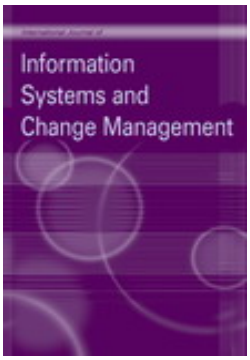

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The impact of user familiarity to ERP usage: an empirical study

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Abstract: ERP vendors are rapidly updating their systems with emerging technology every year. Many companies are trying to catch up with the speed by upgrading their current ERP systems. Although various IS acceptance models, including the TAM model, were developed to understand the ERP end-users' behavioural intention, few studies have examined the effects of familiarity from a user perspective. This study focuses on usability issues of current ERP systems and gains an in-depth understanding of familiarity in the context of ERP continuance usage. We collected data from a user practice experiment to investigate how this cognitive and affective factor, familiarity, is interrelated with ERP users' continuance intention. The results support the criticism of TAM and show the importance of familiarity as an additional critical construct to the context of ERP adoption. Implications for both academic research and practice, as well as suggestions for future studies, are discussed.

Keywords: enterprise resource planning; ERP; familiarity; continuous usage.

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1 Introduction

Given the rapid growth of enterprise systems (ES) over the last two decades, understanding the factors contributing to the success of ES implementation and upgrade

projects is still a crucial concern for organisations that spend over $400 billion annually (Gartner, 2018). Enterprise resource planning (ERP) systems, the most complex and expensive ES, are the dominant ES adopted by current organisations to support their daily business processes and system integrations (Rouhani and Mehri, 2018). Since the 1990s, researchers have identified over 30 critical success factors (Barth and Koch, 2019; Kiran and Reddy, 2019; Olson and Zhao, 2007) and developed various theoretical models (Alam and Uddin, 2019; Kamdjoug et al., 2020) to summarise the lessons learned from actual failure cases and help organisations understand characteristics of ERP systems and improve outcomes of ERP projects. Despite numerous previous studies on the success of ERP (Ali and Miller, 2017), organisations continue to encounter some unpleasant numbers of ERP implementation and upgrade projects (Carlton, 2019): 60% of ERP projects fail; 80% of customers are unhappy with their current ERP; 39% of ERP workers are unsatisfied with ERP. Among all the factors, recognition and satisfaction from end-users become a critical concern to organisations (Alcivar and Abad, 2016; Ali et al., 2016). According to Oracle (2020), 50% of organisations are acquiring, upgrading, or planning to update their ERP systems soon. ERP upgrades include upgrading the functions/features of the current system with the same vendor, upgrading the current system user interface with a browser application, or switching to another ERP product or a cloud system. Before starting their ERP upgrade projects, these organisations may ask how to improve their end-users' satisfaction with their new ERP systems to achieve the success of these projects.

ERP usability issues have been discussed in previous studies (Scholtz et al., 2016; Wong et al., 2016). Usability has become one of the weaknesses of current ERP systems, such as SAP (Babaian et al., 2016). End-users, especially novice users, complained of ERP systems of their non-user-friendly interfaces, difficulties to use, and long learning curves (Lambeck et al., 2014; Topi et al., 2005). Research has often emphasised users' perspectives and training instead of directly tackling ERP usability issues (Babaian et al., 2016). It has been readily acknowledged that the user's subjective opinion affects the usefulness (Karahanna and Straub, 1999). Positive outcomes observed by the user will raise the user's attitude about using new technology as well as the intention of using the technology (Subramanian, 1994). Perceived ease of use of a new technology decreases users' physical and mental efforts to adapt a new method to complete desired tasks (Saadé and Bahli, 2005). The more the user believes in the ease and effortlessness of the new technology, the higher the degree of the user's positive perception (Segars and Grover, 1993).

The technology acceptance model (TAM) is a theory that was developed by Davis (1989) to explain how users adopt and use information technology (IT). TAM posits that two main factors influence a user's intention to use a new IT system: perceived usefulness and perceived ease of use. TAM has been widely tested and found to be a valid and reliable model for predicting IT adoption (King and He, 2006). However, despite its simplicity, TAM is often used in research without considering its actual applications (Hojjati and Khodakarami, 2016). This is because TAM cannot fully explain the reasons behind the acceptance and use of technology in the business environment (Torres and Gerhart, 2019).

Here are some of the limitations of TAM (Lim, 2018; Opoku and Francis, 2019):

- It is a unidimensional model that only considers two factors (perceived usefulness and perceived ease of use) in explaining technology acceptance.

- It does not consider other factors that may influence technology acceptance, such as social influence, organisational culture, and individual differences.
- It has been criticised for being too simplistic and unable to explain the complex reality of technology acceptance in the business environment.

Despite its limitations, TAM remains a popular model in research because it is easy to use and understand. However, it is important to be aware of the limitations of TAM when using it to explain technology acceptance in the business environment. Hence, the purpose of this study is to find additional constructs to explain and predict user technology acceptance behaviours in the business environment, especially in ERP usage. Through our research, we are trying to answer the following questions:

- Is TAM enough to reveal user intentions in ERP systems usage?
- Is there any other critical factors that could help us to predict user behaviour and intention in ERP usage?
- Is perceived ease of use the dominant factor influencing users' decision in ERP continuance usage?

Familiarity has been adopted as an extended factor in behaviour intention, acceptance, and technology continuance research frameworks in some empirical studies such as customers' online shopping behaviours (Gefen et al., 2003), adoption of recommendation agents (Komiak and Benbasat, 2006), and continuance usage of smartphones (Idemudia and Raisinghani, 2014). Chau and Lai (2003) argue that end-users are more likely to use a system when they are more familiar with the features/functions of the system because completing the tasks in the system may require little or no extra cognitive learning efforts. However, few studies have examined the effects of familiarity on the end-users' behavioural intention with theoretical support. In this study, we argue that the original TAM is insufficient to explain ERP continuance usage from users' perspectives because of the complexity and difficulty of the system. Additional variables, such as familiarity, should be considered in future studies to provide more comprehensive theoretical support in ERP continuance usage research. Through an experimental design and a survey of end-users' perceptions concerning adopting and continuously using an available ERP system, we test the research hypothesis and discuss the implications of the results. The paper concludes with a discussion of the limitations and future research directions.

2 Literature review

From an employee's perspective, introducing a new information system (IS), such as ERP, brings changes in business processes, job responsibilities, perceived task/job control, accountability, and technical skill requirements (Hsieh, 2016; Klaus et al., 2007). These changes generate resistance among employees, such as refusal, complaints, and defensive behaviours (Klaus et al., 2007). Employees' resistance to change has been found to be a key contributing factor to many ERP project failures (Alcivar and Abad, 2016; Kim and Kankanhalli, 2009). According to a previous ERP implementation study (Cooke and Peterson, 1998), user resistance was found to be the second most important factor that affects the budget and time of ERP projects, and the fourth most important

challenge for overall ERP project implementations. By summarising and consolidating three theories of resistance, Markus (1983) argues that understanding resistance within the context of IS innovation requires comprehension of three aspects of resistance such as people, system, and interactions between people and systems. In regard to the system aspect, he lists lack of user-friendliness, poor human factor, and inadequate technical design as three main factors influencing user resistance. These factors, defined as system usability in later literature, were found to be related to user satisfaction (Nasution and Mohamad, 2019; Yassien et al., 2017). Even with intensive training on ERP systems, there is no guarantee that the employees fully understand the business processes in the systems and skilfully operate the functions and features because of the complexity of the ERP systems, massive menu structures, inadequate navigational guidance, and limited system support and help (Lambeck et al., 2014).

Numerous studies of resistance adopt theoretical models, such as TAM, to explain users' cognitive perceptions of contextual factors, such as system usability, to their beliefs and behaviours toward a new system (Kim and Lee, 2016; Rammile and Nel, 2012). According to an empirical study on e-health systems (Özdemir-Güngör and Camgöz-Akdağ, 2018), resistance was found indirectly affecting users' intention through perceived ease of use, which is one of the key factors in TAM. Perceived ease of use refers to 'the degree to which a person believes that using a particular system would be free from effort' (Davis, 1989).

Despite the wide applications of TAM in academic research, there is a limitation identified by Van der Heijden (2004) that when the use of technology is unavoidable or limited, the variables in TAM are appropriate to explain users' acceptance behaviours; however, if there are more options with other overwhelming factors, the users' decisions of technology adoption may not be limited to the variables in TAM. Simply applying TAM to a study may not successfully contribute to the theoretical understanding of user intention and behaviour (Shachak et al., 2019). Therefore, in some cases, the original TAM variables may not be sufficient to explain and predict the acceptance attitude toward certain technologies, including VR technology (Manis and Choi, 2019). Empirical studies have shown that when the user interface matches the end-user's skill levels, user performance will be improved with higher user acceptance (Burkolter et al., 2014). End-users' skills are accumulated from their previous experience of using the system. The more they used the system, the more familiar they became with it. This familiarity implies an increasing amount of accumulated knowledge, which builds up end-users' confidence, decreases their fear of arbitrary behaviour, enhances efficiency, and influences their behavioural intention (Gefen et al., 2003). Therefore, in our study, in the context of ERP acceptance, we extend the TAM framework with an additional variable: familiarity.

Familiarity is defined as the degree of one's understanding of an entity based on previous interactions, experience, and learning with 'the what, who, how, and when of what is happening' (Gefen et al., 2003). A person tends to prefer the familiar to the unknown because more risk could be involved in the unknown (Bornstein, 1989). Familiarity is based on cognisance of previous knowledge, experience, or skills of using a particular interface (Gefen, 2000). The concept of familiarity was introduced in the early days of psychology with personality and communication research (Reis et al., 2011; Whittlesea, 1993). It has been studied in various disciplines, such as customer behaviour, learning, marketing, and IS. According to Kim and Gupta (2009), repeat consumers are five times more profitable than new consumers in retail. Therefore, customer trust is

critical to determine a customer's decision to purchase a product or use a service. Legendre et al. (2019) argue that consumer familiarity with edible insect food contributes to the formation of media trust. Additional studies on supplier familiarity and restaurant consuming familiarity further support the relationship between customers' familiarity and their trust in certain products or a commercial brand (Gulati and Sytch, 2008; Söderlund, 2002). However, through a study of a banking system, Gu et al. (2009) surprisingly failed to support the significant relationship between customers' familiarity and their trust in the banking system. The authors explained that compared to online shopping; the trust of customers in the bank has already been established. Thus, customers would not consider familiarity anymore.

In addition to the consumer trust context, IS scholars have studied familiarity in a few research works regarding IS adoption and acceptance. Based on the theory of reasoned action (TRA), Komiak and Benbasat (2006) identified the positive relationship between customer familiarity and cognitive trust in both competence and integrity, which, in turn, would increase the intention to use a recommendation agent. By adopting the expectancy-confirmation model (ECM), Lee and Kwon (2011) showed the positive effects of familiarity and consumers' continuance intention in web-based services. There are also several studies on familiarity in the hardware system context, such as smartphone systems (Idemudia and Raisinghani, 2014) and wearable devices (Wang et al., 2017). In the current studies of the relationship between familiarity and continuance intention, the IS system or technology is relatively simple, such as web-based services and a smartphone. However, the relationship between familiarity and intention to continuance usage of complex ISs, such as ERP systems, has not been explored by researchers to date.

Familiar processes, graphical user interfaces, and even similar wording or module abbreviations may bring some positive or negative impact on user behaviour. End-users of ERP systems, for example, may expect to complete a function with the same or similar navigation using an updated system. This navigation is the knowledge end-users gained from previous ERP systems and allows them to encode information about the new system more efficiently without intensive learning. In our study, in the context of an ERP system acceptance, familiarity is that end-users understand how to use most of the functions in a previous ERP system, recognise the similarity of the functions in the updated system, and apply prior exposure and experience to the new system. Familiarity represents the degree of non-variability and certainty of functions/features end-users need to complete using ERP systems. It develops a cognitive knowledge structure toward the systems through end-users' previous interactions and experience with the technology and activities. This knowledge structure reduces end-users' perceived system complexity, improves the efficiency of the work related to the technology, and increases productivity. The tasks in ERP systems tend to be more structured and predictable when non-variability and certainty are high. However, when the variability and uncertainty increase, end-users need more effort to complete a function/feature with less structured tasks and unpredictable results.

3 Theoretical background and research model

Sample et al. (2020) argued that visual perception theory helps explain a user's cognition and behaviour stimulated by visual experience. Vision is a direct and simple presentation

of objects around people. Human brains are programmed to search for and understand the meanings of the visual images reflected in vision. According to Gibson (1950), the essential information of these visual images, including the elements of size, shape, colour, texture, transparency, direction, etc. induce psychological responses that impact human decisions and behaviours. From the human-computer interface (HCI) perspective, perception is the core relationship between humans and the interface, which includes not only the interface of the system, such as images, icons, or any static design, but also the navigation of the interface (Gibson, 2014). It is a feeling of recognition and interpretation of the sensory information through the vision that a user captures from the system environment. Through perception, this sensation presents a user's understanding, feeling, and response to the system.

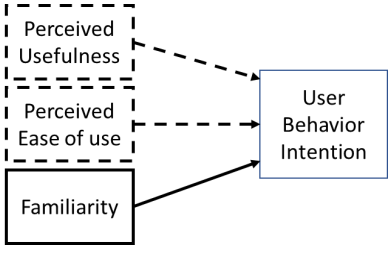
The visual perception theory refers to the extent to which human perception relies directly or indirectly on the information in the environment (Gibson, 2014). Some of the perceptual processes are direct that the information came from the environment stimulus itself. In contrast, some of the perceptual processes are indirect that more depend on a user's expectations and previous knowledge (Goldstein and Cacciamani, 2021). The visual perception theory provides an essential understanding of how users collect stimulation through vision and react to this sensed information. Psychologists demonstrate two types of processes in perception theory: bottom-up processing and top-down processing. Gibson (1950) argues that perception is direct that it begins with the stimulus itself by analysing the sensory information. This bottom-up processing starts from a simple analysis of raw sensory data and accumulates the information by gradually increasing the complexity of analysis through the visual system. Some psychologists, such as Gregory (1970), focus on top-down processing that perception is a constructive process which relies more on past experiences or stored knowledge. Top-down processing refers to the recognition of contextual information according to user's perception and reaction came from the combination of incoming sensations and past experience or knowledge. In this case, a user's response, activities, and intention integrate the visual signals from the outside environment with their prior knowledge. Since the stimulus information from the system is frequently ambiguous and unpredictable, a system user typically requires higher cognitive information from past experiences and prior knowledge to explain and accept what he/she perceives (Goldstein and Cacciamani, 2021).

Familiarity is a perception generated from top-down processing that visual perception is an associative process involving not only memory and cognition but also past experience and familiarity (Von Helmholtz, 2013). Familiarity not only provides a solid structure or framework for future expectations of the systems but also allows end-users to establish concrete solutions of what to expect based on their previous experience of the systems (Gulati 1995). According to Luhmann (2018), end-users are likely to perceive less complexity and uncertainty if they are familiar with a system. In contrast, people are more likely to resist or be reluctant to use the technology when overwhelmed by the complexity of an interface and navigation. Therefore, Gefen (2000) argues that familiarity directly influences the behavioural intention toward a technology. Additionally, Proctor and Van Zandt (2018) suggest that developers should adopt more familiar features/functions to enhance systems' usage, adoption, and acceptance. Thus, it is postulated that familiarity with an ERP system positively affects the continuance usage of a similar ERP system. According to our literature review, even though TAM was criticised by many current researchers for its limited explanation of the complexity of the

socio-technical system (Lim, 2018) and simplified constructs of interpretation of individual users' perceptions or expectancies (Sherer et al., 2015), we still need to consider the substantial influence of the two constructs, perceived ease of use and perceived usefulness, on end-users behavioural intentions (Feng et al., 2022). Therefore, we propose our research model (Figure 1.) that all three factors, including perceived usefulness, perceived ease of use, and familiarity, positively influence user behaviour intention in the context of ERP systems continuance usage. Since TAM is validated by hundreds of empirical studies in ERP research areas, we only focus on the familiarity construct in this study. Thus, we propose the following hypothesis:

Hypothesis Familiarity has a positive effect on end-users' behavioural intention toward ERP systems continuance usage.

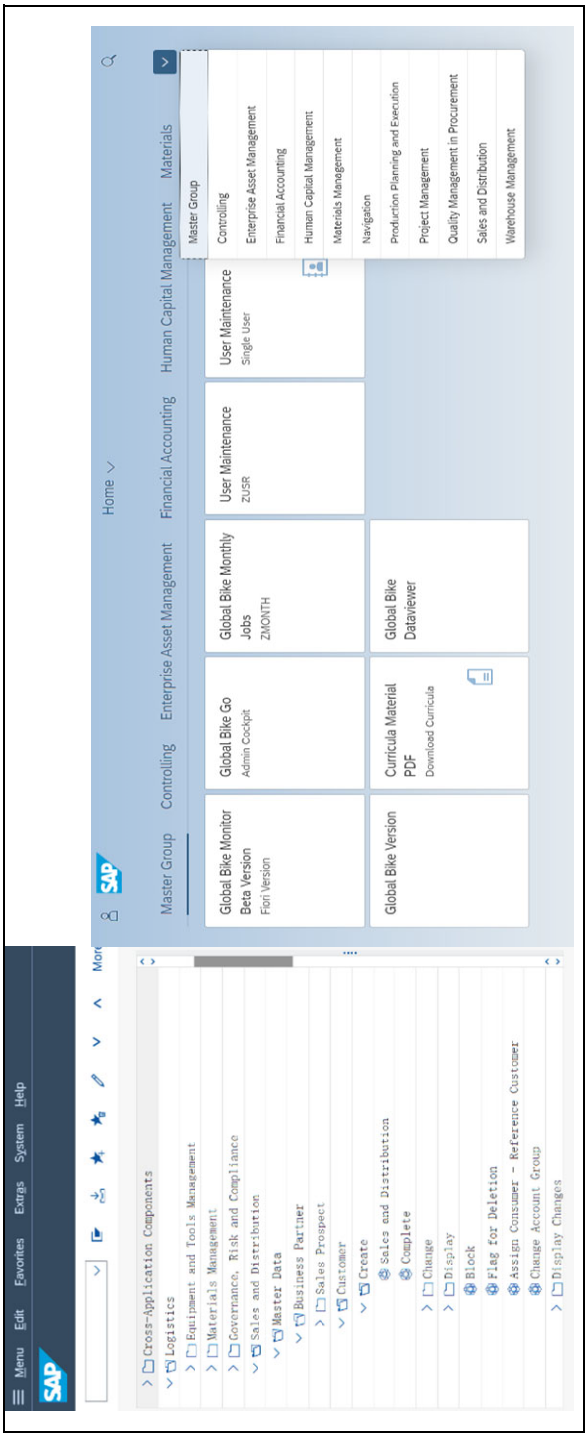
Figure 1 Proposed research model (see online version for colours)



4 Research methodology

To evaluate the impact of familiarity, we designed an experiment in a junior-level introduction to IS course and a senior-level ERP course at a university in the USA. This school enrolled in the SAP University Alliance program. Therefore, we have full access to two SAP ERP systems: SAP R/3 and SAP S/4. SAP ERP system R/3, built on client-server technology, is a core component within SAP's Business Suite and allows users to store, retrieve, analyse, and process corporate data. S/4, released in 2015, runs through the SAP HANA memory database. Both systems contain a central menu interface named SAP easy access menu, while S/4 has a new interface option named Fiori, the best user-friendly interface for SAP ERP (Ghattamneni, 2016). On the left side of Figure 2, the interface of R/3 uses expanded menu branches to show all the features/functions. Another way to locate a particular feature/function is to enter a transaction code, such as MM3, in the search bar at the top of the menu. Since there are over 3,000 features in the SAP systems, most users prefer to memorise transaction codes when they use the SAP R/3 system (Babaian et al., 2016). Previous studies (Calisir and Calisir, 2004; Topi et al., 2005) have revealed multiple usability issues of R/3, such as complex and tedious navigation, limited guidance in the system, and inability to retrieve frequently accessed data efficiently. On the right side of Figure 2, the interface of S/4 Fiori, integrated with a tiled menu structure, utilises graphical visualisations to provide a better user interface and a more intuitive way to run SAP applications (Ghattamneni, 2016).

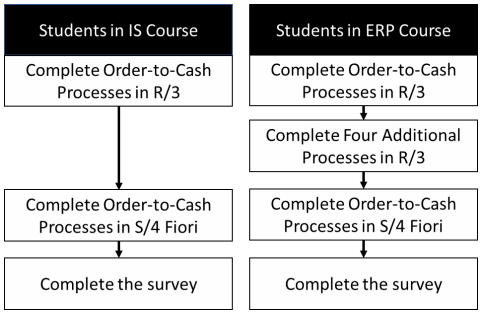
Figure 2 Comparison of the interfaces of SAP R/3 and S/4 Fiori (see online version for colours)



Convenience sampling was adopted in this study due to the restricted availability of SAP ERP. In the IS course, we asked students to complete one business process, order-to-cash in sales and distribution module, designed by SAP, in the R/3 system first and then S/4 Fiori. The S/4 Fiori project required precisely the same business process in the sales and distribution module with the same data. The only difference was that the students were required to use S/4 Fiori to complete it. In the ERP course, we asked students to complete five business processes, including the one we used in the IS course, in different SAP ERP modules in R/3, such as sales and distribution, Finance and Accounting, and human capital management (HCM). Students in the ERP course on average took 5 to 8 hours to complete each business process project, and they were required to complete all five projects within one month during the semester. These ERP course students represent users with significant familiarity with R/3. After completing these five projects, they were asked to complete the same business process using S/4 Fiori as the students in the IS course. Please see the summary of these steps in Figure 3. In both courses, all the lectures about IS or ERP systems did not use SAP ERP systems or interfaces as examples. Therefore, students' cognition of the SAP ERP systems or interfaces only came from their practices through the SAP ERP assignments, and students from the ERP course do not have any significant advantages in SAP R/3 experience over the students in the IS course from prior experiences. Regrading S/4 Fiori, the only difference in prior experience between the two groups of students is that the students in the ERP course completed an SAP project using S/4 Fiori when they took the IS course a year ago because the IS course is the prerequisite course for the ERP course.

All the students were then asked to complete a survey about their experience using the SAP systems. We asked one question at the end of the survey: 'Overall, in my ERP assignments, I like to use SAP ERP S/4 Fiori much better than SAP ERP R/3'. This is the question to ask students' intention to use which of the two SAP ERP systems continually. We used a Likert scale from 1 = strongly disagree to 5 = strongly agree to collect students' opinions. We repeated this experiment for two semesters in the IS course and three semesters in the ERP course until we had a sufficient sample size. We only kept the data if the students completed four of the six main steps of the cash-to-order process in the IS course and if the students completed all six projects correctly in the ERP course.

Figure 3 Flowchart of the steps students completed in two courses



If familiarity has a positive impact on user behaviour intention, because the ERP students have more experience and therefore are more familiar with SAP R/3, they are less likely to agree with the survey question than the IS students, who tried both systems only once,

do. Because the data are in a Likert scale and the ordinal scale, non-parametric tests, such as Mann-Whitney U Test, are used in SPSS to test the hypothesis.

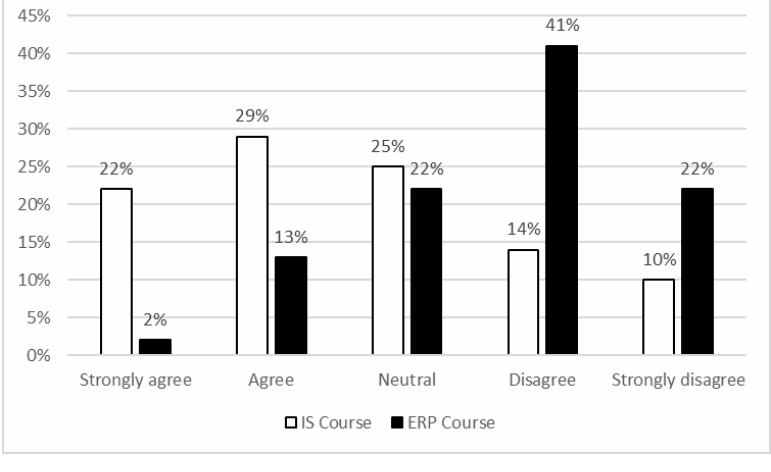
5 Data analysis and discussion

A total of 174 valid responses were collected from the IS course while a total of 153 valid responses were collected from the ERP course. The medians of the IS course and the ERP course were 'agree' and 'disagree' to use S/4 Fiori, respectively. The distributions of the responses are summarised in Table 1. As shown in Table 1 and Figure 4, the distribution of responses shows that 51% of the students in the IS course agreed and strongly agreed to use S/4 Fiori, while only 15% of students in the ERP course did. The results also showed that 24% of the students in the IS course disagreed or strongly disagreed to use S/4 Fiori, while 63% of the students in the ERP course disagreed and strongly disagreed to use S/4 Fiori in future tasks.

Table 1 Distribution of responses from the IS course and ERP course

Use S/4 Fiori over R/3	*IS course*	*ERP course*
Strongly agree (5)	38 (22%)	3 (2%)
Agree (4)	50 (29%)	20 (13%)
Neutral (3)	44 (25%)	34 (22%)
Disagree (2)	25 (14%)	62 (41%)
Strongly disagree (1)	17 (10%)	34 (22%)
Total	174 (100%)	153 (100%)
Median	4	2
Mean	3.39	1.93

Figure 4 Distribution of responses from the IS course and ERP course



To test the hypothesis, first, one-sample Kolmogorov-Smirnov test was conducted for the data from both groups. The results show neither of them has the normal distribution at a p-value of less than 0.01.

Table 2 Results of one-sample Kolmogorov-Smirnov test

Course	*Null hypothesis*	*Sig.*	*Decision*
IS	Distribution of the data is normal with mean 3 and standard deviation 1.247	0.000	Reject the null hypothesis
ERP	Distribution of the data is normal with mean 2 and standard deviation 0.840	0.000	Reject the null hypothesis

Notes: *Asymptotic significances are displayed. The significance level is 0.050.
*a. Lilliefors corrected.

Since the data is in the Likert scale and ordinal data in nature, a non-parametric test, independent-samples Mann-Whitney U test, was used to compare the behaviour intention of the two groups to test the hypothesis. The result shows that the distribution of the students in the IS course, who practiced with both R/3 and S/4 Fiori system only once, is statistically significantly different from the students in the ERP course, who significantly experienced the R/3 system and only once with S/4 Fiori, at a p-value of less than 0.01.

Finally, one sample binomial test was used to determine if the students in the two courses agreed or disagreed with the survey question. Each of the ordinal responses to the survey question was evaluated at the significance level of 0.05.

Table 3 Results of independent-samples Mann-Whitney U test

Total N	327
Mann-Whitney U	4,957.000
Wilcoxon W	16,738.000
Test statistic	4,957.000
Standard error	831.749
Standardised test statistic	–10.044
Asymptotic sig. (two-sided test)	0.000

Table 4 Results of one sample binomial test

	IS course		*ERP course*	
Null hypotheses evaluated in the binomial test	*Sig.*	*Decision*	*Sig.*	*Decision*
The categories defined by the question <= 5 and > 5 occur with probabilities 0.5 and 0.5	0.000	Reject H_0	0.000	Reject H_0
The categories defined by the question <= 4 and > 4 occur with probabilities 0.5 and 0.5	0.000	Reject H_0	0.000	Reject H_0
The categories defined by the question <= 3 and > 3 occur with probabilities 0.5 and 0.5	0.940	Retain H_0	0.000	Reject H_0
The categories defined by the question <= 2 and > 2 occur with probabilities 0.5 and 0.5	0.000	Reject H_0	0.258	Retain H_0
The categories defined by the question <= 1 and > 1 occur with probabilities 0.5 and 0.5	0.000	Reject H_0	0.000	Reject H_0

Notes: *Asymptotic significances are displayed. The significance level is 0.05.

The results show that students in the IS course, who had practiced both systems once, agreed with the statement that "Overall, in my ERP assignments, I like to use SAP ERP S/4 Fiori much better than SAP ERP R/3" more than those in the ERP course did, who had significant experience with R/3 and limited experience with S/4 Fiori. Students in the ERP course gained more experience with the R/3 system and are more familiar with it. Therefore, according to the visual perception theory, when they were asked about the intention to continuance usage of ERP systems, most of them, with the perception of familiarity based on their prior knowledge of R/3, preferred the R/3 system, which is in line with the top-down processing in the visual perception theory. This result statistically supported our hypothesis that familiarity has a positive effect on end-user's behavioural intention of continuance usage.

A typical way to measure familiarity construct is to use survey questionnaires asking users about how much they were familiar with the systems. However, this self-reported data is subjective. According to Tempelaar et al. (2020), self-reported data could be biased because of the response styles, a tendency to use the rating scale unrelated to the content of the items, and overconfidence, the differences between subjective and objective confidence in predicted performance. Therefore, based on the visual perception theory, in this study, we asked students in the ERP course to complete four additional business processes using R/3 to guarantee they were familiar with the SAP ERP system. After completing these tasks, students were more familiar with the SAP R/3 and acquired a cognitive map of the procedures involved in this ERP system.

S/4 Fiori has a more modern user interface. Most people, especially the students who participated in this experiment (the majority were younger than 30, and the oldest participant was 45), are now familiar with this type of user interface. As mentioned before, S/4 Fiori provides a more intuitive, better user interface (Ghattamneni, 2016). Therefore, according to the TAM, we should predict that users should choose S/4 Fiori over R/3. The result of this study was consistent with this as the distribution of the students in the IS course, who had the same experience with both R/3 and S/4 Fiori systems, was clearly skewed to 'agree' to choose S/4 Fiori to complete their tasks if they have a choice. However, the predicting power of the perceived ease of use diminished for the students in the ERP course, who had significant experience with R/3. The results from our statistical analysis show that the students in the ERP course preferred R/3 instead of S/4. They did not want to choose S/4 Fiori over R/3 to complete their tasks if they had a choice. They wanted to keep using an inferior user interface because of their familiarity with R/3. This implies that end-users with a higher degree of user experience in a certain ERP system are more likely to choose it for their future usage even if its usability is not as good as the other system. This result is in line with the visual perception theory that the perception of cognitive familiarity with past experience and knowledge significantly affects a user's intention prediction (Frith and Dolan, 1997). This result was also consistent with previous research about the role of familiarity in other systems such as online shopping systems (Gefen et al., 2003), smartphone (Idemudia and Raisinghani, 2014), and recommendation agents (Komiak and Benbasat, 2006).

When familiarity or prior knowledge is not involved, according to the bottom-up processing in the visual perception theory, a user's perception directly comes from the system interface and navigation without interpretation of the system information because there is no or limited past experience stored in the mind (Gibson, 2014). This explains why students in the IS course prefer the S/4 with Fiori system. Students did not have past experience with either system. In this case, familiarity does not affect their perception of

the systems, and perceived ease of use becomes a dominant factor influencing their behaviour intention.

In 2019, SAP announced that their technical support to all the legacy products, such as ECC and R/3, would stop at the end of 2025. Many companies that run SAP legacy systems are rushing to update their systems. Companies that adopted ERP systems from other vendors are also acquiring, upgrading, or planning to update their ERP systems soon (Oracle, 2020). Organisations learned various lessons from thousands of ERP implementation projects over the past three decades, and their employees gained experience using EPR systems. Both ERP vendors and organisations who adopted ERP should pay more attention to end-users' familiarity today. When organisations upgrade their current systems, they should understand the power of familiarity, which could make their upgrading projects more successful and post-implementation operations more efficient by reducing end-users' cognitive effort to operate the new system and accomplish their tasks. From a vendor perspective, the changes they made in their new version of ERP should be consistent with their previous version so that the end-users would be able to apply their previous experience in the new system to reduce user resistance and improve their productivity.

According to the results of this study, we propose two strategies for the current ERP vendors when they develop a new system or upgrade their existing system. ERP vendors could adopt the familiarity strategy when they develop a new system and try to inherit some of their current system interface. This strategy suggests that, when they plan to significantly change the ERP system interface and navigation in their next version, vendors of ERP systems should extend their upgrade period and evenly provide multiple minor upgrades to their customers instead of forcing customers to upgrade the system through a one-time big-bang strategy. A sudden change of a system interface and navigation could create a negative attitude toward the intention to the system usage by diminishing the effects of users' familiarity even though this new version may provide a better user-friendly interface. A frequent and gradual update strategy of an ERP system may be preferred over significant changes to the interface. By following the top-down processing in the visual perception theory, this strategy could effortlessly help users build up their experience and knowledge about the system, thus increasing their familiarity with the system and positively impacting users' behaviour intention. The second strategy, the usability strategy, should be adopted when the vendors are developing a system with a brand-new interface and navigation. For instance, the user interface of SAP S/4 with Fiori is a state-of-the-art system compared to its R/3 system (see Figure 2). This strategy suggests that vendors should concentrate more on developing the factors in the TAM, such as perceived ease of use and perceived usefulness. By following the bottom-up processing in the visual perception theory, this strategy helps vendors enlarge the perceived usability benefits of the new system and enhance users' recognition and acceptance of the system.

6 Conclusions, limitations, and future research

Numerous studies have explored the antecedents of ERP users' continuance behaviour during the post-implementation stage. However, little attention has been paid to the role of familiarity in building the framework of users' continuance intention to ERP systems.

This study explores the characteristics of familiarity from a comprehensive literature review and identifies the influence of familiarity on end-users' ERP acceptance attitude based on the visual perception theory. We conducted a Mann-Whitney U test and one sample binomial test to examine the relationship between familiarity and ERP continuance usage. Our data analysis results also identify and compare the impact power of perceived ease of use and familiarity in the context of behaviour intention to ERP continuance usage. In line with previous research (Gefen, 2000; Proctor and Van Zandt, 2018), the results of this study indicate that familiarity should be considered an important construct for future ERP continuance intention research. This study provides insights and understanding of antecedents that directly influence ERP continuance usage from a usability perspective.

There are four theoretical implications of our study. First, prior research (Bhattacherjee, 2001; Chou and Chen, 2009) examined multiple constructs of IS continuance. However, no consideration was dedicated to understanding the role of familiarity in ERP continuance usage. Our study uniquely identifies the importance of familiarity, which is not only suggesting a construct in system usability research but also enhancing the ERP acceptance framework by recognising the power of familiarity. This research model expands the research view of IS continuance, especially in the ERP continuance studies. Second, while most of the current IS acceptance studies validated the TAM model, this model needs to be supplemented with a key factor, familiarity, to precisely identify the essential constructs in the context of ERP acceptance. Third, this research adopted the visual perception theory to successfully define the familiarity construct in the current IS acceptance research context and adequately explain the findings from this study. This study represents an effort toward validating a psychology theory adoption in the IS research field. Future IS studies could expand the applications of this theory. Lastly, the findings of less power of perceived ease of use compared to familiarity in this study prompts researchers to re-evaluate the significance of this construct in the IS acceptance and continuance usage theories. If the findings of the future studies are consistent with our current research, we could then argue that this factor would become less significant in terms of influencing behaviour intention under certain constraints, such as with familiarity. Moreover, our study further supports the criticism of TAM that this model fails to explain broader system-level issues with limited constraints (Ammenwerth, 2019).

The findings also have significant managerial implications on successful ERP implementations and upgrades. First, the finding of familiarity as a vital precedence of user behaviour intention supports this managerial suggestion that appropriate ERP implementation or upgrade actions help end-users create and increase familiarity with the ERP systems. This positive formation of familiarity in end-users' minds strengthens their positive attitudes toward a new system. Secondly, familiarity has a positive impact on user attitudes toward the continuance usage of ERP systems. Thus, during the system design face, managers could adopt a similar system interface to increase end-users' feeling of familiarity with the system. Additionally, managers could develop early intensive training schedules to improve users' familiarity with the new system if the system interface or functions significantly changes from the previous system. Appropriate implementation or upgrade plans and activities help companies understand their end-users' needs so the managers can utilise better change management strategies to minimise user resistance. Lastly, building on the finding that perceived ease of use has less power compared to familiarity on influencing user behaviour intention, managers

should pay more attention to the continuity of the system interface and functionality from the previous version rather than merely emphasising the perceived ease of use of the system.

From the practitioner's perspective, the results of this study provide organisations with valuable knowledge that might prompt them to make significant changes in their next ERP upgrade. To reduce the resistance to the new ERP system, organisations, for example, could assign additional business process case studies to their end-users to enhance their familiarity with the new system before the ERP upgrade project starts. Additionally, understanding the importance of familiarity on the ERP continuance intention could give the ERP vendors a hint that when they upgrade their ERP systems, they should avoid drastic changes of the interfaces, navigations, and task completion procedures, which could increase the end-users' resistance to the new system and lower the success rate of the ERP upgrade implementations. The two strategies, familiarity strategy and usability strategy that we suggested are useful to the ERP vendors in their decision-making when they start to upgrade their current system or develop a new one.

This study has limitations. The study used convenient sampling instead of random sampling, and the sample size was about 150 subjects for each group, limiting the generalisation of the results. Furthermore, the data were collected from college students who used SAP for a few months at most. If data are collected from employees of companies who have been using SAP for several years, the credibility of the results could be improved. Also, different results could be obtained if the data were collected from people with different cultural backgrounds, levels of technology skills, and societal expectations. Validating the results with a randomly selected larger sample from several countries in business settings would be ideal.

This study considered only the visual changes in the interface and navigation; however, if the business processes change, more fundamental changes may be necessary in the interface and navigation, which may have a more significant impact on the user's familiarity. Future studies should investigate the impact of familiarity from many different aspects.

Generalising the impact of familiarity we found in this study from ERP systems to other types of IS needs further investigation. The main difference between ERP and other systems is complexity. ERP is vastly complex and requires a significant amount of training, whereas other IS have smaller scales with fewer requirements for learning and less practice time. Therefore, the importance of prior experience and knowledge might not be that significant in the perception of the system. We argue that familiarity will still play an important role in other IS but may have less power in influencing a user's behavioural intention. Data should be collected using different types of IS to evaluate whether the impact of familiarity differs in other IS.

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