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The agility construct on project management theory

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Abstract

Definitions of agility found in the project management (PM) and agile project management (APM) disciplines are inconsistent, incomplete and lack clarity. This paper presents a complete definition of the agility construct, built from a combination of systematic literature review and frame semantics methodology. A survey with 171 projects with different innovation levels and industry sectors combined with factor analysis was used to first validate the construct. The results show that the agility construct is cohesive and useful in different PM contexts. The implications for advancing the PM theory and practice are threefold: i) agility should be considered a team's performance, rather than a mere adjective for practices and methods; ii) agility, as a performance, might be dependent upon a combination of organization, team and project factors; and iii) the agility performance level can be measured within two main factors: rapid project planning change and active customer involvement.

Keywords: Agility construct; Agility performance; Project management; Agile project management; Frame semantics

1. Introduction

Agile project management (APM) is an emerging approach that is gaining ground in the business world, especially in high-tech companies and I.T. software development projects (Lee and Yong, 2010; Persson et al., 2012). This approach has evolved since the creation of the Agile Manifesto for Software Development in 2001 (www.agilemanifesto.org) by a group of practitioners that proposed many of the "agile" (or lightweight) methods, practices and tools used today.

Recent industry pools and market surveys, as State of Agile Survey (2014), have shown that the APM approach has gained great attention. Additionally, the term "agility" has been discussed in boardrooms across the globe as a way to gain competitiveness and to improve innovation capabilities (see for example, Sull, 2009).

Several studies about the application of the agile methods are found in the literature, especially for software development (Dybå and Dingsøyr, 2008). The current discussion is on how to apply these methods beyond the scope of I.T. (Conforto et al., 2014) and on how to measure the performance and impact of these APM practices (Qumer and Henderson-Sellers, 2006; Mafakheri et al., 2008; Sheffield and Lemétayer, 2013).

The APM approach, which considers methods, tools and techniques, was created to improve the performance of the project by promoting "agility". Uncovering what is agility should be the first step in order to be able to verify and validate

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results from this theory. Nevertheless, there is a gap in the literature regarding the investigation of the "agility construct" for project management. The majority of the studies have focused on agile manufacturing, as Sharifi and Zhang (2001), but this is another knowledge area not directly related with the specific context of project management.

In addition, some references that use the "agility construct" are not well detailed and do not offer consensus about its definition. There are authors who consider "agility" as an approach (Highsmith, 2004), as an attribute of practice (Schwaber, 2004), and others as a behavior (Qumer and Henderson-Sellers, 2008). They do not include a theoretical foundation for its correlation with practices, tools and techniques that originated in the APM theory. The definitions are incomplete, sometimes overlapping, and divergent as demonstrated in Sections 2 and 3 of this article.

These problems pose many challenges for empirical tests and cause an unnecessary multiplicity of constructs. Having a unique and clear "agility construct" definition will be helpful to identify how to measure it, which is an essential pillar for the construction of an agile project management theory. One key characteristic of a construct is having a clear and complete definition that allows other researchers to use in theory building as described by Suddaby (2010); Bacharach (1989); Christensen (2006) and Sutton and Staw (1995).

We consider that the APM theory is part of the whole project management body of knowledge, and should be developed considering the relationship with other PM knowledge areas. In the last decades, studies conducted by Shenhar and Dvir (1996); Shenhar et al. (1997); Shenhar et al. (2002) and Lechler and Dvir (2010) revealed that the type of the project as well as its environmental factors would impact the project's performance. This corroborates with the need to understand the context where each practice performs better and to identify those fundamental performance measures.

This argument also applies to the importance of developing a common vision about the agility construct, its definition and how to measure it — which might be quite useful in all PM theory areas, beyond the current scope of APM practices or agile methods.

This paper focuses on the need of taking the first steps toward the definition of agility construct for the project management theory. Having a clear definition and understanding of the agility construct will help researchers uncover some key answers for these questions: (i) what is the criterion for classifying a management practice, tool or technique as "agile"? (ii) how do we know if an organization is in fact using an "agile practice, tool or technique"?; (iii) what practices, tools and techniques really contribute to greater agility?; and (iv) does greater agility in the project mean better performance of the project and the product? Therefore, it would be helpful to explore its relationship with practices from different approaches (e.g. agile, lean and design thinking), and/or other organizational factors.

This paper is relevant for both theory and practice since one of the first steps to uncover these questions lies in the understanding of the construct of "agility" under the project management perspective. Therefore, this paper (i) identifies and carries out a critical analysis of the definitions of agility, as they exist in the literature across multiple disciplines e.g., manufacturing, organizations, product development, and software development. Next, (ii) we applied a technique named "frame semantics" (from the Linguistics field) to compare settings of definitions and to propose a more robust definition for the agility construct in the project management theory. Finally, the paper (iii) presents a preliminary empirical analysis of five variables proposed to measure the agility construct in the project management theory.

2. "Agility" as a construct for project management

The term "agility" was first observed in the area of manufacturing (Nagel and Dove, 1991), where it was disseminated as a concept called "agile manufacturing," even before the term was popularized in the area of agile project management (or agile methods). The term "agile manufacturing" was treated as a new paradigm, characterized as "an ability to change the configuration of a system in response to unforeseen changes and unexpected market conditions (Goldman et al., 1995; Gunasekaran, 1999; Vokurka and Fliedner, 1998; Zhang and Sharifi, 2000).

The agility construct applied to manufacturing won supporters and was explored from different perspectives. One of these perspectives considered agility at the organizational and strategic level. In this case, the agility construct is addressed broadly, considering the entire organization (Goldman et al., 1995; Gunasekaran, 1999; Nagel and Dove, 1991; Sharifi and Zhang, 2001).

In the end of decade of 1980 and early 1990, agility appeared in the project management area, mainly illustrated in studies focused on software development projects (Eisenhardt and Tabrizi, 1995) and was underpinned by the development of the agile or lightweight methods (Schwaber, 2004; Poppendieck and Poppendieck, 2003; Cockburn, 2004; Palmer and Felsing, 2002; Highsmith, 2000; Stapleton, 1997; Beck, 1999).

One of the milestones for the dissemination of the term agility in this area was the Manifesto for Agile Software Development (Beck et al., 2001). Following this document, numerous publications adopted the term to describe the approach "agile project management" (Erickson et al., 2005; Cohn, 2005; Highsmith, 2004; Qumer and Henderson-Sellers, 2006). In parallel, scholars and practitioners have noticed similar principles and practices have been explored in other approaches such as Lean (Womack and Jones, 1996; Liker, 2004) and Design Thinking (Dorst, 2011; Brown, 2008, 2009; Razzouk and Shute, 2012).

The problem we identified with this literature, especially related to agile project management and project management as a broad theory is the lack of precision in defining and understanding the meaning of "agility", causing different interpretations. One such interpretation is in terms of ability: the "ability to both create and respond to change in order to profit in a turbulent business environment" (Highsmith, 2004, p. 16); while others include to apply knowledge and experience to adapt to new environments, to react, and to seize unexpected opportunities (Boehm and Turner, 2004); and also, "the persistent behavior or ability of a sensitive entity that exhibits flexibility to accommodate, expected or unexpected changes rapidly…" (Qumer and Henderson-Sellers, 2006, p. 261).

Another possible interpretation is related to the method or practice. For example, Erickson et al. (2005, p. 89) state that: “agility means to strip away as much of the heaviness, commonly associated with the traditional software-development methodologies, as possible to promote quick response to changing environments, changes in user requirements, accelerated project deadlines…”.

This unconditional relationship of “agility” as an adjective of practice (“agile practice”) or method (“agile methods”) introduces another problem. The majority of the literature does not present a theoretical basis with respect to the conception of the agility (as a construct) and its resulting relationship with such practices or methods, as evidenced by Conboy (2009). This author highlighted the importance of building foundations that underpin the agility, allowing that the theory can evolve and be empirically verified in the area of software development projects.

3. The challenge in defining and measuring agility

The different definitions generate imprecision and inconsistency in the use of the construct of “agility” in the project management theory and practice. This has an impact on the measurement and assessment of practices, tools and techniques designated as “agile” that are carried out in the field, and consequently in the theory building. For example, Qumer and Henderson-Sellers (2008) evaluated the main “agile methods” for I.T. software development projects. They considered four dimensions to assess the characteristics of agility by means of flexibility, speed, simplicity, and readiness. However, one key challenge is that these terms could be considered different constructs, and this could affect the results and analysis.

More recently, Sheffield and Lemétayer (2013) presented a survey with 106 respondents from software development communities. The authors used the “values” of the agile manifesto as dimensions (Beck et al., 2001)[1] to which they added the construct “flexibility of the development cycle” as a measure of agility in software development projects.

One of the challenges of the work of Sheffield and Lemétayer (2013) is the use of the principles of the manifesto for agile software development. The authors clearly state that the “the constructs used are not all based on theoretically sound conceptualizations and tested instruments”, and suggest future research in order to produce more detailed user-friendly indicators of software development agility (Sheffield and Lemétayer, 2013, p. 470).

These facts indicate that a more robust definition with a proper developed set of variables does not exist to assist in the evaluation of the agility considering the whole project management theory. This absence limits empirical analysis as well as the development of clear constructs to explore the phenomenon, and therefore, improve the comprehension of this construct and communication between scholars and practitioners, which represents the basis for theory building (Bacharach, 1989; Christensen, 2006; Suddaby, 2010; Sutton and Staw, 1995).

[1] The values can be consulted at: http://agilemanifesto.org/.

4. Research method

We applied a combination of two techniques, systematic literature review (Cook et al., 1997; Kitchenham et al., 2010; Levy and Ellis, 2006) and frame semantic analysis (Fillmore, 1982, 1985, 2003; Fillmore and Baker, 2010; Petruck, 1995, 1996) to identify the key elements of the agility construct for project management theory. To test the construct, we collected data through a survey with 171 participants and applied factor analysis. The research was organized into five main steps described as follows.

4.1. Step I — construction of the “corpus of definitions” of agility

The corpus[2] was created by means of a systematic literature review (Cook et al., 1997; Kitchenham et al., 2010; Levy and Ellis, 2006). The target was the definitions of agility in the areas of organization, manufacturing, product development, and software development project management. The initial population comprised a total of 9634 articles from 87 journals indexed in the Web of Science or Scopus databases.

The texts identified were analyzed using a set of “reading filters” in an iterative process. Table 1 summarizes the key phases and results from the systematic literature review. The final set containing 43 articles generated 59 definitions for the term “agility” representing the corpus used in the frame semantic analysis (Section 4.2).

4.2. Step II — frame semantic analysis

The method of frame semantic analysis employed was specifically adapted for this research and is founded on well-known theoretical–methodological principles of the area of frame semantics (Fillmore, 1982, 1985, 2003; Fillmore and Baker, 2010; Petruck, 1995, 1996). This theory of linguistic analysis is based on frames, a construct introduced by Marvin Minsky (1974) in artificial intelligence and by Charles Fillmore (1977) in linguistics.

According to this approach, the meaning of a word “*x*” can be described by means of a semantic frame, that is, a set of related concepts that represents a global pattern of commonly understood knowledge. The method started with the identification of the frame elements that were used in the analysis of the definitions found in the literature review.

The frames specified in FrameNet[3] were the starting point. From this example, we created an adaptation of the frame elements (FEs) of the selected term “capability” to be used in the analysis of the present study, as described in Table 2. The choice of the frame “capability” is justified by the fact that the term “agility” can be defined as a “specific type of ability/

[2] The word “corpus” refers to a set of definitions that represent a particular theme or area of knowledge. In this paper, we adopted the term “corpus” to designate the group of definitions analyzed, a group concerning the definitions of “agility” retrieved from the literature.

[3] For information on the FrameNet project: https://framenet.icsi.berkeley.edu/fndrupal/about.

Table 1
Summary of the key phases and results of the systematic literature review.
Source: prepared by the authors based on key phases of the systematic literature review process.

Phase	Description/results
(1) Search string and keywords used in the literature survey.	This string was defined according to the standards of Web of Science search engine with the following keywords: TS = (agile OR agility OR adaptable OR adaptability OR quick OR flexible OR flexibility OR speed OR speediness OR velocity OR rapid OR reactive OR responsive OR responsiveness) AND TS = (concept OR construct OR definition OR description OR framework OR "theoretical model") SAME TS = ("agile method" OR methodology OR "agile product development" OR "agile project management" OR "project management" OR "product development"). These keywords were selected in the preliminary literature review and systematically tested through a series of searches prior to this phase.
(2) Database selection	We relied on two of the most used search platforms for peer reviewed scientific articles: Web of Science (WoS) and Scopus (Falagas et al., 2008).
(3) Article selection	We applied two main criteria to select articles: i) The article should contain one or more definitions of the construct agility, or elements used by authors to explain agility; and ii) the definition could be described in articles from related areas such as project management, product development, organization or software development. These areas were identified in the preliminary search of the term agility prior to conduct this study. All articles should be written in English.
(4) Population	We identified a preliminary set of 9634 articles retrieved from 87 journals based on the keywords used in the search string. In our study we opt to use two strategies to double-check our findings: i) a cross-reference analysis to look for articles that might be relevant and were not identified during the search in the WoS or Scopus (also refer to phase 7); and ii) a specific search in the journal in which the preliminary set of articles was identified. We used the same string adapted to meet the requirements of each journal search engine.
(5) First reading filter	This preliminary filter was applied in reading the title, abstract and keywords. Out of 9634, we identified 546 potential articles for this study. In all filters (phases) of the systematic review we also applied the search feature to look for the words "agility" and "agile" in the body of the articles.
(6) Second reading filter	The 546 articles were read and evaluated based on the introduction, method and conclusion and other parts when necessary. This resulted in 189 texts that contained indications of definitions of agility or related terms.
(7) Final reading filter and cross-reference analysis	The 189 articles were read in their entirety and we carried out a cross analysis to find other potential articles and sources cited in the articles' list of references. We applied the same set of filters to those papers identified in the cross-analysis. In the end, we managed to identify 43 articles that generated a preliminary corpus of 59 definitions related to the term agility.

capability," according to an analysis of a preliminary set of definitions as exemplified in Section 4.3.

Of these frame elements (FEs), *entity* and *event* are the central ones while other ones are peripheral. Each of the 59 definitions of agility retrieved from the literature was analyzed with the purpose of identifying each *frame element* (FE), with this transformed into tables. We did not translate the definitions; the entire frame analysis process was carried out considering the original language of the paper (English). An example for the definition in Conboy's (2009) article is shown in Table 3. The example shows that it was not possible to infer the values of the elements *trigger* and *circumstance*, which are specified with the *null* value. This occurred in several definitions found in articles selected for this study.

Table 2
Description of semantic frame elements used in the analysis of definitions of agility.
Sources: adapted from Fillmore (1982, 1985, 2003); Fillmore and Baker (2010); Petruck (1995, 1996).

Semantic frame element	Description
Entity (ENT)	Is an entity (or agent) of an action that does or does not meet a set of characteristics or an evaluated, observed pre-condition
Event (EVT)	Is the action performed, answered by a particular entity or agent (*entity*)
Trigger (TRG)	Is the element that "causes," motivates the action (*event*) in which the entity or agent can be involved
Degree (DEG)	Is the moderator element of the entity or event that interferes in the characteristics of the agent (*entity*) or action (*event*), meeting the pre-conditions of an action (*event*)
Purpose (PUR)	Is the objective, the purpose to be achieved as a result of the implementation of the action (*event*) by its executor, the agent or entity (*entity*)
Circumstance (CTC)	Is the context or environment in which an entity or agent (*entity*) is inserted, wherever the action occurs, and it can or cannot meet the evaluated, observed pre-conditions

4.3. Step III — quantitative analysis

The third step consisted of a quantitative analysis of the most frequent words that comprised the corpus of agility. The first task before the quantitative analysis consisted of the frequency count of words. A file was created in "txt" format, containing all the definitions in sequence. Initially, the corpus of agility contained 1726 words. All punctuation, prepositions, articles and pronouns were excluded from the database. Once these steps were complete, the corpus of agility had 986 words.

The next task was the grouping of words with equal or similar meaning (synonyms). The basis for grouping words that were synonymous was the freely accessible Cambridge on-line dictionary and the WordNet database.[4] This task only considered words with at least five citations in the corpus. Some examples of

[4] WordNet database is available at: http://wordnetweb.princeton.edu/perl/webwn.

Table 3
Example of the systematization of manual linguistic description.
Source: prepared by the authors.

Definition	"The continual readiness of an ISD method to rapidly or inherently create change, proactively or reactively embrace change, and learn from change while contributing to perceived customer value (economy, quality, and simplicity), through its collective components and relationships with its environment."	
Knowledge area	*Software Development*	
Primary source	Conboy (2009, p. 340)	
Frame elements (FEs)	Entity	ISD method
	Event	create change; embrace change; learn from change
	Trigger	*Null*
	Degree	rapidly/inherently; proactively/reactively
	Purpose	contribute to perceived customer value
	Circumstance	*Null*

words grouped by synonyms were "*ability*" and "*capability*"; "*quickly*" and "*rapidly*"; and "*organization*" and "*firm*". The result then was compared with the semantic analysis. The final result was the corpus of agility with 986 words, including 397 different words.

Finally, the relative frequency analysis was employed (Manning and Schütze, 1999). The simple frequency of each word was divided by the total number of words of the corpus of agility (n = 986), thus indicating the most relevant words to explain the construct, in relation to the occurrence of this word in the definitions. Then, for each definition analyzed under the frame semantics technique, we checked the occurrence of the most relevant words using relative frequency analysis, as per see in the results session (Section 5.1).

4.4. Step IV — proposition of the definition of the agility construct and its variables

The definition of the "agility" construct was built based on the results of the semantic analysis. Based on the most frequent meanings, it was possible to identify a frame description for each definition, constructed based on the composition of the most frequent elements to identify the core terms used in the definitions. The result is the theoretical construct for agility and a preliminary set of variables considering the project management theory, more specifically with a focus on project team perspective. The detailed description of this theoretical formulation is presented in Section 5.

4.5. Step V — preliminary test of the agility construct

The proposed construct indicates that agility could be defined as a team's performance indicator, which could be a result from a combination of external and internal organizational factors, such as team characteristics and competencies, client characteristics, business environment, product type, complexity, and novelty. Therefore, the measured variables should indicate different levels of agility when applied to a diverse group of projects, e.g., different industries, types of products and different levels of innovation.

To test the agility construct we applied exploratory factor analysis (EFA). EFA is often used as a method for grouping latent variables according to a similar correlation pattern (Fabrigar et al., 1999; Cudeck, 2000). The EFA is useful to demonstrate if a set of variables derived from the agility definition would result in a correlation pattern if applied to a group of diverse projects, indicating the consistency and accuracy of the construct. In addition, the EFA is useful to group related variables into factors that represent key dimensions of the construct (Fabrigar et al., 1999).

To make sure we had different organization conditions and project types we selected a group of projects from different industry sectors, representing different market conditions and project environment. We also selected projects with different degrees of innovation (novelty) and complexity, and different types of products (the final result of the project), for example: software development, service development, hardware and manufactured products, and those that combined hardware and service. These attributes contributed to have a significantly level of heterogeneity between projects in the sample.

In order to meet these conditions, we collected data through different communities of experienced project management professionals hosted in the professional network LinkedIn. The survey focused on professionals working in different industries in the São Paulo, state, Brazil, which has a diversified number of industry sectors and it is considered the most industrialized state in Brazil. The unit of analysis was a project that was completed in the last two years or it was in the completion phase. Each individual responded the questionnaire for a unique project.

The search started with the identification of the people's profiles. We selected experienced professionals from eight different project management communities from LinkedIn, as shown in Table 4. Since LinkedIn search engine allows access to only the first 500 most relevant profiles, we have identified 3255 potential candidates (professional profiles). Each profile was manually verified in order to select those with at least three years of project management experience and that have been worked in product, service or software development in the last three years. The final population resulted in 996 potential candidates to participate in the survey.

We sent individual invitations to each professional with a unique link to answer the questionnaire, which asked the respondent to select a project concluded in the last three years to answer a set of questions related to this project. The questionnaire

Table 4
Survey population identification–professional communities–LinkedIn.
Source: prepared by the authors.

Professional group	Number of professionals selected to participate	Number of valid responses
IGDP	157	32
Agile Brasil	143	21
PMISP	172	30
IPMABR	106	12
UMI	140	20
PMI Agile	34	13
DNP	106	23
GP	108	20
Total	966	171

comprised a total of 27 questions. We characterized the size and industry sector (2 questions), the professional experience (2 questions), the type and conditions of the project and product (5 questions), and the agility construct (5 questions, as per Appendix 1). The remaining questions were used to measure other dimensions such as practices and additional organizational factors that are out of the scope of this article.

We received a total of 236 questionnaires, which resulted in 171 valid responses (almost 18% of response return). The sample comprises small, medium and large companies in terms of number of employees from at least 16 different industry sectors, including software development (26%), consulting (12%), banking and financial services (8%), food and beverages (6%), automaker (5%), machinery manufacturing (5%), computer and electronics (5%), research and development (5%), chemical and pharmaceutical (4%), aerospace and defense (4%), and others (20%), such as government, construction, mining and energy, medical equipment and entertainment.

The respondents had at least four years of experience working with project and product development and we collected data from different types of projects: product development (34%), software combined with service (20%), implementation of software (14%), a product combined with service (13%), pure software development (11%), and pure service development (8%). The diversity of the sample in terms of project type and industry is in accordance to the type of statistical test used to explore the agility construct. The variables used and analyses performed are detailed in Section 6.

5. Building the agility construct

5.1. Agility as the "ability to change"

The terms "ability" and "to change" stand out first and foremost when considering the relative frequency analysis of the corpus of agility, as observed in Fig. 1. Fig. 1 shows the thirty most relevant words in the corpus agility, considering a total of 59 definitions.

As the next step, we identified the words "ability" or "capability" and "change" as their elementary semantic meaning. Therefore, we checked the occurrence of these words in the definitions as well as how they are employed, considering the frame elements.

The word "*ability*" (or "*capability*") occurs at least once in 61% of the definitions according to the semantic frame analysis, and this result corroborates with Fig. 1. This representation is independent of the area in which the agility construct is used because examples were found in "*organization*" (Amos, 1996; Ismail et al., 2006; Sharifi and Zhang, 2001); "*manufacturing*" DeVor et al., 1997; Gunasekaran et al., 2002; Kumar and Motwani, 1995; Lengyel, 1994); and "*management of software development projects*" (Highsmith, 2004; Qumer and Henderson-Sellers, 2006). Therefore, agility is predominantly seen as "*ability*".

The word "*ability*" is accompanied by an occurrence of 41% of the word "*change*" in the frame element *event*, and it is second word in the relative frequency as per Fig. 1. There are definitions that feature the word "*change*" as one of the main words of the element *event* (Dove, 1995, 2001; Goranson, 1999; Narasimhan et al., 2006; Sharifi and Zhang, 1999). Other studies presented definitions with the word "*change*" accompanied by additional terms such as "*to respond*" (Ifandoudas and Chapman, 2009; James, 2005; McGaughey, 1999); "*to react*" (Nagel and Bhargava, 1994; Voss, 1994); "*to cope*" (Zhang and Sharifi, 2000); "*to detect*" (Mathiyakalan et al., 2005); "*to sense*" (Ashrafi et al., 2005); "*to adapt*" (Crocitto and Youssef, 2003); "*to meet*" (DeVor et al., 1997); "*to create*" (Conboy, 2009; Highsmith, 2004); "*to embrace*" (Conboy, 2009); and "*to accommodate*" (Qumer and Henderson-Sellers, 2006).

Considering this evidence, it makes sense to use a combination of "ability" and "to change" in the element *event* of the frame*frame* semantics. Agility would therefore be a quality or skill that the *entity* has to change. If the "*agility*" construct can be described as "*ability to change*," the next step is to understand its relationship with the semantic frame element "*degree*".

5.2. Velocity as a key attribute of the frame element "event"

The *degree* of the frame semantics indicates a moderating element that can belong to the *event* or the *entity* (according to

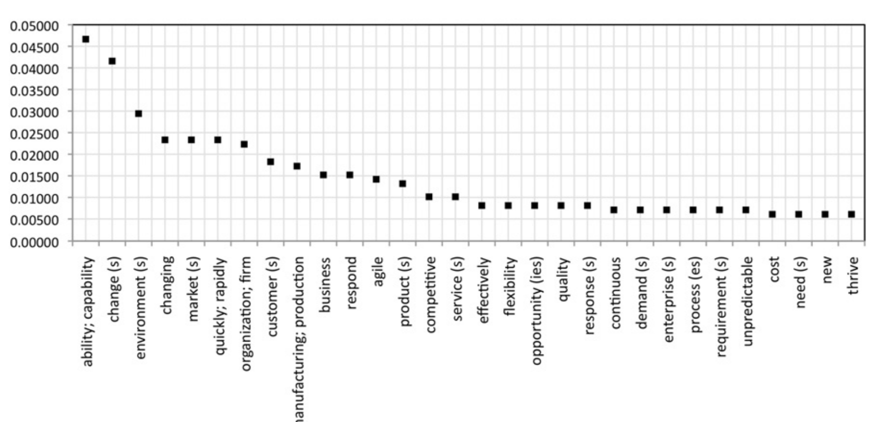

Fig. 1. The words with the highest relative frequency of occurrence in the corpus "agility". Source: prepared by the authors.

Table 5
Example of a definition with the term "quickly" for the FE *degree.*
Source: prepared by the authors based on the results of the semantic *frame* analysis.

Source	Agility definition	Entity (ENT)	Event (EVT)	Degree (DEG)	Trigger (TRG)	Purpose (PUR)	Circumstance (CTC)
Narasimhan et al. (2006, p. 442), adapted from Brown and Bessant (2003) and Bessant et al. (2001, p. 31)	Involves the ability to respond quickly and effectively to changes in market demand	–	To respond to changes	Quickly and effectively	Changes in market demand	–	–

Table 1); in other words, something that qualifies the entity or the action, as an attribute. The words with the highest occurrence (Fig. 1) of this element, present in 32.2% (19 definitions of the agility term), were "*rapidly*" or "*quickly*," considered in this analysis as synonyms.

These terms were in sixth place among the most relative frequency of all the words used in definitions (Fig. 1). They were only behind the terms already used here (*ability* and *change*). There is therefore sufficient evidence to suggest that the terms *rapidly* and *quickly* are essential in characterizing agility, as presented in the example in Table 5, which appear as the FE *degree*. In this example, the characterization of these elements as an attribute or quality of the event (*to change*) is clear. The change needs to be fast or quick, it needs "velocity".

The content analysis of the articles reinforced this definition. The majority of the definitions that use these words (quickly or rapidly) give them the same meaning (e.g.: Amos, 1996; Brown and Bessant, 2003; Cho et al., 1996; Christopher, 2000; Gunasekaran, 1999; Gunneson, 1997; Ifandoudas and Chapman, 2009; Jain and Jain, 2001; Kidd, 1994; Lengyel, 1994; McGaughey, 1999; Meredith and Francis, 2000; Nagel and Bhargava, 1994; Nagel and Dove, 1991; Qumer and Henderson-Sellers, 2006; Sambamurthy et al., 2003).

Therefore, to develop agility, the essential attribute needed is velocity. The change or action should be performed quickly, rapidly. In this case, agility is obtained by an entity that is able to change by performing the action quickly. It is an essential element for the construct of agility in the project management theory. Once we have identified the event and degree, the next key element is the entity.

5.3. Who has the ability to change?

If agility is "an ability", someone—an actor or subject—is the holder of this ability. The organization was considered the entity or actor in 59% of the definitions of agility following the frame semantic analysis. The definitions used words such as "*organization*," "*firm*," and "*enterprise*" as the entity (e.g., Amos, 1996; Gunasekaran and Yusuf, 2002; Gunneson, 1997; Nagel and Bhargava, 1994; Voss, 1994).

The organization would be the principal agent affected by a change in the environment (*entity*), and would exercise this ability with the aim of responding to the changes in customers and the market (e.g., Amos, 1996; Goldman et al., 1995; Goranson, 1999; Gunneson, 1997; Jain and Jain, 2001; Kidd, 1994; Naylor et al., 1999).

The second characterization of the FE entity identified was in the area of manufacturing, which occurred in 32% of the definitions found, according to the frame semantic analysis. This focus was characterized by the use of words such as "*manufacturing*" or "*production*", as in definitions by Booth (1996); Crocitto and Youssef (2003); Gunasekaran et al. (2002); Nagel and Dove (1991); Narasimhan et al. (2006) and Vázquez-Bustelo et al. (2007). According to the definitions of these authors, agility would be the ability of the productive system (manufacturing) to respond quickly to fluctuations in demand from customers and market changes, producing different types of product, customized, and in specific amounts.

The third focus found in the articles was related to the management of new product development (occurred in 9% of the definitions), for example, the *entity* of which is described at the level of the method or process of managing projects, e.g., software development (Conboy, 2009; Erickson et al., 2005). Another evidence is that the term used in the last area (management of new product development projects) is not hegemonic. There are authors who use development process or a method (e.g., Williams and Cockburn, 2003; Dybå and Dingsøyr, 2008; Conboy, 2009).

In sum, there is a clear dominance and use of the "agility as a construct" as of organizational and manufacturing entities. The explanation for the dominance of organization and manufacturing is evident. These are areas of knowledge that have been using the "agility" term for a longer period and have a larger body of knowledge. The solution, therefore, would be not to opt for one of them, but to consider the development of a specific definition for the project management theory, as proposed in this article.

The agility of the organization encompasses the agility of manufacturing and product development. Moreover, to respond to changes in customer needs, it would be necessary to have the ability not only to change the manufacturing process (part of the agility of manufacturing) but also product development (agility in development). For this reason, it would be necessary to have a project team with the ability to change the project efficiently (agility of the project team).

5.4. What are the triggers for developing "agility"?

The frame element (FE) *trigger* was used in only 34% (out of 59) of the definitions found. There is no consensus or dominance of a more frequent term for the element *trigger*. Many terms used are very distinct from each other, but during the semantic analysis, it was possible to recognize certain groups.

There is a group related to *market*, such as "*new opportunities*" (Ismail et al., 2006); "*business challenges*" (Goldman et al., 1995); and "*market instability*" (Adeleye and Yusuf, 2006), that is, market changes and uncertainties in the business environment and the need to adapt to new technologies. These aspects can be grouped as "*market and technology demands.*"

Another group is related to aspects of the customer, including: "*changes in requirements*," "*new needs and opportunities*," and "*accelerated project deadlines.*" These can be summarized as "*customer demand or needs*," according to examples of the definitions stated by Booth (1996); Erickson et al. (2005); Lengyel (1994), and Nagel and Dove (1991).

Finally, there is a scattered set of terms that address the demands of entities related to the business, which can be labeled as stakeholders. This is reflected in expressions such as "*business challenges*," "*opportunities identified internally*," and "*opportunities identified by stakeholders*," according to definitions found in the texts of Dove (1995, 2001); Gunasekaran (1999), and Mathiyakalan et al. (2005).

In sum, the triggers for developing agility basically can be considered from different sources, synthesized in this paper as: *customer or stakeholders' needs*, *market or technology demands*. In project environment is not unusual to have different demands and opportunities from these distinct sources that, in many ways, contribute to raise the uncertainty level, instability and high rate of changes on the project.

5.5. A comprehensive definition of the agility construct

The previous sections contain the analysis of the semantic elements *entity*, *event*, *degree*, and *trigger.* With these results, it is possible to synthesize the agility definition focused on the project management team. This can be presented by means of a semantic frame with the words that are considered most appropriate for each element.

The result is the framework presented in Table 6. The table shows a basic definition of agility using its core elements: *event* and *degree*. The definitions of the sub-areas: organization, manufacturing, and project team are different in the defining excerpts and in the element *entity*, as well as the element *trigger*.

Table 6
Semantic elements of the definition of agility.
Source: prepared by the authors based on the frame semantic analysis.

Sub-Area	Entity (ENT)	Event (EVT)	(Event) Degree (DEG)	Trigger (TRG)
Agility in organizations	Organization	Ability to change (e.g., products platforms and services)	Quickly	Response to stakeholders or business' needs, technology, competitors, new market demands, or opportunities
Agility in manufacturing	Manufacturing			Response to customer or stakeholders needs, market or technology demands
Agility in product development process	Product development process			
Agility in project management	Project Team	Ability to change the project plan		

In addition, the corpus of agility definitions studied has something in common: they are from studies discussing how to improve performance. This is related to the *purpose* of developing the "agility". The FE *purpose* varied according to the area of knowledge of the definition. For example, the performance could be related to the business as a whole: adapt to the changes and challenges of the business environment; create competitive advantage; and generate flexibility, speed, and quality and efficiency in service to respond deliberately to changes, opportunities, and threats as illustrated by several authors (e.g., Meredith and Francis, 2000; Naylor et al., 1999; Raschke and David, 2005; Vázquez-Bustelo et al., 2007; Yusuf et al., 1999).

Moreover, the performance is also related to the product development and manufacturing processes, such as adapting to market demand, requirements, maximize the level of customer service, providing value, and personalized products and services (e.g., Amos, 1996; Gehani, 1995; Gunasekaran and Yusuf, 2002; Kidd, 1994; Prince and Kay, 2003; Vokurka and Fliedner, 1998; Yusuf et al., 1999). Therefore, theorists of the three fields (organization, manufacturing and management of new product development projects) are in agreement in considering that agility can lead to better performance.

There is evidence in the definitions found in the literature, regardless of the field of knowledge, the trigger and purpose would be related to the FE *circumstance*, defined as the context or environment in which an entity is inserted. The FE circumstance is described as unpredictable, highly dynamic market conditions, competition, and continuous changes, as identified in 69% of the definitions studied (e.g., Rigby et al., 2000; Gunasekaran, 1999; Goldman et al., 1995; Kidd, 1994; Highsmith, 2004; Qumer and Henderson-Sellers, 2006). Therefore, the FE *circumstance* might be summarized using the terms "innovative and dynamic project environment".

Finally, the proposal for a complete definition of agility, considering all the elements of the frame semantics technique (Fig. 2), is described as follows: "*Agility is the project team*'*s ability to quickly change the project plan as a response to customer or stakeholders needs, market or technology demands in order to achieve better project and product performance in an innovative and dynamic project environment.*"

6. Preliminary test of the agility construct

The first step to perform the test of the agility construct was the identification of latent variables. According to the exploratory factor analysis theory, latent variables are the ones that will potentially present a correlation pattern, because they illustrate some dimensions of the same construct. The researchers identified these variables based on the frame elements (Fig. 2). This task involved multiple variables' identification and prioritization. We considered at least one variable for each frame element. Then, we transformed each variable into a survey question using Likert Scale.

The element "event" (ability to change the project plan), and "degree" (quickly) were measured by two variables combined: Project Plan Updating Time (AI-ProjUpTime), and Decision

Entity	Event	Degree	Trigger	Purpose	Circumstance
Project team	Ability to change the project plan	Quickly	Response to customer Stakeholders needs Market change Technology change	Achieve better project performance Achieve better product performance	Innovative and dynamic project environment

Source: prepared by the authors.

Fig. 2. Agility definition using a complete set of frame semantic elements.
Source: prepared by the authors.

Time (AI-DecTime). These variables are in consonance with prior studies such as Thomke and Reinertsen (1998) and Stockstrom and Herstatt (2008). For both variables we adopted a 6 point Likert scale, as described in Appendix 1.

The frame element "trigger" (response to customer) generated three variables (Fig. 3). The "Customer and Team Interaction (AI-ClieInt)", the "Delivery Frequency" (AI-DelivFreq), and the "Customer Validation" (AI-CustVal). These variables were measured using a six point Likert Scale (see Appendix 1). These measures are aligned with previous work in the area of product development and agile project management, e.g., Eisenhardt and Tabrizi (1995); Highsmith (2004), Callahan and Moretton (2001), MacCormack et al. (2001), and Hoda et al. (2011).

The triggers "stakeholders' needs", "market change" and "technology change" were not investigated in this study due to the level of abstraction between the variable and the construct, so we decided to not measure these variables. The frame elements "purpose", "circumstance" and "entity" defined the conditions and type of projects for this study, including more innovative and complex projects.

This set of variables was used to perform a first test of the agility construct, as per illustrated in Fig. 4. If the agility construct is correct, by applying a factor analysis technique on diversified sample of projects, including different types of project results, industry sectors as well as innovation and complexity degree, we should expect an emerging correlation pattern between these variables, illustrating different "levels of agility". Using factor analysis we can also identify variables that are potentially grouped into factors, forming the key dimensions to explain the agility construct.

In order to apply EFA the quantity of respondents (sample size) and the limitations of this technique must be reviewed. Some authors have suggested five participants per measured variable (Gorsuch, 1983) and others have claimed that this number can vary between 10 and 1 (Nunnally, 1978; Everitt, 1975). According to Fabrigar et al. (1999) some studies have indicated the need

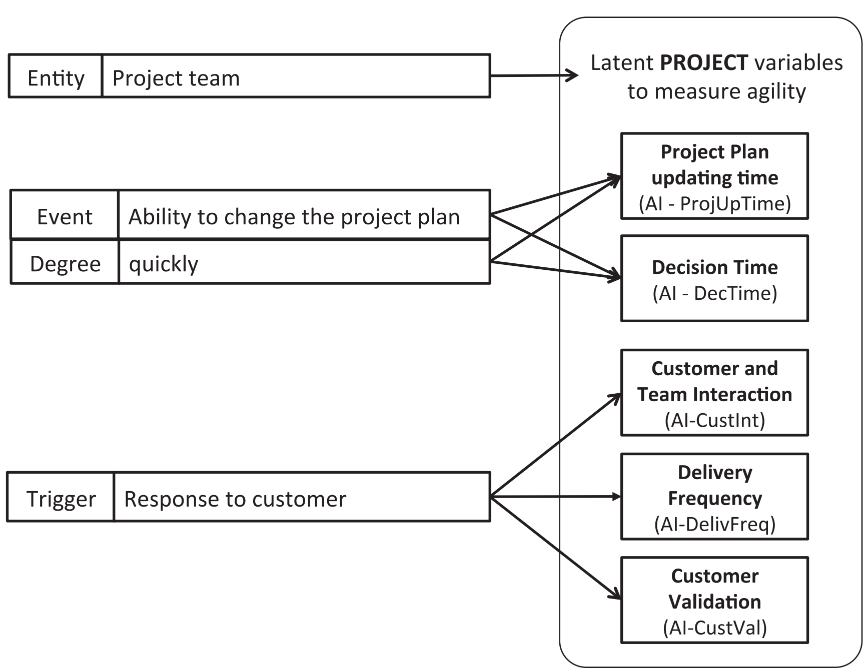

Fig. 3. The identification of variables based on the elements of the frame semantics.
Source: prepared by the authors.

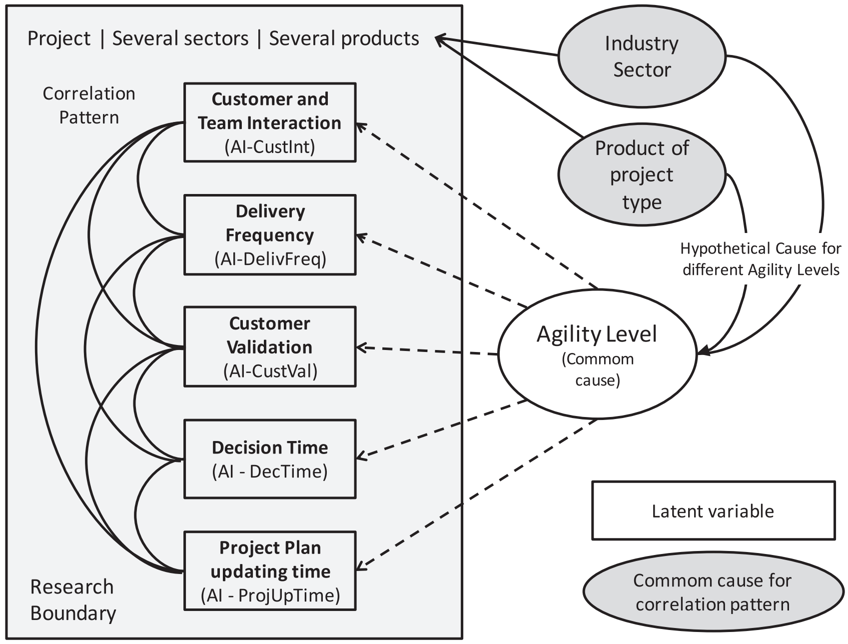

Fig. 4. Illustrative path diagram and context of the exploratory factor analysis.
Source: prepared by the authors.

to consider other parameters to properly decide the sample size (e.g., communalities of .70 or higher), but under more moderate conditions a sample size of at least 200 is desirable (Fabrigar et al., 1999, p. 274).

In this study we had 171 participants, which means a ratio of 34:1 observations for each variable of the model. The sample of respondents was selected in a way to avoid sample biases, having a heterogeneous sample of participants from different industries and types of project, as described in the research method. Therefore, the use of the EFA technique for testing the agility construct is supported in the literature (Fabrigar et al., 1999).

The results of the factor analysis are presented in Tables 7 and 8. We identified two factors. Factor 1 includes the variable "Project Plan Updating Time" (AI-ProjUpTime) and "Decision Time" (AI-DecTime). Factor 2 includes the remaining variables. We computed a 0.587 K.M.O test (Kaiser–Meyer–Olkin Measure of Sampling Adequacy), which is above the minimum accepted value (0.50) for this type of test, and it was considered statistically significant for $p < .05$ (Hair et al., 2006).

We applied the extraction method Maximum Likelihood with Varimax and Kaiser Normalization (Fabrigar et al., 1999). The initial Eigenvalues for 2 factors were respectively 1.996 and 1.295, and the extraction sums of squared loadings 1.350 accounted for factor 1 (27% of total variance) and 1.115 for factor 2 (22% of total variance) with a cumulative percentage of 49% of the total variance.

The results show that we can extract two factors from this preliminary test. The first factor could be named as "Rapid Project Planning Change", which is aligned with similar studies in this area exploring the importance of planning on innovative product development success (Stockstrom and Herstatt, 2008), and the need to have a deeper understanding and treatment of task uncertainty in more dynamic project environments.

This factor combines two variables related to fast decision making and time to update the project plan and communicate all changes: AI-ProjUpTime and AI-DecTime, and had a Cronbach's alpha of .703, which is considered relevant (Hair et al., 2006).

Table 7
Descriptive statistics.
Source: prepared by the authors.

	AI-CustInt	AI-DelivFreq	AI-CustVal	AI-DecTime	AI-ProjUpTime
Mean	5.06	4.05	4.71	3.91	3.86
Median	6	4	5	4	4
Std. deviation	1.206	1.382	1.087	1.475	1.395
Variance	1.455	1.909	1.182	2.175	1.945
Skewness	−1.171	−0.339	−1.325	−0.382	−0.365
Kurtosis	0.709	−0.5	1.93	−0.897	−0.815

N = 171.

Table 8
Rotated factor matrix (all variables).
Source: prepared by the authors.

Factor matrix [(a)]		
Variable	Factor 1	Factor 2
AI-ProjUpTime (Project Plan updating time)	***0.997***	−0.067
AI-DecTime (Decision Time)	***0.565***	0.305
AI-CustInt (Customer and Team Interaction)	0.122	***0.642***
AI-CustVal (Customer Validation)	−0.048	***0.557***
AI-DelivFreq (Delivery Frequency)	0.240	***0.506***

Extraction Method: Maximum Likelihood. Rotation Method: Varimax with Kaiser Normalization.
[a] 2 factors extracted. Rotation converged in 3 iterations.

The second factor is formed by three variables (AI-CustInt, AI-CustVal and AI-DelivFreq) and could be named as "Active Customer Involvement" in the project management lifecycle. It is important to highlight that these variables represent more than just customer interaction, it is about active collaboration, which is very important for teams adopting APM practices (Hoda et al., 2011). They illustrate the ability to deliver frequent tangible results, interact with customers and have their collaboration, validation and constant feedback on partial results. This second factor had a Cronbach's alpha of .589.

7. Analysis of results

7.1. Revealing the problems of agility definitions on project management

The majority of definitions are from manufacturing and organization theory, not from project management area. Out of the 59 definitions of agility found in the literature, only five (roughly 8%) were categorized as related to project management area, more specifically, they were related to the software development (Highsmith, 2004; Conboy, 2009; Erickson et al., 2005; Williams and Cockburn, 2003; Qumer and Henderson-Sellers, 2006).

Regardless the area of focus, the definitions found are incomplete and do not contain all the semantic elements according to the frame theory (Fillmore, 1982, 1985, 2003; Fillmore and Baker, 2010; Petruck, 1995, 1996). This indicated that the authors are not explicit with at least one key area of this phenomenon. We identified definitions that missed one key element, the entity, such the one described in Highsmith (2004), Yusuf, Sarhadi and Gunasekaran (1999), and others. The lack of an explicit entity is a critical issue in the frame semantic structure and hinders the correct understanding of this phenomenon.

There are also other problems related to redundancy and excessive use of adjectives for each element of the frame semantic structure. For example, Sharifi and Zhang (1999) describe agility with multiple "events" that might be correlated, e.g., "to exploit changes", "to detect the changes" and simply "to change". In this example, to exploit changes you first have to identify changes, so it could be implied in this term and the authors could have adopted just the word "exploit". Another example illustrates the use of multiple verbs that may cause confusion when measuring agility. For instance, Conboy (2009) used "create", "embrace", and "learn" to describe the events related to changes. According to the frame semantic approach, one of the key characteristics of a definition is to be objective and clear, so these definitions are not adequate to be used in defining a concept and could difficult the proper measure and understanding of a construct.

In sum, considering that the frame semantic structure used in this study has all critical dimensions to describe a construct, and the definitions of agility found in the literature are incomplete, including those from the project management, this paper contributes to fill the gap of not having a clear and complete definition and understanding of the agility construct and its role in the project management theory. By improving the comprehension of this construct, scholars will be able to advance empirical investigations and the measurement of agility in different project management contexts with a diverse set and combinations of practices, tools and management approaches.

7.2. Agility as an ability more than an attribute of method or practice

The definition proposed states that agility is an ability of the project team as result of the most frequent use of this term in the definitions found. This evidence supports the assumption that agility is not a characteristic of a practice or method. Therefore, using terms such as "agile practice" or "agile methods" would not be adequate. Understanding agility as a team's performance is important to provide a more comprehensive view of the agile methods, practices and tools disseminated in the APM approach.

This result could change the way organizations see the adoption of these practices and methods and it is critical for a couple of reasons: firstly, to eliminate the imprecision and different interpretations found in the literature (Highsmith, 2004; Boehm and Turner, 2004; Erickson et al., 2005; Qumer and Henderson-Sellers, 2006); secondly, to evolve and promote a better understanding about the adoption of the so-called "agile methods or practices" by different organizations, not only I.T. or software development companies; and thirdly, to provide a theoretical background toward the definition of a research agenda to investigate the impact of agility in project and product performance, and in other areas of an organization.

7.3. Agility is dependent on a combination of two factors

The EFA results (Section 6) showed that team's agility, defined as a performance indicator, would be related at least with two factors: the capacity to change the project plan and the active involvement of customer in the development process, that are directly dependent on the use of "agile methods" and are supposed to be industry-agnostic. This result takes the discussion of agility to another level beyond the current state of the literature on agile project management, that is primarily focused on discussing success adoption of agile practices in the software development industry (Misra et al., 2009; Sheffield and Lemétayer, 2013).

This test indicated that these two dimensions might be influenced by internal and external factors. The internal factors observed in this preliminary test were related to the project and product type. In addition, Conforto et al. (2014) described a number of internal factors that could affect team's agility, such as: team size, team autonomy to make decisions, team location, project manager and team experience, among others.

The empirical test evidenced the external factor "industry sector", which could be correlated with the variance of competition and types of projects. This factor deserves more investigation as well as customer demand changes, market conditions, technology readiness, along with more specific factors such as "customer availability and commitment to be actively involved in the project", as identified in Conforto et al. (2014).

The empirical evidence showing the potential influence of internal and external factors in the use of practices and tools and its relationship with team's agility performance highlights the improper use of terms such as "agile practices" or "agile methods". In fact, according to the analyses (Section 6), the practice, by itself, could not bring agility, because agility is an *ability of an entity*, a performance indicator of the project team. The use of a management practice, technique or tool can either contribute or not to developing the "ability to change" (=agility), but will not be considered the unique factor.

In this sense, we could affirm that iterative development and visual management tools along with different classical project management tools such WBS (Work Breakdown Structure), Gantt Charts, and PERT/CPM, combined, could contribute to improve agility performance depending on the conditions in which the project is being developed.

For this reason, it is important to measure agility as an independent construct, without the bias of any given method, practice or management approach, which is a common concern among researchers (Sheffield and Lemétayer, 2013). The variables used to measure agility are also less complex and better aligned with the definition proposed, therefore these results advances the studies in the agile software development area (Qumer and Henderson-Sellers, 2008; Mafakheri et al., 2008).

In addition, the two dimensions identified in this study might be useful to understand how practices, tools and techniques from various management approaches (e.g., *Lean*, *Agile*, *Waterfall*, and Design Thinking) impact team's agility performance in different project scenarios, and investigate how to improve this ability under different organizational conditions.

7.4. Agility has different levels of intensity

The factor analysis evidenced that this construct could be used to measure agility in projects. In this sense, agility could be considered as a performance indicator, and consequently evolve in different levels (e.g., lesser or greater agility) depending on the conditions of the project and organizational context.

One of the challenges that researchers need to overcome is to be able to identify the most appropriate conditions (or, something named as "agility critical factors") and management practices that can provide greater agility performance for the project team in the face of different contexts. In addition, it is important to investigate the relationship between team's agility and project performance and consequently the product results. Then, it also may support an additional hypothesis to be further explored: Greater agility performance leads to better project and product performance. It would be important to investigate the project context and other key elements to better understand this potential correlation.

8. Conclusions, future research and study limitations

This paper makes relevant contributions to the current state of project management theory and practice with regard to the agility. Firstly, it provides a complete definition of the construct agility, built from a rigorous methodological approach named frame semantics adapted from the area of linguistics.

Secondly, the preliminary empirical test of the construct indicated two key factors that might represent the core elements of the agility construct applied to project management: *rapid project planning change* and *active customer involvement*. The analysis demonstrated potential to continue exploring the variables proposed in different studies and scenarios, including the identification of additional variables for the construct according to the frame semantic elements from the definition proposed.

The results offer a new perspective to understand agility as a core construct for APM approach and to advance project management theory. It results in three main implications for advancing theory and practice:

1. Agility should be considered a project team's performance and not merely an adjective of a certain practice or method, e.g., "agile methods".
2. The agility performance might be affected by a combination of ability to change the project plan and active customer involvement.
3. The agility as a team's performance indicator has different levels and it would be relevant to investigate how different levels of agility are influenced by internal and external factors, and how these levels might impact project results in different degrees and circumstances.

A future research agenda on agility should include these implications as a starting point in order to continue the development and comprehension of this construct and its contribution to advance the APM approach and project management theory.

An additional contribution of this paper is the framework used to analyze the definitions of agility. It could be useful to improve definitions in project management theory as well as in other related disciplines. By adapting the semantic structure proposed in Table 2 and Fig. 2, e.g., changing the elements *entity*, *trigger*, *purpose*, and *circumstance*, it would be possible to create customized instances of this definition for different focus, allowing a more systematic, precise and replicable analysis of existing definitions in the project management area.

The frame semantics framework was also useful to develop a complete definition and to identify potential variables to empirically test the proposed definition. Therefore, scholars and practitioners could use this method to create or improve current definitions in project management literature.

Regarding the research limitations, our study covered a large extent of the literature and previous studies that have used the term agility in project management related perspective. Despite of the quantity of definitions we analyzed, there might be other definitions not captured during the literature screening process. For this reason we encourage further investigations as well as to explore similar terms, e.g., flexibility, found in manufacturing, product development, and project management literature, and its correlation with agility. This would be relevant to collect sufficient evidence to validate this construct in the project management discipline.

The frame semantic analysis was performed considering the original definition in English as published in the original source to avoid translation issues. Despite that this might not be an issue, it is important to consider this limitation when comparing results with or from translated definitions.

From the empirical test perspective, the questionnaire was applied in Portuguese since the professionals were all from Brazil and Portuguese-speaking. We translated only the results to English for the purpose of this paper. Despite the diversity of the sample, we focused only in the industries from the São Paulo state. We suggest that future tests consider a broader sample to include organizations from different states, industry sectors and even the possibility of having participants from different countries.

In addition, in order to reduce the effect of one respondent per project, future investigations can adopt complementary research methods such as longitudinal data collection and analyses over a period of time in projects under development. Combined with multiple sources of data, e.g., interviews and document analysis, the results would allow researchers to investigate additional elements of the agility construct, as well as to further explore the causal relationship with project outcomes.

Future research should also consider developing additional variables to explore this phenomenon in more detail, and cover all frame semantic elements, for example: the quality of the decisions (related to FE *event*); project and product performance and results (FE *purpose*); quantity and frequency of changes generated by technology, market and stakeholders (FE *trigger*); and project and business context and characteristics (FE *circumstance*).

Using additional variables and including new measures for all frame semantic elements, combined with additional statistical tests would allow scholars to identify other potential implications of the agility construct, and ultimately identify a bigger set of variables to measure this construct in the project management theory in different contexts.

Conflict of interest statement

None.

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Appendix 1 Questions used to measure agility.

- Customer and Team Interaction (AI-ClieInt). “The frequency of the communication (interaction) between the project team and the customer to discuss project related topics was”: 1) above 6 months; 2) every 6 months; 3) bimonthly; 4) monthly; 5) biweekly; 6) weekly or daily.
- Delivery Frequency (AI-DelivFreq). “The frequency in which the team delivered partial results to the customer was”: 1) above 6 months; 2) every 6 months; 3) bimonthly; 4) monthly; 5) biweekly; 6) weekly or daily.
- Customer Validation (AI-CustVal). “The partial results of the project were frequently presented, discussed and validated by the customer”, with the options: 1) strongly disagree to 6) strongly agree.
- Decision Time (AI-DecTime). “In case of changes in the project scope, what was the average time needed for the team analyze an information and make a decision?” 1) above 30 days; 2) 15 to 30 days; 3) 8 to 14 days; 4) 4 to 7 days; 5) 1 to 3 days; 6) less than 24 h.
- Project Plan Updating Time (AI-ProjUpTime). “In case of changes in the project scope, what was the average time for the team to update the project plan and to communicate to all stakeholders?” 1) above 30 days; 2) 15 to 30 days; 3) 8 to 14 days; 4) 4 to 7 days; 5) 1 to 3 days; 6) less than 24 h.

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