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Impact of absorptive capacity on project success through mediating role of strategic agility: Project complexity as a moderator

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ABSTRACT

The purpose of this study is to explore the role of potential and realized absorptive capacity on project success through both the mediating roles of strategic agility and the moderating role of project complexity. A simple random sampling was used to collect data from 285 respondents working in the IT sector of small-medium sized Portuguese enterprises (SMEs). Due to the Covid-19 pandemic, data were collected from and distributed on, several online channels (Gmail, LinkedIn, Twitter, and Facebook). Smart PLS-SEM, version 3.2.8 was used for the analysis. The results indicate that the two absorptive capacity sub-dimensions, potential and realized absorptive capacity, not only directly affect a project's success but also indirectly through the mediator of strategic agility. Although the moderating role of project complexity has a positive and significant effect on the relation between potential absorptive capacity and strategic agility, it is insignificant concerning the relation between realized absorptive capacity and strategic agility. Finally, theoretical and practical contributions are made, research limitations are stated and future research is suggested.

Introduction

Small-medium IT enterprises (SMEs) must use external sources for a better response and survival under the complexity of a dynamic, rapidly changing environment (Tallon et al., 2018; Haider et al., 2020). The need to learn and manage knowledge has been emphasized in the literature so far. A company's overall performance can be improved and competitive advantages created. Liu et al. (2017) and Khan et al. (2020) investigated absorptive capacity (AC) to a degree, which acknowledged that a company needs new external information, to understand it and use it to achieve organizational goals successfully.

The absorptive capacity theory presumes that the absorption of new knowledge assists organizations to increase their success and also makes them more flexible and innovative than not having new knowledge absorption (Kale, Aknar & Başar, 2019). Andersén (2015) and Albort-Morant et al. (2018) stated that absorptive capacity has two common states: potential absorptive capacity and realized absorptive capacity. Potential absorptive capacity (PAC) comprises learning and absorption. It encompasses endeavors used to distinguish and secure new outside information and to absorb information taken from outside sources (Lyu et al., 2022). Realized absorptive capacity (RAC) comprises information change and utilization. It contains inferred new bits of knowledge and the results from a blending of the existing and recently obtained information and fuses changed information into tasks (Kotabe, Jiang & Murray, 2011).

The identification of AC as a dynamic capability points to interesting research opportunities. Organizations are now undergoing continuous transformation. The influence of different elements such as technology, innovation, industrial trends and growing rivalry means that competitive advantages are further required (Galvin et al., 2020). Therefore, strategic agility (SA) serves to detect the changes in the business environment and to respond to them. There is a reasonable amount of literature available in the domain of absorptive capacity and strategic agility. However, the existing literature is completely silent on information technology (IT) companies at the SME level in the context of developed countries (Kohtamäki et al., 2020; Nyamrunda et al., 2021).

This study is an attempt to fill this gap by focusing on the absorptive capacity of Portuguese SMEs by presenting a model to identify its potential factors. We use the present literature as the background to strengthen our grasp of the concept and its influence on the success of SMEs in relation to SA. Moreover, market dynamics have been seen as a significant driver for innovation and growth for businesses, as rapid technological developments influence the competitive world (Xue & Swan, 2020). Due to this environment, companies are under

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enormous pressure to adapt and implement more complex projects to survive among tough market competitors, while improving and sustaining their market share. Organizations are continuously researching and taking new and innovative steps to gain an advantage on their competitors and to strengthen their position in the market (Haider et al., 2022). However, technological change is hard to oversee among SMEs worldwide and it is significantly more difficult if the project is complex (Costa et al., 2021; Rehman et al., 2021). So, it is important for both practitioners and academics to understand project complexity (PC), to know how to handle PC, and how it affects individuals and organizations (Bjorvatn & Wald, 2018).

The literature shows that time, budget and quality are not the only criteria for a project's success, but the handling of complexity has to be considered as well (Marnewick, Erasmus & Nazeer, 2017). The most suitable theory, and chosen as the theoretical foundation for our conceptual framework, is complexity theory (Larsen-Freeman, 2017). Complex systems are made up of a lot of minor parts with no centralized control. As a result, organizations exhibit non-linear and unexpected behavior. The term "complex system" refers to a system that contains a large number of components and their interactions (Ladyman et al., 2013). Complexity is a term used throughout the literature on project management and it usually brings additional difficulties to achieving the desired outcome (Luo, Zhang & He, 2020). There must be some techniques to manage the project complexity so that a team does not face difficulty while working on the project (De Toni & Pessot, 2021). The environment of the 21st century is uncertain and comprises huge risks to meet the criteria of project success (Gurca et al., 2021). Within these conditions, the current study proposes a framework that can be applied by different SMEs within the IT sector and future analysts. In addition, this exploration is a commitment to fill, at least partially, gaps existing in earlier investigations. Experts have mainly neglected the moderating effect of project complexity on the relation between PAC and SA, as well as RAC and SA, therefore its role should be examined thoroughly. Thus, the aim of this research is to examine how Potential and Realized absorptive capacity enhance project success, and strategic agility as a mediated mechanism and moderator of project complexity are the new contributions for SMEs research on project-based IT Companies in Portugal. Furthermore, this article is in accordance with the following. To begin, we show important literature and theory to support in the development of hypotheses. After that, technique was described, followed by data analysis. Then comes the results, discussion, and implications, led by the conclusion and suggestions.

Literature review

Underpinning theory

Complexity theory is used to analyze complex systems in the area of strategic management and organizational studies, also called complexity strategy, or complex adaptive organizations (Anderson, 1999; Benbya et al., 2006). It is based on research in the field of natural sciences that examines insecurity and non-linearity. The notion of complexity highlights interactions and feedback loops whose systems constantly change. While it claims that systems are unpredictable, it also claims that order-generating laws constrain them (Larsen-Freeman, 2013). Complexity theory has been applied in the domains of strategic management organizational studies. Examples of areas of application have been introduced in order to understand how companies adapt to their environments and deal with uncertain situations. Organizations have complex structures by having dynastic interaction networks and not adding many static elements (Larsen-Freeman, 2017).

PAC and RAC on project success

The term absorptive capacity (AC) was first introduced and defined by Cohen and Levinthal (1990), to describe a company's capacity to identify, assimilate and exploit information available in its environment. Zahra and George (2002) define AC as "a set of organizational routines and processes through which companies acquire, assimilate, transform and exploit knowledge to produce a dynamic organizational capacity". Lichtenthaler (2016) investigated a reversed U-molded connection between absorptive capacity and the financial outcome of a company. Absorptive capacity increases the financial outcome of a company further on. However, after a certain point, the financial outcome is negatively affected. Actual absorptive capacity has been reported as being related to data securing and increasing new item market success (Liu et al., 2013). This concept is also called an organization's ability to gather and organize information, to create operational capabilities (García-Sánchez et al., 2018). It includes four features of the organization's learning process: "acquisition, assimilation, transformation and exploitation" (Spithoven et al., 2010; Rehman et al., 2021).

The acquisition capacity shows, according to research, the ability of a company to differentiate and secure external information essential for the organization. Assimilation offers schedules and procedures for examining, processing, transforming and capturing the data obtained by the organization. Similarly, change refers to the ability of a company to produce and develop plans that integrate existing knowledge with newly acquired expertize. Finally, exploitation means the power of a company to incorporate information in real time and accomodate it into its operations. The focus is on transforming information into new processes.

The first two abilities can be combined to generate a potential absorptive capacity that captures a company's ability to evaluate and obtain outside knowledge, growth and expect expansion in the company's information databases (Lyu et al., 2022). The last two can be grouped under a realized absorptive capacity using the data gathered from its operations to generate new ideas (Albort-Morant et al., 2018). The existing literature has mostly focused on large-scale organizations in manufacturing industries (Liu et al., 2017; Duan et al., 2021). So, it is also necessary to examine the impact of AC on SMEs belonging to the IT sector, as the results might differ due to differences in infrastructures and the support provided to them (Müller, Buliga & Voigt, 2021). According to Nyamrunda et al. (2021), technological absorptive capacity in technical endeavors significantly and positively generates hierarchical knowledge and progress. Empowering innovative absorptive capacity inside a company guides workers to look for and learn new ideas. By transforming this information into new services efficiently, production will increase, the innovation performance of companies will be improved and the success rate of projects will grow in return.

Companies with higher levels of AC, in comparison to others, are more likely to recognize market opportunities, obtain market information and understand the clients' requirements. As a result, they undertake innovation development activities appropriately, improve the company's success and increase opportunities for high-success rate projects (Duan et al., 2021; Wang et al., 2020). Based on the above argumentation, the following hypotheses may be considered:

H1. Potential absorptive capacity is positively associated with project success.

H2. Realized absorptive capacity is positively associated with project success.

Relationship of potential absorptive capacity and realized absorptive capacity with strategic agility

The concept of agility previously appeared in an Iacocca Institute review in America in 1991. It concentrated on ability as well as

adaptable and agile creation to meet the quickly varying requirements of business (Dove, 1991). It is the change of constant and capriciously evolving customer circumstances into beneficial capacity in a competitive environment (Haider, 2019). It makes advances and evolves in a changeable and unexpected climate, performing actively and modifying itself in a violent environment and creating opportunities before change (Sheppard & Young, 2006). According to Kohtamäki et al. (2020), a deeper investigation of the mechanisms by which AC influences learning ability could improve our understanding of the relationship between IT competency and strategic agility. AC is a knowledge-based and IT-driven capacity that provides an organization with the ability to master a given area of knowledge and adjust its existing processes to respond to changes, resulting in significant commercial value (Hurtado-Palomino et al., 2022). Agility is believed to be better understood from a coordinated point of view. As a result, absorptive capacity serves as a link between IT competence and SA (Harvey et al., 2010; Khan et al., 2020). In order to bring IT-enabled improvements, the development of absorptive capacity is an essential method (Ali et al., 2021). The dynamic capacity-based study was focused on conceptual clarifications of absorptive capacity outcomes such as innovation, adaptability, and performance (Volberda, Foss & Lyles, 2010). Absorptive capacity and strategic agility are linked as two dynamic characteristics because researchers use complexity theory as a reference framework to define the role of agility (Bakarada & Koronios, 2018). The sub-dimensions of absorptive capacity are substantially similar to the sensing and reacting components of SA, according to Verma, Bharadwaj and Nanda (2017). Furthermore, SA focuses on change management, whereas absorptive capacity is connected to knowledge management. As a result, absorptive capacity provides sufficient explanatory power to explain the organizational capacities of perceiving and responding to change in this investigation.

According to AlTaweel and Al-Hawary (2021), SA implies the capacity to survey or rediscover the organization and its strategy in relation to changes in the business climate. The capacity to be agile is straight forwardly identified with human performances, cycles and association advancements. Škare and Soriano (2021) stated that SA has the purpose to get data of normal modifications into business through the organization's participation. Current research shows an absence of analysis managing the connection between strategic agility and absorptive capacity. Some investigations offer indirect help for this association. Rojo et al. (2018) concluded that those elements of strategic learning included: information procurement, understanding, scattering, and actuation (strategic information creation, strategic information understanding and strategic information execution), which are entirely identified with SA. Based on this discussion, we can predict that:

H3. Potential absorptive capacity is positively associated with strategic agility.

H4. Realized absorptive capacity is positively associated with strategic agility.

Strategic agility as a mediator

Haider et al. (2021) explained that strategic agility is a company's capacity to respond swiftly, accommodate and act to manage uncertainty in the changing business environment. According to Shams et al. (2021), strategic agility is a tool to create a company's competitive advantage. Researchers have been discussing the impact of market factors such as technology, sustainability and competitiveness (Gurca et al., 2021). Pereira et al. (2021) believe that IT and agility increase corporate success by leveraging the defining agility elements: sensing and responding. The importance of strategic agility in the IT sector is supported by Morton, Stacey and Mohn (2018). A corporation should constantly be open to transformation by addressing strategic agility as a concept. Tzokas et al. (2015) mentioned how vital investments of IT resources are to SMEs in order to achieve market leverage. According to Tallon et al. (2018), SA is an emotional competence governed by IT, which increases corporate success. Zahoor et al. (2022) note that a corporation must have a business continuity plan while making a change. It entails ensuring that the company can cope with turbulent change while still operating at total capacity. Strategic agility has a strong relationship with transformation. Companies with high-level SA are better able to assimilate, codify, and use new knowledge created by AC and proactively seek new ways to react to environmental changes swiftly. Consequently, they have adequate business model innovation and strategic transformation (Junni et al., 2015). Inter-organizational knowledge acquisition about organizational transformation may vary depending on a company's ability to transfer and use the information learned to their organizational renewal processes.

Kale et al. (2019) and Kohtamäki et al. (2020) consider strategic agility as a mediator of absorptive capacity and company success. Rehman et al. (2020) also claim that strategic agility has an increasing effect on the organization, especially in a changing corporate environment. Tallon and Pinsonneault (2011) discovered that company agility has a mediating role in the impact of strategic IT alignment on project success. Another study found that strategic agility plays a mediating role in the relation between the ability to manage customer knowledge and project success (Haider et al., 2020). Albort-Morant et al. (2018), who focused on innovation due to AC, explored the role of AC in prior studies. An integrated approach is required to comprehend agility properly. Agility can also be achieved through strategic collaborations. Nyamrunda et al. (2021) stressed that agility is a synthesis that many companies, each with different fundamental skills and qualities, create to respond to customers' requirements. They also suggested that essential elements, such as people, organizations, and technology should be integrated to achieve agility. Through inter-company cooperation, SA tries to obtain information about predicted market developments. SA is proactive and knowledge-based, as opposed to reactive production agility. Based on prior research findings, strategic agility may have a role in the influence of absorptive capacity on project success, leading to the following hypotheses:

H5. Strategic agility is positively associated with project success.

H6. Strategic agility mediates the relation between PAC and project success.

H7. Strategic agility mediates the relation between RAC and project success.

Project complexity as a moderator

In the context of project management, complexity is the most important topic, and, at the same time, it is very controversial (Bakhshi, Ireland & Gorod, 2016). Complexity is defined as "the property of a project which makes it difficult to understand, foresee and keep under control its overall behavior, even when given reasonably complete information about the project system" (Vidal & Marle, 2008). To be more precise, complex projects are inclined to schedule delays and budget overruns (Mikkelsen, 2020). A project is considered as complex, when it is extremely dependent on its (political, economic, or legal) environment, with continuously changing stakeholders' demands, requirements and having conflicting stakeholders' interests (Luo et al., 2020) . It becomes more complex when there is an inadequacy of information and too many variables are involved simultaneously (Lu et al., 2015). According to Benbya et al. (2006), complexity theory is the foundation for team members to represent structured behavior and cooperate in dealing with ambiguous situations. Complexity theory demonstrates how principles from various

disciplines can be combined and applied to related contexts (Kasemsap, 2020). It claims that a set of rules governs complex behavior. All complex systems are made up of a network of interconnected components interacting according to those rules. According to Ruoslahti (2020), complexity theory is a concept used to manage project teams to foster the creativity required to meet project objectives.

It is widely reported in the literature that projects have become more complex over time (Zhu & Mostafavi, 2017; Hansen et al., 2020). The success of software development projects has had a broad impact on different industries and business management processes (Andersén, 2015) e.g., operational planning and control (Rehman et al., 2021), human resource management, inventory management, supply chain management etc. (Eckstein et al., 2015). This literature emphasizes the fact that project success depends on the project's complexity and its features, including size and timing, depending on the tasks (Luo et al., 2020). Complexity in a project may have a negative influence on the success of the project but, on the other hand, it may also have a positive influence on project results/outcomes as a result of emerging properties which can create new opportunities (Bjorvatn et al., 2018). Therefore, the main focus should be on how to manage project complexity in a constructive way rather than focusing on reducing it or avoiding it completely. In today's dynamic environment, only those project-based organizations from the software development industry will be able to deal with project complexity and successfully improve their project success (Butler, Vijayasarathy & Roberts, 2020). A high rate of project failures is a fact which is experienced by both advanced and developing nations, especially in the software industry (Varajão et al., 2014; Sousa et al., 2020; Morcov et al., 2021). According to De Toni and Pessot (2021), to eliminate the influence of project complexity on project success, research is urgently needed to identify the risks associated with project complexity and offer techniques to minimize the risks that may have an impact on a project's success. Thus, we propose that (see Fig. 1):

H8. Project complexity negatively moderates the relationship between potential absorptive capacity and strategic agility.

H9. Project complexity negatively moderates the relationship between realized absorptive capacity and strategic agility.

Research methodology

SMEs have great employment potential. They are the main contributors to economic development and are a major income source of generations. Therefore economies have concentrated on the SMEs' successive role in economic prosperity (Müller et al., 2021; Nyamrunda et al., 2021). Likewise, SMEs from the IT sector in Portugal contribute significantly to the country's GDP (Sousa et al., 2020). Consequently the ongoing development of this sector has a major impact on different economic indicators. Taking into account the importance of this sector, we have chosen SMEs for this study as an analysis unit. This research used the hypothesized model with a cross-sectional design (see Fig. 2) (Kalof & Dan, 2008). Data cannot be collected from the entire population due to limited time and resources.

Thus, a simple random sampling technique was used for the collection and investigation of information (Taherdoost, 2016). The data was collected during four months, from February 2022 to May 2022. This information was initially collected from the PORDATA database regarding SMEs in the IT sector in Portugal. SMEs from the IT sector of developed economies are more open to intense competitiveness and environmental change. They recognize and appreciate the importance of knowledge resources and continued renewal (Galina et al., 2016; Silva et al., 2021). The selection was made among five small to medium IT companies from Portugal with an estimated number of 900 workers. Among these companies are: Unbabel, BI4ALL, Glintt, Vortal, and Timestamp. The sample size of 276 was adopted based on the Slovin formula, accepted globally to calculate the sample size and used recently in the SMEs by Kosasi and Yuliani (2017).

$$n = \frac{N}{1 + N\,(e)2}$$

$$n = \frac{900}{(\{1 + 900 * (0.05)2\}}$$

$$n = 276$$

Due to the Covid-19 epidemic, the data was collected through self-administered surveys (generated via Google Docs) and distributed across several online channels (Gmail, LinkedIn, Twitter, and Facebook). This allowed the most significant number of people possible to take part in the survey. A total of 380 questionnaires were circulated and 323 people responded to the survey. Project managers, shift supervisors, and team members from public and private IT organizations are among those who answered. After removing any partial replies, 285 surveys were eligible, resulting in a 75% response rate, which was highly encouraging during the pandemic. Harman's one-factor analysis findings revealed that the study had no issues with common method analysis, based on the exploratory factor analysis and the principal analysis approaches, because the single factor explained 16.43 percent of the cumulative variance, which was less than the suggested 50 percent threshold (Fuller et al., 2016). The bulk of the 285 responders are aged between 20 and 40, 23.9% female and 76.1% male. As for their formal qualifications, 26.3% have a Bachelor's degree, 44.9% a Master's degree, 20.4% have an MBA/Post Graduation

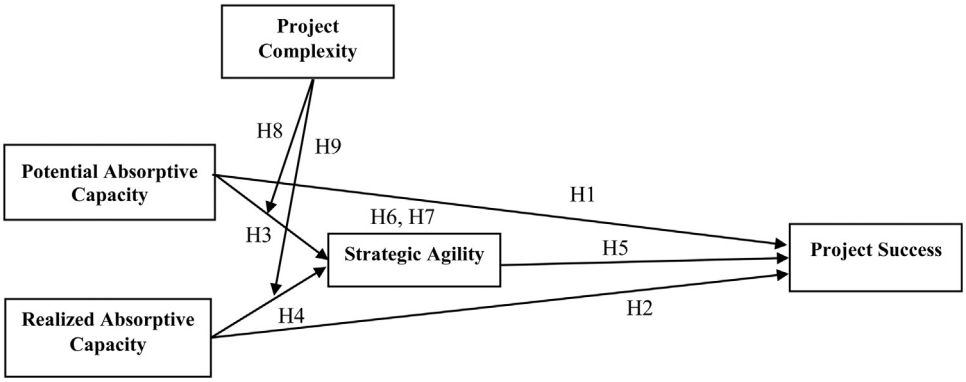

Fig. 1. Conceptual model.

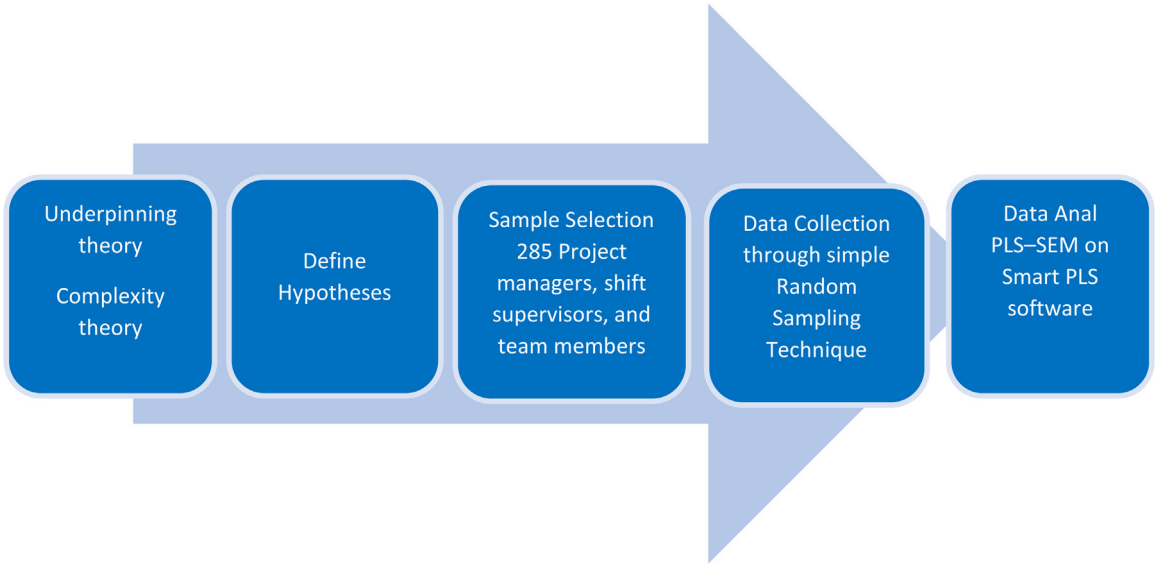

Fig. 2. Quantitative research method.

degree and 3.9% have a PhD. In terms of job experience, 7.7% respondents have less than one year's experience, over 33% have one to three years' experience, 34.4% four to six years' experience and 24.9% have more than six years' experience (see Table 1).

Measures

In order to measure five constructs, the questionnaires were used to gather data, and all of the constructs were derived from existing sources. Questionnaires were administered in two languages English and Portuguese, using a Likert scale ranging from 1 to 5, 1 representing "strongly agree" and 5 representing "strongly disagree" respectively. A total of 39-items were included in the questionnaire. Two independent variables were adopted: a potential absorptive capacity (PAC) based on a 6-item scale and realized absorptive capacity (RAC) based on a 9-item scale, from Albort-Morant et al. (2018). In addition, an 8-item scale was used to measure the dependent variable project success adopted from Luo et al. (2020). Strategic agility (SA) was used as a mediator and measure by a 13- item scale adopted from Khan et al. (2020). The last variable introduced, the moderator project complexity, was measured based on a 3-item scale adopted from Bjorvatn et al. (2018).

Table 1
Descriptive Statistics.

Demographics	Categories	Frequency	Percent
Gender	Female	68	23.9
	Male	217	76.1
Age	20–30	99	34.7
	31–40	131	46.0
	41–50	53	18.6
	>50	2	.7
Education	Bachelor	75	26.3
	Master's	128	44.9
	MBA/Post Graduation	58	20.4
	PhD	11	3.9
	Any Other	13	4.6
Experience	<1	22	7.7
	1–3	94	33.0
	4–6	98	34.4
	>6	71	24.9

In order to assess each instrument's dependability, a pilot test comprising of 50 questionnaires was conducted as part of the ongoing investigation. Cronbach's alpha, which gives the structure a trustworthy or internal consistency, was used to measure reliability (Tavakol & Dennick, 2011). Internal cohesiveness refers to the application of the same concept to all the items of a construct. It has a value that runs from 0 to 1. A Cronbach's alpha value of 0.70 or above was the general rule (Taber, 2018). The Cronbach's alpha value for each construct is shown in Table 2. Common method variance (CMV) may exist in the data since the same respondents were used to collect all the variables. However, several procedural remedies were applied to lessen the issue of CMV, such as a cover letter to assure respondents' confidentiality, description of new words, brief and straightforward questions, etc., nevertheless CMV was a part of the process (Tehseen et al., 2017). In addition, the statistical treatment of (Dziuban & Shirkey, 1974) "Correlation Matrix Procedure" (CMP) was used to examine the CMV's influence through the correlation of latent variables. Because the correlation between the primary variables was less than 0.90, CMV was not discovered in this technique. Similarly, CMV was investigated using a complete collinearity evaluation approach.

Results

PLM–SEM (Partial Least Squares–Structural Equation Modeling) is divided into two components (Sarstedt et al., 2017). The first component is a measuring model (or external model), which depicts the relationship between the components and their indicators. The structural model (or internal model) is the second component, and it depicts the link between two constructs. Exogenous or endogenous constructs are used. There is no arrow pointing to exogenous constructs because they are independent variables. The constructions explained by other factors are known as endogenous constructs (i.e., arrows are pointing towards them). When an endogenous construct is inserted between two variables, it becomes an independent variable. Smart PLS-SEM release 3.2.8 was used for the analysis. The 285 individuals were analyzed using the T-test 5000 subsamples to determine their significance level (Wong, 2013), path coefficients, and weights for loading. To evaluate the measurement model, using indicator loads or weights, composite reliability, multicollinearity, convergent and discriminant validity can be applied (depending on whether the construction is formative or reflective). The next step:

Table 2
Measurement Model.

Constructs/Items	Factor loadings	A	CR	AVE	Source
Potential Absorptive capacity		0.868	0.904	0.620	Albort-Morant et al. (2018)
We have frequent interactions with top management to acquire new knowledge.	0.844				
Employees regularly visit other units or project teams.	0.836				
We collect information through informal means.	0.849				
Members do not visit other units or project teams.	0.833				
We periodically organize special meetings with clients, suppliers, or third parties to acquire new knowledge.	0.851				
Members meet regularly with external professionals, such as advisers, managers, or consultants.	0.415				
Realized Absorptive capacity		0.853	0.873	0.510	Albort-Morant et al. (2018)
We regularly consider the consequences of changing market demands, in terms of new ways to provide services	0.667				
We quickly recognize the usefulness of new external knowledge for existing knowledge	0.726				
Employees hardly ever share practical experiences	0.669				
We laboriously grasp opportunities for our unit from new external knowledge	0.709				
We periodically meet to discuss the consequences of market trends and new service development	0.455				
It is clearly known how activities within our unit should be performed	0.693				
We have a clear division of roles and responsibilities	0.713				
We constantly consider how to better exploit knowledge	0.630				
We have difficulties implementing new services	0.638				
Project Success		0.847	0.883	0.507	Luo et al. (2020)
Time	0.821				
Cost	0.849				
Quality	0.630				
Health and safety	0.828				
Environmental performance	0.858				
Participants' satisfaction	0.524				
User satisfaction	0.517				
Commercial value	0.473				
Strategic Agility		0.938	0.946	0.577	Khan et al. (2020)
Our company adopts technology-driven production systems such as just-in-time.	0.759				
Our company adopts advanced production techniques such as value analysis, concurrent engineering, and modular design systems.	0.628				
Our company invests in upgrading production, information, and inventory management systems.	0.805				
Our company upgrades process/product design by investigating customer needs in the product development process.	0.788				
Our company promotes collaboration among major functions from the planning stage.	0.649				
Our company collaborates with customers for process development and improvement.	0.753				
Our company provides an optimal working environment in which best performance practices can be disseminated.	0.784				
Our company promotes interdisciplinary training and team-based activities.	0.792				
Our company empowers employees for individual learning to manage customer contact services effectively.	0.743				
Our company promotes individual and organizational learning for business environment adaptation.	0.755				
Our company aligns functional strategies with business strategy well.	0.816				
Our company aligns operations strategy with other functional strategies well.	0.792				
Our company aligns its goals and objective measures with strategic task performance well.	0.783				
Project Complexity		0.826	0.896	0.741	Bjorvatn et al. (2018)
The project had a high degree of complexity concerning content.	0.872				
To me, the project had a high degree of complexity concerning interdisciplinary participants.	0.868				
The project was characterized by high risk and uncertainty.	0.843				

Abbreviations: Cronbach's Alpha (α), Composite Reliability (CR); Average Variance Extracted (AVE).

the structural equation model was measured by evaluating the coefficient of determination (R^2), pathway, and predictive relevance (Q^2) values (Sarstedt et al., 2019).

The validity of explicit indicators can be evaluated by examining their factor loading. This suggests that factors with a loading of more than 0.50 are reflected significant (Hair et al., 2020). Therefore, the findings of the five variables PAC, RAC, PS, SA and PC are all valid measurements of their specific variables, which are shown in Fig. 3. According to Ahmad et al. (2016), the average variance value extracted (AVE) must be greater than 0.5, and the composite reliability is above 0.6. The convergent validity of a variable is accepted this way. The measurement model has a convergent validity (see Fig. 3). According to Hair et al. (2017), a method has been proposed that suggests that items with loads from 0.40 to 0.70 should be removed from the assessment, provided that the removal of the observed variable increases the reliability of the reflective scale composite. Thus, all factor loads, composite reliability (CR), and AVE estimations are higher than the cutoff criteria proposed. Table 2 shows a convergent validity in the measurement model.

As proposed by Henseler, Ringle and Sarstedt (2015), the Heterotrait-Monotratit (HTMT) method was utilized in two ways to evaluate the validity of discrimination. First, the threshold value was measured by HTMT. A more significant value than the HTMT threshold indicates that there is no discrimination . When the correlation is close to one, the precise HTMT threshold value is debatable. Some experts have recommended a threshold value of 0.85 (Purwanto, 2021), while others have proposed a value of 0.90. (Voorheeset al., 2016). Secondly, discriminant validity was determined and established by evaluating HTMT values with less than one confidence interval. When the value of 1 is removed from the interval range, the variables become empirically evident. The HTMT values among the constructs are less than 0.85, as shown in Table 3. As a result, discriminating validity is recognized in this research.

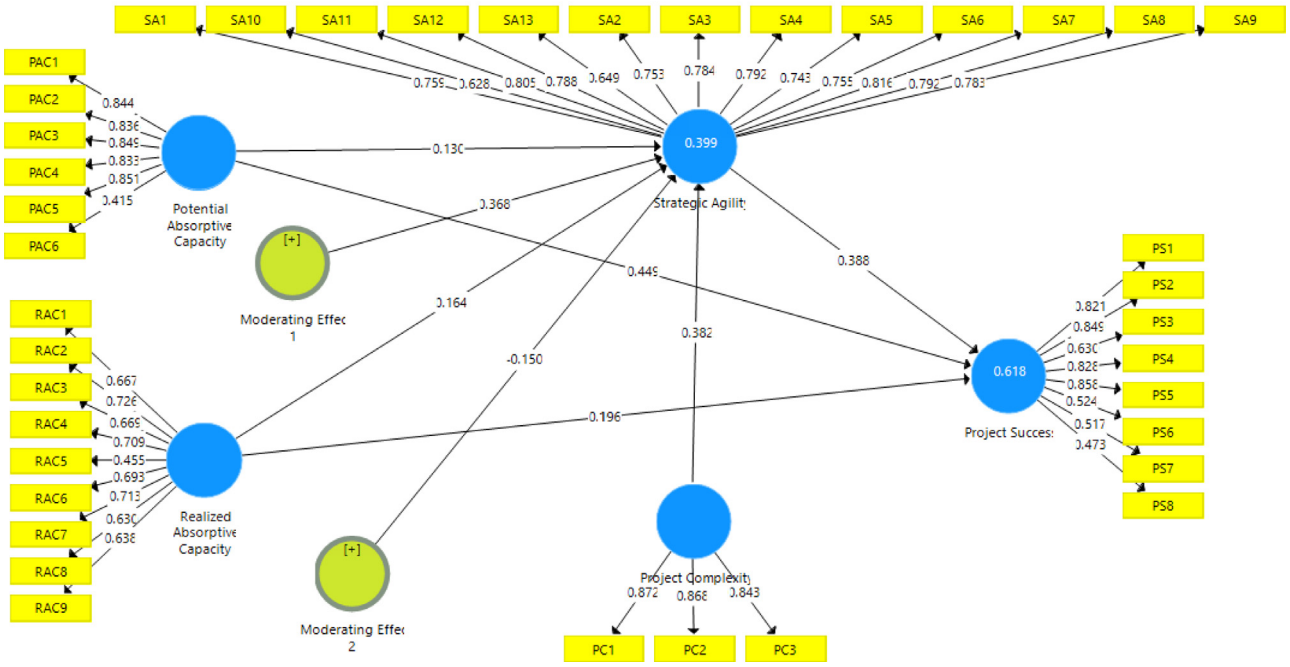

Fig. 3. Measurement model analysis.

After the measuring model was completed, the SEM was calculated. The techniques proposed by Sarstedt et al. (2019) were also adopted in this study in order to examine the necessary results of strategic agility and the moderating role of project complexity. In order to assess the direct and indirect effects of SEM, three specific criteria were used (Hair et al., 2016). The first step was to determine the variance values displayed by all the variables by calculating the R^2 level for endogenous latent components. Although Hair et al. (2014) noted that a satisfactory assessment of R^2 was dependent on the study context, the evaluation of 0.26, 0.13, and 0.09 revealed high, moderate, and low values, respectively. However, the direct effect model revealed that strategic agility was 0.399 for the R^2 values for endogenous variables in the current study, implying that PAC, RAC, and PC predicted a 39.9% change in SA. Furthermore, the R^2 for project success was 0.618, implying that PAC, RAC, PC, and SA can predict a 61.8 percent change in PS. Table 4 shows that the model has high predictive accuracy. Secondly, a cross-validated redundancy measure (Q^2) was used to assess the research model's estimated significance (Hair et al., 2014). Table 4 shows that the Q^2 values for two constructs are 0.210 for SA and 0.302 for PS. They are greater than zero, indicating satisfactory predictive relevance of the model.

Fig. 3 and Table 5 show the direct effect of PAC on PS (β=0.441, t = 7.485, p<0.05), RAC on PS (β=0.195, t = 4.847, p<0.05) and SA on PS (β=0.398, t = 7.040, p<0.05) . They are all positive and significant. Therefore, a 1-unit change in PAC, RAC and SA leads to a 44.1%, 19.5% and 39.8% change in PS. Furthermore, the direct effects of PAC on SA (β=0.130, t = 2.559, p<0.05), and RAC on SA (β=0.164, t = 3.339, p<0.05) are positive and significant. Thus, all the direct hypotheses H1, H2, H3, H4, and H5 were accepted. Finally, the model anticipated and validated the hypothesis that SA would mediate the association among PAC, RAC and PS. As designated in Table 5, the indirect effects of PAC on PS (β=0.054, p<0.05) and RAC on PS (β=0.065, p<0.05) are both positive and significant but less than the direct effect. However, if the indirect effect is significant, its effect is less than a direct effect, nevertheless it is still considered as partially mediated. In addition, the moderating effect of project complexity is positive in relation to the relationship between PAC and SA (β=0.368, p<0.05), but has a negative influence on the relationship between RAC and SA (β=−0.150, p<0.05). Consequently, the outcome has revealed that the hypotheses H6, H7 and H9 were accepted but H8 was rejected.

Table 3
Heterotrait-Monotratit (HTMT) Analysis.

Constructs	1	2	3	4	5	6	7
1. Moderating Effect 1							
2. Moderating Effect 2	0.662						
3. Potential Absorptive Capacity	0.169	0.087					
4. Project Complexity	0.092	0.022	0.832				
5. Project Success	0.088	0.060	0.767	0.868			
6. Realized Absorptive Capacity	0.172	0.264	0.568	0.555	0.520		
7. Strategic Agility	0.214	0.112	0.511	0.607	0.763	0.437	

Discussion

The success of SME establishments in the IT industry, affected by environmental uncertainty and rapid changes, requires absorptive capacity (Müller et al., 2021). The technological transformation of Portuguese SMEs is difficult to manage, and it is even more difficult when the project is complex (Costa et al., 2021). This framework is offered in the light of this reality. The IT industry can be used by various organizations and future analysts. Furthermore, this investigation is an effort to fill, at least partially, the gap left by previous studies. Following along the path of previous research and conclusions, the primary goal of this study was to investigate the relationship between potential and realized absorptive capacity and its impact on project success through the mediating role of strategic agility and the moderating role of project complexity within the context of the

Table 4
Determination coefficient in the PLS method.

Constructs	R Square	R Square Adjusted	Q^2 (=1-SSE/SSO)
Strategic Agility	0.399	0.388	0.210
Project Success	0.618	0.613	0.302

Table 5
Result of Structural Equation Model.

Hypothesis	Relationship between Constructs	β	Mean	S.D.	T Value	P Values	Remarks
	Direct Effect						
H1	PAC -> PS	0.441	0.442	0.059	7.485	0.000	S
H2	RAC -> PS	0.195	0.193	0.051	4.847	0.005	S
H3	PAC -> SA	0.130	0.129	0.074	2.559	0.014	S
H4	RAC -> SA	0.164	0.162	0.070	3.339	0.019	S
H5	SA -> PS	0.398	0.396	0.057	7.040	0.000	S
	Mediating Effect						
H6	PAC -> SA -> PS	0.130 * 0.398 = 0.052	0.050	0.034	2.238	0.024	S
H7	RAC -> SA -> PS	0.164 * 0.398 = 0.065	0.064	0.029	2.284	0.022	S
	Moderating Effect						
	PC -> Strategic Agility	0.382	0.384	0.073	5.255	0.000	S
H8	Moderating Effect 1 -> SA	0.368	0.367	0.059	6.204	0.000	S
H9	Moderating Effect 2 -> SA	−0.150	−0.149	0.060	2.507	0.012	NS

Abbreviations: PAC: Potential Absorptive Capacity, RAC: Realized Absorptive Capacity, PS: Project Success, SA: Strategic Agility, PC: Project Complexity, S.D.: Standard Deviation, S: Support, NS: Not Support.

Portuguese IT sector. The results also indicate that the PAC and RAC both positively influence project success directly and indirectly through mediating strategic agility. The absorption capacity achieved symbolizes the active influence of the new ability (Albort-Morant et al., 2018). Other studies have empirically established the impact of potential capacity on already realized capacity (e.g., Volberda et al., 2010; Andersén, 2015). Currently, information concerning absorptive capability and project success is regarded as critical to dynamic capabilities. To establish a long-term competitive limit, organizations should manage them from a strategic perspective. In the literature, the importance of these capacities justifies the significant increase of knowledge about absorptive capacity and project success (Duan et al., 2021).

The current study's results indicate the complexity of projects. Project complexity a moderator has a positive and significant effect on the relation between potential absorptive capacity and strategic agility but a negative and insignificant one on the relation between realized absorptive capacity and strategic agility, respectively. The management of complex systems is challenging and most projects can be successful if they are handled by analyzing earlier success patterns. They can fail if managers only focus on aspects of project complexity (De Toni et al., 2021). The triple constraints of money, time, and scope has traditionally been used to measure project success, in spite of many additional criteria now being incorporated as contributing considerations (Majeed et al., 2021). It has been suggested that a project's complexity has adverse effects on the success of the project. The results also indicate that a project's success will be negatively affected if complexity is not appropriately evaluated. Project success can be measured in various ways, e.g., completion in a particular time, quality and a specific budget, for example.

Theoretical and practical implications

This study is a contribution to a new domain in the literature. The relation of strategic agility is tested and analyzed with variables such as PAC and RAC and their effect on project success. By providing additional empirical evidence in the area of project complexity theory, this research points to some theoretical implications. Significant aspects of project complexity have been analyzed as variables with a moderating effect on PAC, RAC. SA is also shown to moderate mediation on project success. The results of the current study indicate that proactive companies have faster environmental scanning and can find more market opportunities than other organizations. As a possibility for development, companies are more willing to acquire knowledge from external environments (customers, competitors, markets, etc.). Transforming this information efficiently leads to new services and products, improving innovation and boosting the success rate of projects in return. These findings reinforce the position that companies should build a proactive, risk-taking and innovation-driven, enterprise-driven environment to improve opportunities for successful projects. Strategic agility can provide further information to help organizations reform and renew strategically. Therefore, organizations should consider AC as a source of knowledge.

The findings also have some practical implications. The results have led us to the conclusion that the dimension of absorptive capacity affects the performance of small and medium enterprises. Obtaining external information may not directly impact on company success, but it is necessary as a first step in the absorptive capacity process. This study explored the favorable effects of using the characteristics of absorptive capacity on strategic agility. Although there has been no research on this topic, some studies have looked at the impact of knowledge reach, knowledge skills, strategic learning, and other aspects of strategic agility. An option for a specific research subject would be to look into the impact of a company's stakeholders on strategic agility. Furthermore, studies on absorptive ability and strategic agility could assist managers to enhance their management success, especially in nations where environmental changes happen quickly, like in the IT industry (Lowry & Wilson, 2016). Companies must evaluate both absorptive capacity and strategic agility when protecting and developing existing market shares for various reasons, including severe competition among enterprises and changing consumer and stakeholders' expectations. Therefore, they should be able to identify, incorporate the significance of external knowledge in their processes, and eventually apply that information to their products or services. All this will contribute to increased success rates for their projects.

Limitations and future research

Limitations exist in every study; the current investigation also has some, which include time and resource constraints. For this reason the research data were gathered from Portuguese project-based IT organizations. The outcome might have been different if the information had been gathered from other organization domains in Portugal. The sample size used can also be considered as a limitation. Due to the Covid-19 pandemic, the data collected from 285 respondents may be considered relatively small. Future studies could test this model on a broader range of industries. Moreover, we recommend further research to explore this phenomenon, which is not necessarily crucial to enhance a company success by capturing value ideas. The early discoveries of local optimization concerns may be investigated further, depending on the performance study of alternative configurations of business-model systems, such as via fuzzy-set analyses. However, its effectiveness is limited to the increase of short-term percentages by adopting such a business-model system in the long term to benefit performance.

Given the scarcity of this kind of study on both topics, future research could examine this issue regarding overall business success and various forms of performance (e.g., financial performance, customer knowledge management capability, innovation performance) in IT, the manufacturing industry and large and small tourism enterprises. Further research is needed to explain agility-related concepts, distinguish strategic agility from other types, help businesses comprehend its value, and fill gaps in the literature.

The results of this research may contribute to the literature and serve as a basis for future research. Additionally, the study on the effects of project complexity on strategic agility and project success needs further research, because these variables could be studied in other sectors by analyzing different dimensions of complexity (i.e., technical complexity, environmental complexity, organizations complexity, resource complexity, etc.). Such an approach would be necessary in mega construction projects (i.e., Dams, Airports, Railways, Road, etc.).

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