizations to assess and predict the adoption and user satisfaction of their ERP systems. As seen before, ERP systems' adoption and user satisfaction are multidimensional and interdependent, and while some relations are stronger than others, the analysis should never isolate or reject one particular construct.

Although management support and training showed a lesser significance, this does not mean the influence should be disregarded since the influence exists and is statistically supported.

However, results are quite clear: system quality has the best explanatory capabilities and can largely and directly explain user satisfaction. Hence, practical implications for industry should be taken into account when implementing and maintaining an ERP system.

A correct understanding of the organization real necessities and requirements is vital to ensure that the configuration and parameterization of the needed functionalities are process oriented and without any clutter. Another implication is the importance of ensuring that all system components (hardware and software) are well balanced and integrated to assure fast and reliable data access.

6.4. Limitations and future work

The present study has some limitations. First, the sample data was collected from several organizations representative of major industries but doesn't have a comprehensive and exhaustive industry-wide panorama. Also, the sample was obtained from just one European country and represents a nationwide perspective. Although the results are statistically relevant, further surveys with a larger territorial scope will increase the model's explanatory capabilities.

The proposed model suggest a deeper study of the influence strength of System Quality with the other constructs. The most intriguing finding relates to the explanatory capabilities of this construct (SYSQ) opposed to the classical adoption and success theories when studying user satisfaction.

7. Conclusions

Nowadays, ERPs are at the core of every modern and competitive business. This multidimensional IS manages all the information flow and is critical for every organization stakeholder. Therefore, it is vital to understand what motivates individuals to use best the given ERP system. Hence, the present study aims to find the main determinants influencing ERP user adoption and satisfaction.

Literature review points out to three most significant constructs influencing adoption and satisfaction (independent LV) which are

System Quality (SYSQ), Management Support (MANS), and Training (TRAI). Additionally, there are other relevant constructs to take into consideration in the model development: Perceived Usefulness (PU); Perceived Ease of Use (PEOU); Behavioural Intention (BI); Use (USE); and User Satisfaction (USS). These are the key dimensions (LV) found and validated to assess user adoption and satisfaction.

The questionnaire answers were representative of various organization sizes and user's experience with ERP systems. The collected data is relevant to validate both the measurement and the structural model's results.

All hypotheses were confirmed enabling a good basis for theoretical and practical implications support. Theoretically, the present study is among the very first works to combine IS Adoption and IS Success theories, and empirically study ERP system's adoption and user satisfaction under the same model. Furthermore, the present model found that system quality is a decisive determinant of user satisfaction with the ERP system.

In practical terms, special care about system quality must always

take place. All system components ought to be carefully defined in a holistic approach, to achieve perfect balance and consequently influence user satisfaction and adoption, where management support is essential. Those findings are helpful to companies involved in the ERPs implementation process. By evolving an active participation of management, and also paying particular attention to system quality, user adoption, and user satisfaction is achieved. This study concludes, that if supervisors encourage the ERP use, and organization leadership is explicitly supportive of the ERP adoption than the frequency of ERPs usage will increase. The degree on which the system is easy to use and complies with functionality, reliability, flexibility, data quality and integration needs to accomplish some task leads to the increase of intention to use, and to user satisfaction about ERPs.

Appendix A. Measurement items.

Construct	Code	Indicator	Reference
Perceived Usefulness (PU)	PU1	Using the system improves my performance in my job	(Venkatesh & Davis, 2000) Cronbach's alpha = 0.973
	PU2	Using the system in my job increases my productivity	
	PU3	Using the system enhances my effectiveness in my job.	
	PU4	I find the system to be useful in my job.	
Perceived ease of use (PEOU)	PEOU1	My interaction with the system is clear and understandable.	(Venkatesh & Davis, 2000) Cronbach's alpha = 0.953
	PEOU2	Interacting with the system does not require a lot of my mental effort.	
	PEOU3	I find the system to be easy to use.	
	PEOU4	I find it easy to get the system to do what I want it to do.	
Behavioural intention (BI)	BI1	I intend to continue using the ERP in the future.	(Venkatesh et al., 2012) Cronbach's alpha = 0.964
	BI2	I will always try to use the ERP in my daily life.	
	BI3	I plan to continue to use the ERP frequently.	
Use (USE)	USE1	At the present time, I consider myself to be a frequent user of the ERP.	(Davis et al., 1992) Cronbach's alpha = 1
Training (TRAI)	TRAI1	According to users programme training, please rate the degree of how was training on the system.	(Ruivo et al., 2014) Cronbach's alpha = 0.911
	TRAI2	According to users programme training, please rate the degree of how was their understanding of the content training material.	
	TRAI3	According to users programme training, please rate the degree of how worthy is navigating through the topics after training and applied in daily tasks.	
Management support (MANS)	MANS1	My supervisor actively encourages me to use the ERP.	(Urbach et al., 2010) Cronbach's alpha = 0.864
	MANS2	My organization's leadership explicitly supports the ERP.	
System quality (SYSQ)	SYSQ1	Our ERP is easy to navigate.	(Urbach et al., 2010) Cronbach's alpha = 0.956
	SYSQ2	Our ERP allows me to easily find the information I am looking for.	
	SYSQ3	Our ERP is well structured.	
	SYSQ4	Our ERP is easy to use.	
	SYSQ5	Our ERP offers appropriate functionality.	
	SYSQ6	Our ERP offers comfortable access to all the business applications I need.	
User satisfaction (USS)	USS1	The ERP supports adequately my area of work and responsibility	(Urbach et al., 2010) Cronbach's alpha = 0.975
	USS2	The ERP is efficient.	
	USS3	The ERP is effective.	
	USS4	The ERP satisfies me on the whole.	

Appendix B. Cross-loadings.

	Behavioural intention (BI)	Management support (MANS)	Perceived ease of use (PEOU)	Perceived usefulness (PU)	System quality (SYSQ)	Training (TRAI)	Use (USE)	User satisfaction (USS)
BI1	**0.956**	0.442	0.596	0.676	0.689	0.489	0.410	0.749
BI2	**0.956**	0.453	0.650	0.682	0.630	0.567	0.484	0.670
BI3	**0.985**	0.438	0.662	0.702	0.678	0.555	0.410	0.739
MANS1	0.458	**0.958**	0.386	0.504	0.292	0.298	0.412	0.366
MANS2	0.397	**0.916**	0.318	0.333	0.329	0.261	0.329	0.373
PEOU1	0.656	0.373	**0.934**	0.657	0.718	0.564	0.414	0.694
PEOU2	0.585	0.374	**0.915**	0.525	0.580	0.520	0.306	0.603
PEOU3	0.595	0.305	**0.946**	0.464	0.706	0.581	0.300	0.635
PEOU4	0.627	0.370	**0.951**	0.530	0.790	0.617	0.342	0.700
PU1	0.699	0.448	0.564	**0.970**	0.587	0.489	0.409	0.703
PU2	0.636	0.428	0.549	**0.957**	0.550	0.456	0.386	0.650
PU3	0.651	0.428	0.531	**0.970**	0.542	0.437	0.421	0.692
PU4	0.739	0.461	0.597	**0.948**	0.592	0.479	0.445	0.727

(continued)

	Behavioural intention (BI)	Management support (MANS)	Perceived ease of use (PEOU)	Perceived usefulness (PU)	System quality (SYSQ)	Training (TRAI)	Use (USE)	User satisfaction (USS)
SYSQ1	0.590	0.320	0.645	0.470	**0.883**	0.519	0.310	0.719
SYSQ2	0.579	0.270	0.698	0.492	**0.913**	0.577	0.254	0.705
SYSQ3	0.660	0.291	0.671	0.575	**0.929**	0.590	0.297	0.766
SYSQ4	0.598	0.256	0.770	0.500	**0.924**	0.573	0.283	0.726
SYSQ5	0.684	0.340	0.616	0.626	**0.873**	0.524	0.293	0.819
SYSQ6	0.630	0.301	0.677	0.546	**0.914**	0.503	0.305	0.785
TRAI1	0.569	0.343	0.646	0.474	0.646	**0.947**	0.252	0.611
TRAI2	0.548	0.229	0.611	0.493	0.596	**0.967**	0.236	0.602
TRAI3	0.389	0.259	0.381	0.352	0.377	**0.844**	0.222	0.393
USE1	0.451	0.401	0.366	0.433	0.320	0.257	**1.000**	0.356
USS1	0.713	0.370	0.694	0.678	0.812	0.582	0.373	**0.957**
USS2	0.717	0.379	0.676	0.694	0.799	0.569	0.342	**0.964**
USS3	0.713	0.424	0.647	0.721	0.780	0.557	0.323	**0.967**
USS4	0.726	0.343	0.701	0.694	0.817	0.590	0.335	**0.970**

Indicators outer loading on the associated construct are provided in bold.

Appendix C. Model structural paths.

Hypotheses	Path	$\hat{\beta}$	t-Value	p-Value
H1	Perceived Usefulness → Behavioural Intention	0.426	6.062	0.000
H2	Perceived Ease Of Use → Perceived Usefulness	0.377	3.223	0.002
H3	Perceived Ease Of Use → Behavioural Intention	0.188	1.903	0.059
H4	Behavioural Intention → Use	0.338	4.075	0.000
H5	Use → User Satisfaction	0.100	1.875	0.063
H6	Training → Perceived Usefulness	0.176	2.248	0.026
H7	Training → Perceived Ease Of Use	0.248	3.293	0.001
H8	System Quality → Perceived Ease Of Use	0.600	7.898	0.000
H9	System Quality → Behavioural Intention	0.296	2.847	0.005
H10	System Quality → User Satisfaction	0.800	19.369	0.000
H11	Management Support → Perceived Usefulness	0.264	3.264	0.001
H12	Management Support → Use	0.246	2.958	0.004

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