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What Software Agile Teams Do To Create Customer Value: A Mixed-Methods Analysis In Brazil

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***Abstract*: An organization's ability to create customer value has fundamental importance to its success in an increasingly competitive market. It is crucial to identify the most appropriate strategies and the most relevant difficulties to effectively manage the value creation process and develop ways to deal with them. Despite the explicit emphasis on early and continuous delivery of valuable software in Agile Software Development, few studies have empirically examined the customer value creation. Understanding this process could help determine where to focus management efforts (and related financial resources) from a practical standpoint and where to focus research efforts from an academic perspective. Two-part mixed-method research was conducted with professionals on agile teams in Brazil to understand the elements that constitute the strategies for creating value for the client, the related factors, and the barriers to adoption. First, an exploratory web-based survey was conducted on the state of practice of adopting strategies to increase customer value in Agile Software Development, with 378 professionals working for 123 Brazilian companies. Multiple studies were then conducted using focus groups involving five software organizations. The empirical results detailed these strategies in terms of objectives pursued, customer value metrics, challenges and usage impacts, and reasons for non-adoption, as well as the factors that influence their adoption by agile teams. It was also found that the lack of customer collaboration and team immaturity were indicated as the main barriers to adopting these strategies.**

***Keywords*:** Value Creation, Customer Value, Agile Software Development, Mixed-Method.

I. Introduction

The creation of customer value is an important concept and discussed in projects and organizations. Among the 30 largest companies in the United States (Dow Jones) and Germany (DAX), in 2016, 50% of them explicitly mentioned in their vision and mission statements the notion of creating value for customers or stakeholders[1]. For example, Procter & Gamble's mission statement includes the sentence: "We will provide branded products and services of superior quality and value that improve the lives of the world's consumers". Unsurprisingly the Marketing Science Institute reported that the most critical tasks for organizations are to create and communicate value to their customers[2]. Clearly, in the business world, the creation of value is explicitly fundamental and a critical element to the success of any organization[3].

In general, the creation of value can be defined as a process by which the customers increase their well-being [4] so that they improve in some aspect [5] when they make use of products or services they bought[6]. Increased customer satisfaction is the main driving factor in an organization's value creation process. It can lead to higher customer loyalty levels and a competitive position[7], [8]. It is essential to identify the most appropriate strategies and the most relevant difficulties to effectively manage the value creation process and develop ways to deal with them.

The first principle of the Agile Manifesto [9] points to the need to satisfy the customer through the early and continuous delivery of valuable software. Agile methods, such as Extreme Programming[10], Scrum [11] have evolved into approaches to prioritize value creation in the software development process, potentially leading to increased customer satisfaction. They aim to create customer value as a guiding principle, and the software development process is seen as a value creation process[12], [13]. Agile methods propose to deliver more than features in a given software; they seek customer value[14].

Although the industry has extensively adopted agile methods[15], few studies have empirically examined value creation in Agile Software Development (ASD)[12], [13], [16]–[21]. Understanding the means used by agile teams to create value, the benefits observed, and the barriers encountered can help determine where to focus management efforts (and associated financial resources) from a practical point of view and where to focus research efforts from an academic perspective[12]. Considering that the domain of

value is key to success in software projects [22] and its practical application challenges are still present in companies operating in the sector, with low value and underutilized products [23]–[25].

Some studies have indicated that adoption agile methods facilitates value creation [13] and provides some relevant aspects of value[16]. However, existing studies are often isolated and with a focus restricted to some aspects of value, such as internal or external product quality, usability, and simplicity, frequent releases, flexibility, or the economic aspect [16]. It is relevant to assess the value creation process to take advantage of more traditional research areas on the subject, such as Business and Marketing, whose first research dates from the 1980s[26]. It allows us to study the phenomenon of interest more holistically and based on more consolidated theories and perspectives.

The focus on customer value is pointed out as primary and a priority concerning all other value categories (such as stakeholder value and user value) [26]. Customer value is the source for all other values[27], [28]. However, few empirical studies were found to explicitly focus on customer value in ASD [14], [29]. The studies indicated difficulties for companies that adopt agile methods to create value. Kauppinen et al. [14] recommend that more empirical studies on customer value be carried out at ASD. Thus, empirical studies on the strategies used in practice by agile teams to create customer value can answer questions about how to improve the software development process and monitor the creation of value in a highly competitive scenario.

Given the limitations of existing work and the lack of empirical studies on the process of customer value creation in ASD, a two-part mixed-methods research [30] was conducted on strategies adopted by agile teams to create customer value. The first part of the quantitative research involved a state-of-the-practice study using industry-leading data collected through a web-based survey. The second part of this qualitative research involved five case studies in Brazilian software companies that helped to better understand the results obtained in the first part of the study. This article reports on the results of the mixed-methods study, which addressed the following questions:

- (RQ1) How are the strategies to create customer value currently practiced by software agile teams?
- (RQ2) What factors influence the adoption of strategies to create customer value by agile teams?
- (RQ3) What barriers are faced for adopting strategies to create customer value from the agile team point of view?

The remainder of this paper is organized as follows: Section II presents a brief literature review on the concept of customer value and value creation and also discusses work related to creating customer value in the ASD. Section III then describes the research methods, including the quantitative (exploratory survey) and qualitative (case studies) steps. Section IV presents the results, which are discussed in the light of previous studies on the topic in Section V. Section VI presents the threats to the validity of this research and how they were treated. Finally, Section VII presents the conclusions and the limitations of the research and an outline for future work.

II. Background

A. Customer Value and Value Creation

In the literature of several research areas, it is possible to find many studies published in the last decades that have been dedicated to investigating the concept of customer value [1], [26]. Several authors have expressed the challenge of addressing this theme because it is a complex concept that is difficult to understand and model [31]. However, it seems of great importance to highlight some key points related to customer value discussed in the literature, supporting the understanding of the target phenomenon of this work.

As a starting point, the conceptual distinction between customer value and stakeholder value should be noted. Business and Marketing literature has been organising these different value categories for a long time with various nuances [26]. Customer value considers the business-customer relationship, which is made possible through products and services, but the concept of stakeholder value is broader and analyses the value created beyond the boundary of the business-customer relationship, which it can also consider: suppliers, shareholders, users, employees, regulatory agencies, and many other stakeholders. Focusing on customer value is stated as primary and priority over all stakeholders, as it is the fundamental premise for developing and maintaining a product or service[32], [33].

Woodruff [34] suggests that customer value is the perception of value derived from a customer's view, not from the seller's perspective of the product or service. This is reiterated by many other authors and is a generally accepted principle of customer value[26], [34], [35]. However, consensus on a definition for customer value is not provided in the literature. In a related systematic review, Khalifa [26] suggests that theoretical customer value models can be divided into three fundamental categories: value component models (VCM), benefit-cost ratio models (BCM), and means-ends models (MEM). In VCMs, the emphasis on customer value is on the usefulness of the functions and features that a product or service can offer. For example, a young basketball player could look for specific functional characteristics when buying a particular shoe, such as a high impact cushioning system or padded forage. An example of VCM well known in the literature is the Kano Model[36]. In BCMs, in various theoretical definitions, there is a good variety of attempts to describe the trade-off performed by the customer between the "give" and "receive" elements. For example, the balance between the benefits received and the sacrifices incurred [37] or between the satisfaction of needs and resources invested[38]. Customer benefits include tangible and intangible elements of the product or service offered, and the sacrifice component includes monetary and non-monetary factors, such as the time and effort required to purchase and use the product. For example, a young soccer player would choose between the monetary amount that he would be willing to invest in a new boot and the benefits that

he would obtain by purchasing it, such as comfort during matches, the durability of the product or the brand. Then, he would decide on the product with the best relation between the benefits offered and the necessary investment. MEMs assume that customers purchase and use products or services to achieve favorable ends. "Means" are the products or services, and "ends" are the goals and purposes considered important to customers. For example, a teenager might seek social acceptance from a group of friends by buying a specific famous-brand sneaker. In MEMs, the consequences of using a product or service facilitate (or block) the attainment of the client's objectives and purposes[34].

However, in the existing literature, it is concluded that customer value is an inaccurate concept [39], [40], and suffers from “diffuse definition problems” [41]. In this paper, customer value is defined as “making the customer better off” to avoid inaccuracy of the concept of value. It is a definition taken from the perspective of Business and Marketing areas, suggested by Grönroos[42].

On a more general level, value creation is a process whereby the customer increases his well-being [4] so that he improves in some respect [5]. Customer value means that once a value creation process meets them, customers are or feel better than before. However, the value can also be destroyed, and the use of a product or service can be a negative experience, permanently or temporarily worsening the customer [43]. Therefore, a company's primary purpose is to provide products and services that create value for its customers[44]. For a provider organization, with a business model whose customers are also business organizations (business-to-business), as is the scope of this study, this means that it supports their customers' day-to-day operation so that they achieve their goals in the business[42]. This is, of course, a simple but indicative working definition of what is meant as a customer value creation process. In this study, references to the process of customer value creation, or only “customer value creation”, are interchanged by “increasing” or “maximizing” customer value to emphasize customer improvement.

B. Customer Value Creation in ASD

The main objective of any agile method is to create value; thus, the entire agile software development process should act as a value creation process [13]. In the first principle of the Agile Manifesto, it is possible to observe the priority given to customer satisfaction, through the early and continuous delivery of valuable software. The Lean Development agile method, for example, shares the emphasis on creating value, in which each activity in the software development process must aim to add value to the customer and eliminate waste[45].

Some studies investigated the creation of value at ASD [13], [16]–[21] and reported that agile practices facilitate the creation of value and provide some essential aspects of value. Santos et al. [21]point out the software delivery before the deadline, agreed with the client, as the main challenge of the software industry, in which agile practices are used more and more to face it. Conboy [17] defined an agile and lean company as one that “contributes to the customer's perceived value through cost reduction, quality, and simplicity”. Facilitating the flexibility of software development was the definition given by Maruping et al. [19]for creating value through agile methods. Hoda et al. [18]consider value creation as the ability to respond to changing customer requirements and the frequent release of new product features[20]. Racheva et al. [12] carried out a study to find the means used to create value for the business in agile software projects. Still, they did not find any employee or any organization that could describe how value creation worked in agile contexts, despite claiming that this happened in their projects.

Alahyari et al. [16]investigated the definitions, use, and measurements of value in organizations that adopt agile methods. They compared the perceptions and priorities of perceived values by domain and roles, as well as examining which practices are used to obtain value and what makes it challenging to get. However, despite the advances obtained by the work of Alahyari et al. [16], the results are limited to four domains (telecommunication, automotive, consulting, and military). Also, when considering the strategies that companies used to create value, the authors focused only on practices cataloged as “agile”, thus limiting the possible approaches that could be used for this purpose in the software development process. The study also did not investigate the strategies to create value after software delivery, during the use of the product by customers, nor the benefits and challenges of adopting these strategies.

Despite the unquestionable importance that value creation has in ASD, there are still few empirical studies on the topic, and its detailed understanding has not yet been achieved. Although some researchers and professionals have provided some aspects or concepts of value [17], [46] in ASD, existing research is often isolated and with a focus restricted to some aspects of value, such as internal quality or external product[17], [21], usability and simplicity[17], [19], frequent releases[18], [20], flexibility [19], [47], [48] or the economic aspect[17], [49].

The existing literature about value in ASD emphasizes different frontiers of the studied phenomenon, in particular on the value categories. It specifically includes stakeholder value [50], business value[12], [13], user value[51], and multiple perspectives value[16].

The focus on customer value is pointed out, above all, as primary and a priority concerning all other value categories [26]. However, few empirical studies were found to explicitly focus on customer value at ASD[14], [29]. Kauppinen et al. [14] analyzed the process of creating value for the customer in six Finnish software development companies, which adopted agile methods. They found that the emphasis on value creation was inadequate, as it focused on the quantity and speed of development of new features in the product. They also noted that customer processes were not deeply understood before solutions were developed. To improve results, the authors recommended three Marketing practices, which support the creation of customer value: identifying customer segments, discovering information about customer processes, and creating direct contact

between software engineers and customers and users. Kasauli et al. [29] investigated how agile teams interpreted the creation of value in each development cycle (sprint), the benefits obtained by this process, and its challenges. The authors reported that the creation of value is hampered, mainly, by the lack of clarity on what constitutes value for the clients among the members of agile teams. They also noted the lack of use of detailed metrics to measure the value delivered to customers.

It is important to note, however, that it is necessary to understand better what constitutes value creation at ASD[12], [16]. Although the first empirical studies carried out by researchers [14], [29] little is known about the strategies adopted by agile teams for this purpose.

III. Methods

This section presents the research methods adopted in the study, describing the respective data collection and analysis processes. This work followed the explanatory sequential strategy of mixed-methods[30], as illustrated in **Figure 1**. First, quantitative data were collected, and then qualitative data helped to explain the initial quantitative results in more detail. In particular, a combination of quantitative exploratory survey (Phase I) and qualitative case studies (Phase II) formed the research's core. As Creswell [30] and others have observed[52], the use of mixed methods can provide a powerful lens for understanding problems involving technical and behavioral aspects, such as software development, and is suited to the broader objective of the present study.

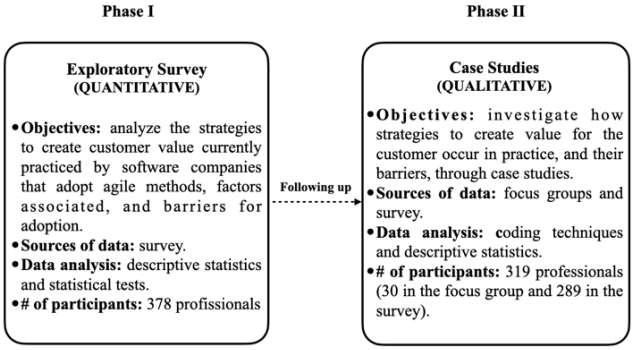

Figure 1. Explanatory Sequential Strategy Adopted

A. Exploratory Survey (Phase I)

1) Data collection

The target population was software professionals, members of agile teams, who worked in companies in Brazil. Data collection was conducted using the web-based survey tool Survey Monkey[53]. The questionnaire was previously reviewed by five agile development experts and pre-tested by six software professionals to verify consistency and readability. Following an accidental sampling approach [54], potential respondents were invited directly by email and posts on agile development-related mailing lists. Many of them were contacted through a Slack tool group (http://agilidade.slack.com) and the professional network Linkedin. A snowball sampling approach [54] was also used through the contacts of the researchers in charge. An estimated total of 6,700 people was contacted, and 378 responses (5.6%) were obtained. These professionals represented 123 different organizations, distributed in 18 Brazilian states. These responses have been filtered and contain only respondents who reported using agile methods. The overall profile of respondents is presented in Section IV.

2) Survey design

The survey design was based on a guide for conducting software engineering surveys[55]. The objective was to describe the extent of adoption of strategies to create customer value in the participating software professional's team and to explore the critical factors and barriers associated with their adoption. The survey, including twenty-seven questions, was drawn from the agile methods literature, particularly a systematic review conducted preliminary by the authors of this paper[56], which mapped fourteen strategies to create customer value in ASD. These fourteen strategies are identified in this paper by S1-S14 (**Table 7**)**.** Survey questions were organized into two parts: the first part gathered demographic data, while the second part collected data on respondents' practical experience in strategies to increase customer value in agile teams. Although pre-defined answer options were presented in the questions in the second part of the survey, the questionnaire included open fields to indicate other options not considered in the suggested list and the option 'I do not know'. Full details of the questions that made up the survey instrument are provided in **Appendix A**.

3) Data analysis

The unit of analysis for the survey was the agile teams the respondents belonged to. This analysis option was more appropriate as organizations, especially large ones, can be formed by teams that implement different strategies to create customer value.

Thus, two types of analysis were performed on the data collected: first, a descriptive statistical analysis was performed, using simple frequency counts on the survey questions, and the results were compared with related existing studies; then, statistically significant associations were sought between some of the participants' demographic attributes (driving factors) and the strategies they adopted to increase customer value (S1-S14). As shown in **Figure 2**, six influencing factors were intentionally considered for analysis, three relating to the participant's team (product type, product owner type, and customer type) and three related to the organizational context (unit size, agile adoption level, and years of agile experience).

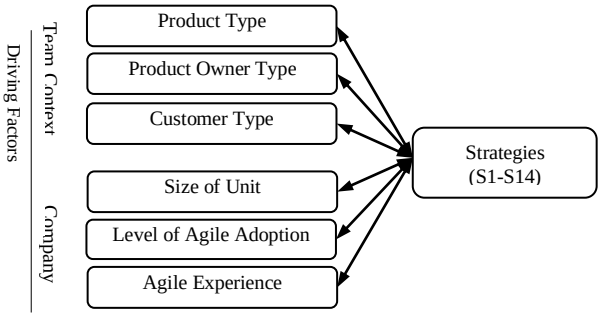

Figure 2. The associations analyzed between the driving factors and the strategies identified in the literature review

Associations between the driving factors and each strategy were validated by Pearson's chi-square independence and likelihood ratio chi-square tests[57]. Only factors that had a statistically significant association ($p < 0.05$) were considered. IBM SPSS software (version 25) was used for all association analysis calculations.

B. Case Studies (Phase II)

1) Case studies selection

As case contexts are considered critical in case studies, it is fundamental to carefully select the cases, and entities investigated to make them more understandable and limit analysis [58]. As recommended by [30] for conducting mixed-method research, the selection of case studies followed the intentional strategy. Thus, the results of the quantitative phase (Phase I) purposefully recommended the types of participants selected for the qualitative phase. The results obtained in the quantitative phase indicated a statistically significant relationship between a more extensive set of strategies to create customer value and companies with 100% of the teams using agile methods, which have adopted them for over five years and are of medium size (between 100 and 499 employees) or large (500 or more employees). This organization profile was considered as a criterion for selecting the companies participating in the case studies.

The multiple case project type was intended to contribute towards more powerful analytical conclusions than those derived from a single case[59]. A theoretical replication (contrast) strategy [59] was also adopted among case studies. Three organizations with organizational characteristics aligned with the prototypic profile obtained in the quantitative phase (Group A) and two other companies with opposite characteristics (Group B) were selected, as summarized in **Table 1**. In all replications, the case studies' focus was holistic, examining only each organization's global nature and considering a single unit of analysis in each case.

Group	Company	Size (# employees)	Level of Agile Adoption (% teams)	Agile Experience (years)
A	Case I	2400	100%	12
A	Case II	1300	100%	8
A	Case III	450	100%	6
B	Case IV	70	72%	<1
B	Case V	40	80%	<1

Table 1. Organizational characteristics of cases.

Other background information from the five case studies was summarized in **Table 2**, based on the recommendations provided by[60].

2) Data collection

Data were collected in two sub-phases, as illustrated in **Figure 3**. In Sub-phase 1, a material walkthrough workshop was conducted by a company representative to let researchers know about the organization's software development process and specific practices and terminology. The workshop was held remotely via the Google Hangout tool and lasted one to two hours. Software development process documents and products and services briefings, usually in the form of presentations, were also provided and used as input to the study. Then, in Sub-phase 2, a focus group session was held with some representatives from each company to create an assessment tool consisting of a set of statements that define the organization's strategies to create customer value. Subsequently, the frequency of adopting the strategies identified in the focus group by the respective software development teams was evaluated.

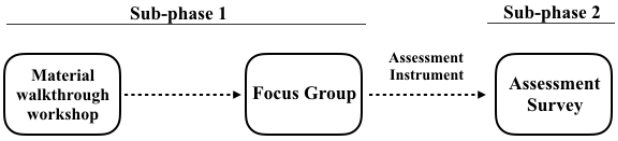

Figure 3. Data collection applied in sub-phases case studies.

The focus group session was conducted with representatives of different agile teams from each company, who held various roles. Their organizations nominated participants. The guidelines of Kontio et al. [61] were used to plan and guide the progress of focus group. As shown in **Table 3**, the sessions were attended, on average, by six company representatives and two researchers. A focus group session was held in each company studied. Focus group discussions were driven by the guiding question: "*What are the core elements that define the current strategies for increasing customer value in the work we do*?". The term "core elements that define the strategies" refers to a set of significant actions or activities that make up a strategy for creating customer value. This lower level of conceptual abstraction was necessary to analyze further each strategy adopted by agile teams and their relationships.

Context Facet	Context Element	Group A			Group B	
		Case I	Case II	Case III	Case IV	Case V
Organization	**Organizational model**	Several locations distributed across various countries. A flat organization based on agile principles	Several locations distributed across various Brazilian cities. A flat organization based on agile principles	Several locations distributed across various Brazilian cities. A flat organization based on agile principles	Headquartered in a single unit. Hierarchical organization	Headquartered in a single unit. Hierarchical organization
	Organizational unit (part of the company involved in the study)	Company headquarters in Campinas, São Paulo (about 1300 software professionals)	Company headquarters in Uberlândia, Minas Gerais (about 900 software professionals)	Company headquarters in Itu, São Paulo (about 350 software professionals)	Company headquarters in Maringá, Paraná (about 55 software professionals)	Company headquarters in Maringá, Paraná (about 30 software professionals)
	Distribution	Local and shared development (on-premises and on-premises)	Local and shared development (at the client and on-premises)	Local development	Local development	Local development
Market	**Segment**	Several	Several	Several	E-commerce	Financial
	Configuration	Business-to-business	Business-to-business	Business-to-business	Business-to-business	Business-to-business
Product	**System type**	Custom development services	Custom development services	Enterprise resource planning system e customizations	Marketplace hub system	Custom development services
	Size	Several	Several	Commercial product. Large scale system	Commercial product. Large scale system	Commercial product. Midsize systems.
Process	**Development process overview**	Scrum	Scrum	Each team defines its development process (Most adopt Scrum).	Scrum	Scrum

Table 2. Cases studies: background information (adapted from [60]).

As the focus group discussions began, participants were instructed to write their answers to the guiding question on self-adhesive cards. The researchers then collected the cards and arranged them on the wall based on theme or strategy similarity. This approach sought to mitigate the risk of a participant's predominance or over-inhibition. All cards were read aloud and discussed by the focus group. New topics related to the question under discussion generally emerged, and some were withdrawn by consensus from the group. The main barriers to adopting of the statements obtained arose spontaneously or were encouraged by the researchers during the discussion. The sessions were conducted until everyone in the group was satisfied with the set of statements collected. Each session lasted between two and three hours. The statements obtained were recorded using a spreadsheet tool and displayed on a large monitor or projector based on the discussions. It was visible to everyone attending the session.

In Sub-phase 2, a web-based survey was used as an instrument to evaluate the frequency of using strategies to create customer value adopt by the agile teams participating companies. Each statement obtained in each focus group became a question in the survey. In addition to the statements, questions about demographics and the profile of respondents were included. Statements were evaluated by asking respondents to consider the extent to which they agreed with each statement. That is, to what extent the statements about the strategies were effectively applied in the respondent's team. For this, it was using a five-point Likert scale, strongly agree (5), agree (4), neutral (3), disagree (2), and strongly disagree (1), including the option “I cannot answer / no applicability” (0). All employees who worked on software development teams in the respective organizations participating in the previous sub-phase, including managers, were invited to respond to the survey. After testing the questionnaire with one or two focus group participants to verify its readability, a request was emailed to the invited staff. Data collection was conducted at different times in each participating company using the Survey Monkey tool [53]. An estimated 2,635 employees were invited, and 289 responses were obtained, of which one hundred and ten (response rate = 7.3%) worked in Case I, sixty-nine (response rate = 7.7%) in Case II. seventy-two (response rate = 20.6%) in Case III, twenty (response rate = 57.1%) in Case IV and eighteen (response rate = 60.0%) in Case V.

	Function	Industry Experience (# years)	Function Experience (# years)
Case I	P1: Senior manager	18	4
	P2: Product manager	14	3
	P3: Product manager	10	2
	P4: Senior developer	10	1
	P5: Software architect	8	2
	P6: Scrum master	6	2
Case II	P1: Delivery success manager	10	2
	P2: User experience designer	8	6
	P3: Digital strategist	12	2
	P4: Software architect	7	1
	P5: Tester	5	5
Case III	P1: Development manager	20	9
	P2: Head of product	15	5
	P3: User experience manager	8	3
	P4: Product owner / analyst	10	8
	P5: Senior developer	8	2
	P6: Software architect	12	6
	P7: Tester	6	4
Case IV	P1: Product manager	15	7
	P2: Quality leader	5	3
	P3: Business analyst	6	5
	P4: User experience designer	8	5
	P5: Developer	7	7
	P6: Tester	5	5
Case V	P1: Development manager	12	5
	P2: Developer leader	10	2
	P3: Scrum master	8	< 1
	P4: Senior developer	8	3
	P5: Developer	9	9
	P6: Database analyst	6	6

Table 3. Profile of focal group session participants.

3) Data analysis

In Sub-phase 1, the audio recording of each focus group session was transcribed and, along with the statements obtained, were encoded in Atlas.ti [62]. The statements and transcripts of the participants' comments went through an iterative process of multiple data analysis stages, which was performed systematically, using coding techniques [30], [58]. The same procedure was carried out separately to obtain the themes of elements of strategies and the themes of barriers to adoption. The recommendations for thematic analysis of Cruzes and Dybå [63] were considered during the investigation. The constant comparison method (CCM) was also applied and, therefore, the analysis was iterative[64]. However, to obtain a readable description of the analysis steps, they will be described sequentially.

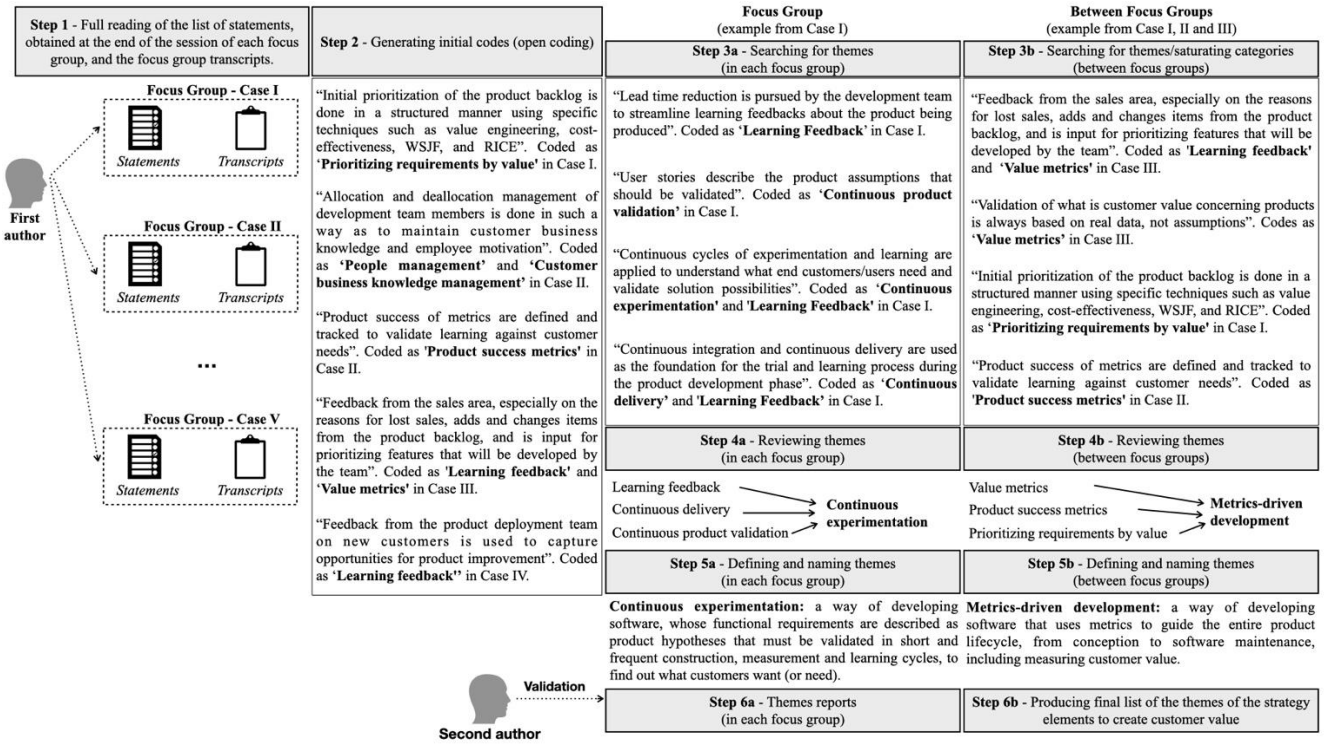

Figure 4. Iterative data analysis adapted [64]

Initially, the first author read each statement and comment transcript from each focus group of participating companies to obtain an overview of the data (step 1, **Figure 4**). Then, he analyzed each statement and comment inductively to generate the initial codes (step 2, **Figure 4**), using descriptive codes (for example, those that describe characteristics of the strategies cited during the focus group or verbal or paraphrased statements by the participants) and interpretive codes (that is, those that required more significant inference about the meaning of the strategy). Subsequently, the CCM was used to identify patterns[30], [58]. **Figure 4** shows some instances of the theme 'continuous experimentation' coded in Case II's focus group transcript. Case II referred to a way of developing software, whose functional requirements are described as product hypotheses that must be validated in short and frequent construction, measurement, and learning cycles, to find out what customers want using terms such as 'learning feedback', 'continuous delivery', 'continuous experimentation', and 'continuous product validation'. We aggregated all under the theme 'continuous experimentation'. By applying steps 3a, 4a, 5a and 6a, themes were identified from each company's statements and comments of the focus groups. Then, the codification process and the themes report were validated by the second author.

Next, the first author applied CCM to identify patterns between the statements and comment transcripts of the different participating companies and saturated categories (step 3b). The themes were revised and modified, when necessary (step 4b), until reaching the final themes of elements of strategies and final themes of barriers for adoption, as presented, respectively, in **Table 17** and **Table 18**, were reached.

It was agreed that, for all focus groups, the first author would analyze and prepare individual reports with the list of themes, and the second author would review the set of identified themes. To maintain a transparent chain of evidence, reports sent via email for review included the list of themes and the quotations from the focus group comments that supported each theme. The coding disagreement during validation generally involved different interpretations of the meaning of the participants' statements, which may have been the result of assigning; for example, several codes instead of a single one. Coding disagreements were discussed and resolved, or both codes were used. Various strategies [30],

[65] were used to identify patterns and themes and protect against possible bias or false inferences.

The data collected in Sub-phase 2, through the web-based survey, were analyzed by calculating the average adoption frequency for each statement obtained from each participating company's employees.

IV. Results

This section presents the summary result of the exploratory survey (Phase I), preceded by demographic information, and the detailed analysis of the case studies (Phase II). The section was organized according to the contributions of each method to the research questions.

A. Exploratory Survey (Phase I)

1) Respondent Demographics

The number of professionals who responded to the survey was 378. Respondents were working in various roles in their organizations. Respondents' main organizational roles were developers (n = 105) and technical leaders / software architects (n = 66). Another respondent profile data is that almost 50% had more than ten years of software development experience. **Table 4** presents the roles of respondents in their organizations.

Roles	n	%
Developer	105	27.8
Technical leader / archtect	66	17.5
Scrum master	40	10.6
Project/Program manager	40	10.6
Product owner (PO)	32	8.4
Other	22	5.8
Tester	22	5.8
Agile coach / Consultant	20	5.3
Executive / Director	14	3.7
Business/Requirements analyst	9	2.4
Intern	5	1.3
IT infrastructure	3	0.8
Total	378	100

Table 4. Roles of the respondents.

Respondents belonged to 123 different organizations, distributed across 18 Brazilian states. Some of the participants did not identify their organizations (n = 3). Most participants' organizations were large (58.0%, 500 or more employees) and medium-sized (28.3%, number of employees between 100 and 499). Small and micro-enterprises, with 99 or fewer employees, accounted for 13.7% of data representation. **Table 5** shows the information on respondents and their respective organizations' agile methods experience, along with the corresponding frequencies and percentages. Almost 40% of respondents had five years or more experience, while only 6.9% had worked with agile methods for less than a year. Respondents were also asked to provide information on their organizations' total experience with agile methods. Most organizations, totaling 40.2% (n = 152), have adopted agile methodologies in their software development processes for five years or more. For 11.7% (n = 44) of participants, the organization's time experience with agile methods was unknown. Almost 63% of respondents had 100% of their organization's software development teams using agile methods, while 23.5% (n = 89) had more than 50% agile teams, and only 7.4% (n = 28) indicated that agile teams were a minority. Just over 6% of participants could not answer.

	Participants		Organization	
Years of Experience	n	%	n	%
Less than a year	26	6.9	19	5.0
1 - 2 years	52	13.7	47	12.4
2 - 5 years	145	38.4	116	30.7
5 year or more	150	39.7	152	40.2
Unknown	5	1.3	44	11.7
Total	378	100%	378	100%

Table 5. Experience in agile methods.

Most respondents reported that their teams specifically implemented the Scrum agile method (43.4%, n = 162). The second and third most adopted methods among the participants' teams were Kanban (17.4%, n = 65) and hybrid methods (13.4%, n = 50). About 50% of the respondents' product owners were employees of their organization, while 41% were representatives of the client's organization. Less than 2% of respondents indicated that no product owner is working with their team.

The respondent agile teams were working for different customer types and market segments. Nearly 60% of respondents' typical customers were outside organizations, while developments for areas and departments within the participants' organization totaled over 13 percent. The rendering of outsourced services, when the developed software aims to serve the clients of the organization that hires the participant's team, totaled almost 21%. Only 5.1% (n = 19) of respondents indicated "other" in their clients' profile, and less than one percent could not answer. To complement the customer profile of the respondents' agile teams, **Table 6** shows the distribution of their respective market segments. Participants were able to choose more than one answer option.

Market Segment	n	%
Financial	125	33.5
Industry	90	24.1
Software	88	23.6
E-commerce	81	21.7
Retail	80	21.4
Other	70	18.8
Transport	53	14.2
Telecom	49	13.1
Health	43	11.5
Food	40	10.7
Education	38	10.1
Public service	36	9.7
Insurance	29	7.8
Energy and oil	27	7.2

Table 6. Customer market segment.

2) RQ1: The strategies to create customer value adopted in ASD

In order to describe what are the strategies adopted by agile teams to create customer value, the quantitative step exploratory survey detailed the first research question (RQ1) of this work in some parts. The survey parts sought to address the adoption or not of strategies to increase the client's value for the participating team, the use of specific strategies, the objectives pursued, the challenges faced to increase customer value, and the metrics used to measure customer value.

In one of the survey questions, respondents were reminded of the first principle of the Agile Manifesto [9] that points to the need to satisfy the customer through the early and continuous delivery of valuable software. Three examples of strategies to create customer value found in the literature [56] were cited. Next, they were asked if the respondent team adopts any strategy to achieve this goal. Around 89% of respondents answered that they adopted strategies to maximize customer value, while only 9% (n = 35) indicated that they did not. Less than 2% (n = 6) could not answer.

Respondents specifically pointed out the strategies their agile teams have been adopting to create customer value. The strategy choice list was based on Sambinelli and Borges[56]. Two strategies indicated by the authors, which dealt with the prioritization of features by higher value to the customer, were unified into one strategy due to the close conceptual similarity. The resulting 14 strategies were grouped in random order into two survey questions to improve readability. Participants could select more than one strategy their team was using, respond that they did not adopt one, or indicate that they did not know. For more than 92% of respondents, the most used strategy is to prioritize the development of the most valuable customer features and often validate them (S1). **Table 7**. presents the strategies adopted by respondent teams to create customer value in increasing order of frequency. Less than 1% could not answer.

Strategy	n	%
S1: Prioritize development of higher value customer features and validate them frequently	312	92.3
S2: Focus on value aspects (such as quality, usability, and on-time delivery) that are more priority for the customer market segment and apply the most relevant agile practices to enable them	219	64.8
S3: Seek to increase customer satisfaction by joining an organizational culture of agility and process maturity	202	59.8
S4: Improve predictability and productivity of software development	193	57.1
S5: Improve the efficiency of software development project management (deadline, cost, and scope)	183	54.1
S6: Increase the motivation of development team members and organizational learning	181	53.6
S7: Apply continuous cycles of experimentation and learning to find out what customers want	179	53.0
S8: Synchronize teams and optimize the product to reduce cycle time to customer	170	50.3
S9: Increase the functional and non-functional quality of the product, without neglecting the management of invested resources	155	45.9
S10: Plan roadmapping based on a deep understanding of customer needs and a long-term vision	148	43.8
S11: Increase strategic alignment of all software development projects of the company	148	43.8
S12: Maximizing cost-benefit ratio by quantifying benefits, not just costs, and improving cost management efficiency	124	36.7
S13: Increasing visibility of software quality to customers by disseminating measurements during the development phase	124	36.7
S14: Considering the value created for customers through software products developed as a criterion in employee organizational performance reviews	92	27.2
Others	21	2.3

Table 7. Strategies adopted to increase customer value.

Respondents were also asked to identify the goals of their agile teams in adopting strategies to increase customer value. Participants were able to choose more than one answer option. The top five objectives of strategy adoption are presented in **Table 8**, along with the corresponding frequencies and percentages. For nearly 90% of participant teams, increasing customer satisfaction is the main reason for adopting a strategy, followed by the pursuit of increasing customer loyalty, which represents approximately 67% of respondents. The search for an increase in customer satisfaction and loyalty had already been mentioned in prior studies on value creation in the Business and Marketing literature[7], [8].

Objective	n	%
Increase customer satisfaction	304	89.9
Increase customer loyalty (retention)	226	66.9
Promote a culture of innovation and learning in the company that develops the product	197	58.3
Improve the software development process	193	57.1
Increase the competitive advantage of the product developer	187	55.3

Table 8. Top five objectives for strategies.

Respondents were asked to report the main difficulties encountered by their agile team in seeking to increase customer value through some strategy for that purpose. **Table 9** shows the main challenges indicated by the participants. Most respondents (over 61%) pointed out that their teams' most significant challenge is defining customer value. Almost 47% of participating agile team members indicated the difficulty of collaborating with the client in implementing strategies as the second biggest challenge. Less than 2% could not answer.

Challenge	n	%
Define what is customer value	208	61.5
Customer collaboration	158	46.8
Agile team maturity	119	35.2
Synchronization between multiple partners	112	33.1
Learning curve	92	27.2

Table 9. Top five challenges for strategies.

Respondents were asked to indicate the metrics their teams used to measure customer value. The list of the top five customer value metrics reported by participants is presented in **Table 10**. Most reported that their teams adopted the defect quantity per period metric (51.5%, n = 174). The second and third most adopted metrics were the amount of work in progress (45.6%, n = 154) and cycle time (45.0%, n = 152). Less than 4% of respondents indicated not using any customer value metrics. Only 1.8% (n = 6) could not answer. Participants were able to choose more than one option to answer.

Metric	n	%
Number of defects per period	174	51.5
Amount of work in progress	154	45.6
Cycle time	152	45.0
Benefit points or business value points	124	36.7
Metrics based on consumer feedback during product use	123	36.4

Table 10. Top five value metrics.

Although some customer value metrics have been identified in the recent literature [56], the number of defects per period is still the most practiced measure to quantify customer value, followed by the amount of work in progress. This can be interpreted as indicative of the lack of maturity from software companies to assess the accurate delivery of customer value - as already reported by other researchers [13], [29], since both metrics are intended to relate aspects of elementary quality of the product and the software production process and little explanation about the value perceived by the customers.

We sought to understand how adopting strategies to increase customer value has affected respondent agile teams through a specific survey question. The list of impacts reported by respondents is presented in **Table 11**. Participants were able to choose more than one answer option. More than 62% of professionals reported improved communication after using some strategy, and around 61% reported improved customer satisfaction. Less than 2% could not answer.

Impact	n	%
Improved communication	211	62.4
Improved customer satisfaction	207	61.2
Improved customer collaboration	190	56.2
Improved ability to adapt to change	189	55.9
Improved quality of development process	188	55.6

Table 11. Main impacts perceived from adoption of strategies.

3) RQ2: Factors that influence strategic adoption to create customer value in ASD

The second research question (RQ2) sought to investigate which factors influence agile teams in adopting strategies to create customer value. We examined to find associations between the respondents 'agile teams' strategies and the demographic characteristics collected in survey questions related to the participants' organization and team context (as in **Figure 2**). This set of demographic characteristics was named in this study as driving factors. Then, the associations between the driving factors and each strategy were validated by Pearson's chi-square and likelihood ratio chi-square independence tests [57]. Only factors that had a statistically significant association ($p < 0.05$) were considered.

First, we analyzed the associations between strategies and the type of product developed (solution) by the respondents' team to assess whether there was statistical significance. The product type options in the survey question were: customized (the solution is created and designed to serve a customer individually, and the initiative is customer driven with the collaboration of the development team), generic (the solution developed must meet the needs of a significant number of customers, and no single customer is a substitute for every market), mixed (the generic solution is developed and then deployed with specific configurations or customizations for each customer) and the "other" option. The results indicate that the type of product produced by agile teams is not associated with almost any specific strategy to increase customer value. Only strategy S13 showed a statistically significant association with product type, being more frequent among teams that develop custom products (18.3%, n = 69).

The product owner's performance type is significantly related to four strategies: S1, S4, S11, and S13. For product owners who are employees in the respondent's company, strategies S1 and S11 are more frequent. Seeking to improve predictability and productivity (S4) appears in similar proportions among product owners who are customer representatives and employees in the respondent's company. Among the product owners that are customer representatives, the S13 strategy is most often adopted. **Table 12** shows the significant associations between strategies and product owner types.

Strategy	Product Owner Type					
	E	C	N	O	Unk	*p-value*
S1	43.8%	34.6%	0.5%	5.1%	0.3%	0.000
S4	24.9%	24.1%	1.6%	3.0%	0.0%	0.047
S11	24.1%	13.8%	0.3%	1.6%	0.3%	0.023
S13	12.7%	18.6%	0.3%	1.6%	0.3%	0.002

E = employee in the respondent's company
C = customer representative
Unk = unknown
N = no product owner
O = others

Table 12. Strategies associated with the types of PO.

Another result indicated that the type of customer served by agile teams (internal customer, external customer, or outsourcing) is not associated with almost any specific strategy to increase customer value. Only the S2 strategy showed a statistically significant association with the type of customer, being more frequent among teams serving one external customer (37.3%, n = 138). It was also observed that the organizational unit's size is related to some strategies to create customer value. **Table 13** shows that strategies S6 and S13 showed a statistically significant association with the size of organizations, being more frequent among medium-sized (100-499 employees) and large (more than 500 employees).

Strategy	Number of Employees					
	1-9	**10-99**	**100-499**	**>500**	**Unk**	***p*-value**
S6	2.4%	6.2%	14.6%	24.6%	1.1%	0.010
S13	1.9%	3.0%	10.0%	18.1%	0.5%	0.006

Unk = unknown

Table 13. Strategies associated with the size of unit.

In the last association analysis step, it was concluded that the level of agile adoption in an organization (see **Table 14**) and the time of experience in agile methods (see **Table 15**) are the driving factors most associated with strategies to increase customer value. Among the 14 strategies taken from the literature and considered for this study, each of the two factors is related to seven strategies (50%). The adoption of strategies is high when agile methods have reached 100% of the respondent's organizational unit, and the company has more than five years of agile experience.

Strategy	% Organizational Teams that Adopt Agile Methods				
	100%	**>50%**	**<50%**	**Unk**	***p-value***
S2	41.6%	12.7%	3.2%	1.6%	0.003
S4	37.3%	10.3%	3.0%	1.6%	0.009
S6	36.2%	9.2%	1.4%	2.2%	0.000
S8	34.3%	9.2%	1.4%	1.1%	0.000
S12	24.3%	7.6%	1.1%	0.5%	0.008
S13	26.2%	5.7%	0.8%	0.8%	0.000
S14	18.1%	5.4%	0.3%	1.1%	0.003

Unk = unknown

Table 14. Strategies associated with the level of agile adoption.

Strategy	Years of Agile Methods Experience in the Organization					
	<1	**1-2**	**2-5**	**>5**	**Unk**	***p-value***
S2	2.4%	7.3%	21.1%	24.3%	4.1%	0.020
S3	1.4%	6.8%	16.8%	25.4%	4.3%	0.011
S4	1.6%	6.5%	14.1%	25.4%	4.6%	0.008
S6	1.4%	4.6%	14.1%	25.1%	3.8%	0.000
S7	1.4%	4.6%	14.6%	24.1%	3.8%	0.002
S8	1.6%	4.9%	13.5%	22.7%	3.2%	0.010
S13	0.8%	3.0%	7.8%	19.7%	2.2%	0.000

Unk = unknown

Table 15. Strategies associated with the agile experience.

The association analysis indicated that the factors driving the organizational context are associated with adopting a more significant number of strategies than the factors related to the respondents' team context. It concentrated on companies that have 100% of the teams using agile methods, experience in ASD older than five years, and large or medium in size. However, this last feature is not as relevant as the previous two. In the team context, the performance of product owner's types was presented as a relevant feature associated with adopting strategies to increase customer value.

4) RQ3: The barriers faced by the adoption of strategies to create customer value

The third research question (RQ3) sought to understand the barriers faced by agile teams to create customer value. In the context of the survey aimed to elucidate the reasons for not adopting strategies based on participants' opinions. Survey responses showed that 35 professionals indicated that they were not using any strategy to create customer value on their agile teams. Non-adopters were presented with options related to why they, or their teams, did not consider such strategies appropriate for their software development activities. The 'other' option was also made available, which could be complemented by a comment. The results of the top five reasons for not adopting the strategies are shown in **Table 16**. Almost 60% of respondents indicated that customer immaturity (external context) is the main reason for not adopting strategies, followed by a very traditional organizational culture in the participants' company (internal context).

Reason	n	%
Customer immaturity to adopt strategies	20	57.1
Very traditional organizational culture	19	54.3
Software requirements instability	12	34.3
Lack of knowledge or training	11	31.4
Lack of managerial support	10	28.6

Table 16. Top five reasons for non-adoption of strategies.

B. Case Studies (Phase II)

Participants from each focus group discussed the core elements that define the strategies to create customer value adopted by their organizations and commented on the main barriers to adopting these strategies. Each focus group discussion resulted in a list of statements that were then coded and grouped into themes. Subsequently, the frequency of each statement's use by the respective software development teams was evaluated using a web-based assessment survey. This subsection was organized according to this research phase's contributions to answering the research questions RQ1, RQ2, and RQ3.

1) RQ1: The strategies to create customer value adopted in ASD

Here the focus is on the various elements that describe the strategies to create customer value adopted by agile organizations. **Table 17** presents the themes of the strategy

elements present in the statements, obtained after the pattern codes[30], [58], organized according to the proposed case study groupings. Brief comments from participants are presented. The full statements of each case study and the frequency results obtained from the assessment survey can be found in **Appendix B**.

In the exploratory survey, in Phase I, as shown in **Table 7**, it was possible to identify some strategies often adopted by agile teams to create customer value. Focus group participants identified previously reported strategy elements, but their comments also disaggregated them to expose layers of complexities that the survey did not elucidate. For example, while the survey cites that "prioritize development of the most valuable customer features and often validate them" (S1) is the most common strategy among agile teams, focus groups have identified that this can be implemented in more different contexts. For example, in Group B, formed by organizations with less experience and agile adoption level, prioritization is usually conducted by customer representatives or by a steering committee with low development team involvement. In Group A, formed by companies with greater experience and level of adoption of agile methods, there is a greater emphasis on continuous experimentation processes supported by metrics to determine what increases customer value.

Group	Theme	Ref.	%Ef
A	T1: Metrics-driven development	10	65.3
	T2: Direct customer engagement in the solution	9	71.0
	T3: Continuous experimentation	9	69.3
	T4: Team's commitment to product success	7	68.4
	T5: Value guided working model	7	67.0
	T6: Delivery management	5	62.8
	T7: Strategic customer impact	5	60.2
	T8: Communicating value to the customer	3	73.3
	T9: Deep knowledge of customer needs	3	65.3
B	T6: Delivery management	10	70.5
	T10: Continuous collection of internal and market product feedbacks	6	60.3
	T11: Team autonomy to propose technical solutions	4	68.0
	T3: Continuous experimentation	3	67.3
	T2: Direct customer engagement in the solution	3	61.3
	T12: Steering committee-based prioritization	2	76.0
	T1: Metrics-driven development	1	56.0

Ref.= # of statements that have been coded and grouped under a given theme
%Ef = Average frequency of adoption of the theme in the software development teams of organizations, considering the five-point Likert scale (5 points = 100%)

Table 17. Strategy element themes.

Metrics-driven development. Participants reported adopting metrics to guide software development (T1). They are used throughout the product life cycle from conception to maintenance. For example, they use metrics to prioritize functionality at planning time, use specific techniques such as value engineering, cost-benefit analysis, return on investment, Weighted Shortest Job First [66], and RICE [67]. Metrics are also used to measure product suitability during their user experience and are called product success metrics. Feedback from product metrics on the user experience is input to new functionality or adjustments to existing functions. As one participant put it:

> "Before we do a lot, we [put in] these metrics to understand how it will work with users" (P5, Case I).

When the product backlog is designed, the team already structures how each feature will be measured for its effectiveness. The team implements the metrics in conjunction with the features. As another participant commented:

> "It's bad to launch a product to let it 'loose'. [...] We have several tools and metrics that we currently adopt to help track product success. It is very important to understand whether the product is delivering value to the customer" (P3, Case II).

Metrics are defined and tracked to validate learning against customer needs. According to **Table 17**, the adoption of metric-driven development is the most referenced theme among Group A cases (10 statements), in contrast to Group B, formed by organizations with less experience and agile adoption level, with only one statement.

Direct customer engagement in the software solution. Respondents discussed known strategy elements among agile methods, such as direct customer involvement in the software solution (T2) and highlighted more subtle aspects. Customer involvement is considered necessary, but also the participation of users, and eventual customers of the customer (end customers), is considered fundamental, concerning functional requirements and product usability. Failures in the perception of product value for users and end customers influence customer value creation's success. As the development manager stated:

> "What matters to us is to involve who will use the product and not just who will buy the solution" (P1, Case III).

The approaches reported to achieve this goal are quite diverse, such as interviews, field research, co-creation techniques, open innovation, design thinking, among other techniques. Also mentioned was the use of multi-functional committee-like structures called the product owner team, made up of development team specialists and customer business representatives, who define and prioritize product functionality. Group B case participants indicated the need for more considerable effort from their organizations to customer engagement and their users and end customers. Here, the contrast between groups A and B is evident. According to **Table 17**, this theme is one of the most quoted (9 statements) among the cases of Group A and with the highest adoption frequency score (71%), while in group B, it appears in only three statements and frequency of 61.3%.

Continuous experimentation. The strategy of applying continuous cycles of experimentation and learning to find out what customers want appeared in the seventh position (53%) regarding the frequency of adoption by agile teams in the survey in Phase I, as shown in **Table 7**. In focus groups, continuous experimentation (T3) was found to be a theme emphasized in both study groups, especially group A (9 statements). In this context, functional requirements are described as product assumptions that should be validated in short construction, measurement, and learning cycles. As soon as possible, the built-in features are made available for

end-users and users with the aim to collect qualitative and quantitative (metric) feedbacks, which become inputs to validate whether what was expected of a given functionality (hypothesis) indeed materialized. As one participant stated:

> "Each user's story is a hypothesis to be tested. The requirement does not describe a customer order, but a problem and why the customer needs that functionality" (P1, Case I).

Continuous experimentation generates in the team a learning process about the customer's actual product needs. As the development manager stated:

> "The idea of running various cycles of experimentation and learning is to capture the pains of customers and understand what is valuable to them" (P1, Case III).

Agile teams use continuous integration and continuous delivery as the foundation for this continuous experimentation process.

> "The strategy to ensure value is not to influence the product backlog beforehand. If the team makes deliveries frequently, it is possible to check customer behavior with respect to the product being produced. Customer behavior forces team and product owner reflection on the best prioritization of the product backlog and its roadmap. Putting the product into production changes the product backlog's 'game'. Making any value delivery without going to production does not provide effective value validation to the customer" (P1, Case I).

Some participants point out that they also adopt a medium-term roadmap (2-3 months) to get a high-level view of product evolution, but as feedback on the released features is collected, the roadmap is updated. Examples of participants' approaches and techniques for this purpose: minimum viable product (MVP), prototyping, design sprint [59], user experience survey and observation, among other approaches.

Team's commitment to product success. The theme of the team's commitment to product success (T4) was mentioned only by Group A participants, formed by companies with more significant experience and level of adoption of agile methods. Participants spoke of a sense of responsibility for delivering customer value, in which team members feel 'owners of the product', not just for technical reasons. The development team even mobilizes other company areas to achieve its goals, such as marketing and customer support. Some respondents mentioned that team members are responsible for tracking the profitability of their products. Besides, the performance of members of the organization's agile teams is assessed by this criterion. One participant manager emphasized:

> "The important thing is for the [team] to deliver something that has value for the customer. If it's something that has value, it sells. It must be something that returns financially to the company. [Our company] has open management regarding financial figures, including for all team members. Everyone has access to the costs, revenues and profitability related to their teams. Teams are encouraged to create products that have value. Actually, it matters little if we are coding well and delivering a quality product if we end up with a product that doesn't sell" (P1, Case III).

Some participants commented on the autonomy that teams have to change the way they work, whenever necessary, to be more effective in value creation. Respondents also stressed the importance of the balance required for team member relocation management. On the one hand, reallocations can compromise business knowledge, reducing customer service quality or productivity. On the other hand, they can demotivate employees and make this commitment to product success unfeasible. In this sense, people management is considered fundamental to maintain the team's motivation and, consequently, its commitment to the product's success.

Team autonomy to propose technical solutions. In Group B, formed by organizations with less experience and agile adoption level, commitment to product success was not mentioned by focus group participants. In this context, the teams' autonomy to decide the product's direction is limited to the technical solutions (T11). The technical solutions usually include architectural decisions, usability, and functional aspects. According to Group B participants, the development team does not act directly in understanding the customer's problem, only the solution. For employees, participation in the solution is crucial because it ends up being more accurate. One product manager stated:

> "It was widespread for the customer, or the analysts themselves, to try to direct a solution to a problem. We always try to let the development team propose solutions to problems because they end up being more assertive (sic)" (P1, Case IV).

Steering committee-based prioritization. The prioritization by a management committee (T12) was another theme reported only in Group B. In this case, the team does not participate in prioritizing the features that will be implemented in the product, but a group formed by managers from various company areas. Eventually, a team member is invited to attend a committee meeting. Participants reinforced the team's interest and need to act on prioritization as well, but several organizational factors restrict them. As one participant commented:

> "We have been fighting to be able to participate more [in the prioritization of the product backlog]" (P4, Case IV).

Value guided working model. Some participants mentioned the value-oriented working model (T5), especially in Group A. Participants described organizations' concern with focusing on customer value from sending the business proposal to a potential customer to developing the product itself. They cited that the business proposals submitted do not set out a detailed scope of product solution, but rather professional profiles (competencies) that will understand the problem and later on designing and implementing the solution that will create the most customer value. As one software architect put it:

> "At the pre-sale time, we don't talk about a solution. The idea is to sell our customer our [value-oriented] execution model, because what really needs to be done can only be discovered later" (P5, Case I).

Functional requirements are also described in such a way as

to make the value for the associated customer explicit. As one senior manager stated:

> "The team writes requirements focusing on the problem and the expected result [in terms of customer value]. [...] If not, the team becomes a group of 'code scouts' and lose the connection with customer value generation" (P1, Case I).

Similarly, the product roadmap is structured with customer value in mind for each release of a new software release, not just describing functionality and delivery times.

Delivery management. The most referenced theme among the focus group participants' statements was delivery management (T6), as shown in **Table 17**. As described by respondents, delivery management refers to a set of software engineering and management activities aimed at ensuring software delivery within customer-agreed parameters. In the context of Software Engineering, participants reinforce the practice of detailing functional and non-functional requirements and are validated by the client before each short development cycle (sprint). Some call this detailing "grooming". Other respondents use standardized functional documents for software requirements. Requirements breakdowns tend to lead to rework and customer dissatisfaction. As some participants stated:

> "[Grooming] must occur well before [developmental onset] so that problems can be identified, and adjustments made" (P5, Case II).

> "If we don't spend time [detailing requirements], we will have problems when we start deployments" (P3, Case II).

Some participants also emphasized the importance of architectural and technological decisions in new products and services when considering the associated maintenance costs. One respondent stated:

> "If the architect designs a complex architectural solution for a product, or few people master it, when maintenance comes, the team will not be able to perform its work productively. [...] The point is to know how easy it will be to perform this work because it can impact customer satisfaction." (P7, Case III).

Participants also mentioned a set of practices adopted in the software development process to increase the quality of the end product. Examples of practices they mention include cross-testing, dedicated approval team, user experience improvement techniques, artifact and code review, coding standards, technical mastery, among other practices. In the management context, the importance of team participation in the preparation of effort and time estimates for product implementation was mentioned. One participant pointed out:

> "We no longer accept projects that are sold and that our teams did not perform in the estimates, otherwise it is impossible to work" (P6, Case V).

Some participants pointed out that during pre-sales, a staff is always required to improve planning and estimation effectiveness.

> "In case there are demands to be budgeted, we set up a pre-sales team with a delivery manager and technical specialists, such as software architects [...]. Structuring a proposal includes various activities, such as visiting the customer, understanding the problem, making an initial problem solution project, and other processes" (P2, Case II).

Deep knowledge of customer needs. Associated with the previous theme, the search for a deep understanding of customer needs (T9) was mentioned by the participants. One approach mentioned was journey mapping [68], as one participant stated:

> "The team needs to identify and focus on all product journeys" (P6, Case III).

Some participants also stated that teams do not reuse previous design solution patterns (such as architectural standards and usability standards) for new issues without first conducting a thorough analysis of customer needs. They also understand that technology is 'middle' and not 'the solution' in a product that delivers value to the customer.

> "If the team doesn't change its thinking, it can use whatever technology it has. I have seen, in practice, 'awesome' mindset teams, using old technology and producing high-value products for the customer" (P2, Case III).

Continuous collection of the feedbacks and communicating value to the customer. Continuous collection of internal and market product feedback (T10), when described by participants as the theme of strategy elements to increase customer value, refers to a set of feedback sources that provide the development team with a realistic assessment of different product perspectives. They mentioned interviewing customers who canceled the contract or product subscription, as well as collecting insights from internal team meetings (such as sales and support) and internal prereleases of new products or existing product versions. As one participant stated:

> "[the previous internal release of the product] has a fascinating effect. As the internal public has several areas, and each area has a particular interest in acting about to the product that will be launched, phrases like: 'I thought the product you were talking about also did this or that ...' are quickly brought to surface and understanding is aligned. When scope suggestions are relevant, they are considered by the team in future developments. There is also a clear alignment for the sales team, highlighting the product functionalities" (P3, Case III).

Some participants reported that employee interactions with the market, customers, and competitors, primarily through customer visits, pre-sales, and specialized conferences, are used to collect demands for new products, existing product enhancements, and technology trends. Also, feedback from the product deployment team to new customers is used to capture opportunities for improvement. This communication also occurs in the opposite direction. That is, on the one hand, if the internal and external exposure of the product is used to collect improvement feedbacks, it also acts as a means of disclosing customer value (T8). Some participants indicated that their teams communicate value to new customers,

especially in product sales, deployment, and training processes. One manager stated:

> "[Deployment] needs to clearly communicate the value that products deliver to customers" (P1, Case III).

Strategic customer impact. Participants also discussed the strategic impacts that software development can have on the client (T7). At this point, it may be possible to take a closer look at the implications of Grönroos' definition of customer value creation [5]. According to this definition, value creation is always made possible by a process by which the customer improves in some aspect, in this case, in the strategic scope. Participants reported that the more significant the contribution of the software developed to achieving the customer's strategic objectives, the higher the value to the customer. Some participants reported that the development team's work is not limited to coding software, but rather that the team works to collaboratively construct the client's strategic planning and its outcomes through various approaches such as Hoshin Kanri [69]. It was also indicated that the team also periodically monitors, through meetings of executive managers, the achievement of its clients' strategic objectives. As one participant stated:

> "Hoshin is the lean way to do strategic planning [...]. Among Hoshin's main objectives are: mapping the main problems of the client's organizational structure and value stream mapping of all areas of the company. During Hoshin, the focus of work is our client and his clients. The key outputs of Hoshin are the answers to some questions, such as what our client wants to be and why he is not yet what he would like to be" (P5, Case I).

The Objectives and Key Results (OKR) approach [70] is used to assist in managing the client's strategic objectives and benchmarking, as one respondent mentioned:

> "Customer Hoshin results are the business objectives for the next year, measurably described. Countermeasures are described in strategic OKRs that will deliver the defined business objectives to the customer. From the OKRs, the development team moves on to a design thinking or design sprint process, which will result in a list of assumptions and an MVP proposal, starting the product development itself" (P5, Case I).

As such, the product vision and critical experiences that address the customer's strategic objectives are elaborated and validated before product implementation. Other participants reported that they are not as close to the customer as when constructing strategic planning but seek to understand the client's strategic objectives and explore alternative solutions to achieve them. Before the start of development, the strategic objectives of customer demands are validated and guide the work of the development team. One participant reinforced:

> "The customer sees [our company] as the strategic partner and not as a supplier. A partner that will help you achieve your strategies [...]. In order to achieve this goal, the team's mindset must be oriented to do this. It is necessary [...] to transcribe the [strategic] understanding to something different than a simple [software] request" (P1, Case II).

2) RQ2: Factors that influence strategic adoption to create customer value in ASD

Based on the survey results, in Phase I, according to **Table 7** (Section IV.A.2), it was possible to identify some strategies frequently adopted by agile teams to increase customer value. However, the thematic analysis results identified previously reported elements of strategy, but their comments also disaggregated them to expose layers of complexities that the survey did not elucidate. For example, while the survey mentions that "prioritize development of the most valuable customer features and often validate them" (E1) is the most frequent strategy among agile teams, the focus groups identified that this could be implemented differently in different contexts. For example: in Group B of the case studies, formed by organizations with less experience and level of agile adoption, prioritization is usually conducted by customer representatives or by a management committee, with low involvement of the agile team, while in Group A, formed by companies with more significant experience and level of adoption of agile methods, there is a greater emphasis on processes of continuous experimentation supported by metrics to discover what increases the value for the client, with intense participation of the agile team. These nuances of strategy implementation can be seen in other themes of strategy elements described in Section IV.B.1.

This finding also corroborates the results obtained in Phase I of the study (Section IV.A.3), which identified that the organizational context has a more significant influence on adopting these strategies than the agile team's context. Therefore, some factors of the organizational context (time of agile experience, level of agile adoption, and size of the company) influence both the type of strategy adopted and variations in the same strategy.

3) RQ3: The barriers faced for the adoption of strategies to create customer value

Focus group participants discussed barriers to adopt strategies to increase customer value from the agile team point of view. **Table 18** presents the themes of the barriers present in the discussions, obtained after the codes of standards [30], [58]. Summary comments from participants are presented in this subsection. Full statements, which add context, appear in **Appendix C**, along with the demographic profile and the speaker's specific focus group.

Barrier	Description
B1: The customer does not accept ideal working model from the development team	The team is prevented or restricted from executing its software development approach, which they believe in creating more customer value.
B2: Lack of access to the strategic customer level	The team is prevented or restricted from accessing the customer from end to end, from business areas to decision-makers (executive level), when developing the software.
B3: Customer structure organized in silos	The team is prevented or restricted from creating more value for the customer when organized into departments (silos). These silos may end up not having a strong link with the company's business, each pursuing its local goals.
B4: Lack of maturity from the development	The team does not have the attitude or the mentality to look for ways to create

team	value for the customer when developing the product, limiting itself to coding it.
B5: Lack of competence or absence of product owner (PO)	The team is prevented or restricted by the product owner from making the best decisions about the product design due to its incompetence or absence.
B6: Unwilling customers and users to co-create solutions	The team is prevented or restricted from accessing customers' end-users or customers to apply techniques to co-create more valuable solutions.

Table 18. Barriers for the adoption of strategies.

In the exploratory survey of Phase I, as shown in **Table 7**, it was possible to identify some challenges for the strategies used by agile teams that seek to increase customer value. Focus group participants identified barriers to adopting of these strategies, some directly related to the results of this survey. However, their comments also brought new and complementary descriptions of this context, which the survey did not elucidate, and helped to understand some subtleties of the subject.

Most barriers to the adoption strategies are related to customer gaps. Only one of the six barriers is associated with the agile team: the lack of maturity (B4). For nearly 47% of survey respondents, gaining customer collaboration was one of the key challenges in using strategies. Focus group participants indicated that client collaboration does not occur because it does not accept the ideal working model suggested by the development team (B1). A scrum master stated:

> "[...] the main challenge is for the client to open up for us to work with our execution model. If the client doesn't want to work this way, it's complicated" (P6, Case I).

The introduction of the client work model is seen by some participants as hard work. Opposition to the ideal working model may be related to some factors: lack of customer time ("But it's always a fight to get time to implement these strategies [of our ideal working model] on customers"), the focus ("If the goal of the product owner or responsible manager at the customer is to deliver scope, there is not much to do, seeking to deliver value will be hard for the development team") and the customer's focus on deadlines or personal interests ("We work on a customer [...], where October and November are the delivery months - the delivery season. As this period approaches, everything needs to be delivered. These deadlines drive the product roadmap in development. They do so because it is the final period for calculating managers' goals and the profit-sharing program. Unfortunately, we need to deal with it.") Some participants even mentioned that there is a correlation between the motivation of the development team and the client's degree of collaboration, especially concerning the ideal work model recommended by the team. As one participant commented:

> "Here [at the company], we have an indicator called 'happy meter'. The indicator collects data from employees regarding satisfaction with their daily work. It is striking the relationship between the low happy-hour indices and the customer [development] teams that are more contestants, who don't let the [business] areas get involved, that is, who are more 'closed-door' to our [ideal] development process." (P1, Case III).

Participants also discussed other barriers that are also related to customer collaboration. Some participants reported the difficulty of executive-level access for clients (B2) to participate in and influence clients' strategic planning. As one participant described it:

> "If we don't have access to senior customer executives, vice presidents and CEOs, that are the people who have the autonomy to change corporate goals quickly, our operation with that customer will not go out of place. If we don't have access and strength to lower our execution model in business areas, we will be limited to delivering software and not delivering value through it." (P2, Case I).

Associated with the barrier to executive-level access may be the customer's structure organized in silos (B3), making it challenging to propose software solutions that add more customer value. As one participant stated:

> "If [the customer] is organized into departments, which in a way does not maintain a strong link with the company's business, each will have a life of its own and pursue its local goals. In lean theory, this scenario is called silos. In a silo-organized company, each department seeks local optimization but ends up not worrying about global optimization, that is, a typical large enterprise. It turns out that, in some cases, the value engineering [performed in conjunction with the customer] is biased toward seeking delivery of a combined scope internally [within the department] so as not to jeopardize the company's department manager's profit-sharing program." (P5, Case I).

Some participants also discussed other barriers to adopting strategies that are directly related to clients. They commented on the unwillingness of customers and their users to co-create solutions (B6). Respondents mentioned the lack of time and cost ("[...] because of time and cost, it's often a big challenge to access our customers' users [to co-create solutions]" and the uncertainties inherent in the development process. "In cases of initial [software] experimentation or validation when users are still unsure that it will be implemented, users complain of not seeing what they have helped materialize. This creates a lot of frustration and creates a barrier to new collaborations, not only in users but in that customer."). Some participants also talked about the barrier of the absence of the product owner.

> "It is not possible to continue using this strategy without product owner for a long time, because in the medium and long term, the damage to the product can be enormous. Today, without this role, we end up trying to assist all customers, all demands, and we can't say 'no', nor can we design a future for our product. If we add the lack of product owner with the current lack of metrics for product use, we have a complicated scenario to improve the delivery of value to customers." (P1, Case IV)

Other participants mentioned the lack of knowledge and personality in the performance of the product owner (B5). As one participant reported:

> "Large corporations have always had 'strong people'. Since these companies want to migrate their software development to the agile approach, rather than lay off a vast number of employees who would no longer have roles in the new approach, they end up allocating these 'strong people' as project product owners, since they have a good knowledge of the business. [...]

> however, acting as a product owner, there are skills gaps for them to perform the job satisfactorily. Even if they do not have the proper knowledge to act as a product owner, these 'strong people' do not give up on influencing product development, or they will eventually lose power over the business." (P2, Case II).

Another participant commented ironically:

> "[Our development teams] have to have strategies to report that the customer and [product owner] do not have a clear strategy for the product that will be developed, or everyone is at risk if they go the proposed route." (P1, Case II).

The lack of maturity in the development team can also be a barrier to adopting strategies to increase customer value (B4). This challenge was also highlighted by several survey respondents (35.2%), as some participants stated:

> "I, as a developer, do not see this concern in the team [about creating customer value]. We implemented the features, checked that they are working without defects, and go to the next development. Sometimes the team realizes the reverse of this, that prioritization was done wrong [creates no value], because the features are not used by our customer" (P5, Case IV).

> "It is a big challenge to change the mindset of developers to get closer to customers and understand the value of what they are developing. We don't want developers who get a requirement and quit coding. This alignment is difficult, but it is important and impactful in product delivery. Realizing value is much more important than receiving a requirement and coding it. Just coding for [our company] is still too little; successful products must be created" (P2, Case III).

V. Discussion and implications

In this mixed-method study, a diverse group of software development industry professionals, agile team members - including representatives of organizations of various sizes, distinct experiences with agile methodologies, and distributed across multiple Brazilian regions - exposed complex and differentiated set elements that constitute the strategies adopted by their teams to create customer value, as well as the factors and barriers that influence their adoption, which previous research has not elucidated. There are important implications for these results to software development companies, leaders, and agile team members. The composition of strategies is primarily related to (1) focus on customer value, an intentional emphasis on seeking to significantly improve the customer in some respect; (2) deep knowledge of the customer, a factual and measurable understanding of the issues that prevent the customer from being better; (3) autonomy, the skills to actively participate in decisions about the most appropriate solutions to customer problems. To date, there are no documented descriptions of these strategies in the literature, but the present study sheds light on their nature and influencing factors and barriers to their adoption.

A. Focus on Customer Value

The intentional emphasis of agile teams on creating customer value through their software products is evident from the results of this study as a key to achieving this goal. Most survey respondents in Phase I (61.5%) pointed out that defining what customer value is, is the main challenge to create value. However, not all agile teams act intentionally for this purpose. In the case studies analyzed, especially among Group A organizations, formed by companies with greater experience and level of adoption of agile methods, when the work models pointed to this focus, the teams acted to achieve this aim from the business process to the delivery of the product to the customer, with much more satisfactory reported results. In Group B companies, formed by organizations with less experience and agile adoption level, the performance of professionals is generally more focused on managing the delivery of functionality within the scope, and deadline criteria agreed with the client. Thus, "the team becomes a group of 'code digitizer' and loses its connection with customer value generation." However, delivery management is essential to any software development organization. In the survey, the strategy related to improving productivity and predictability of software development (S4) was indicated as being adopted by almost 60% of respondents, as well as the strategy related to project management efficiency (deadline, cost, and scope). (S5), which is used by 54% of respondents. Some agile teams go beyond this limit of delivery management by also focusing on value in order to increase customer value.

Focusing on customer value is not only a matter of intentionality but also of the scope of customer improvement. The goal of some agile teams is to improve the customer significantly. For example, when considering the possible levels of improvement that a software solution can bring to a customer (such as strategic, tactical, and operational), impacts at the strategic level are related to the customer organization's vision of the future. Overall, they tend to be far more significant than operational optimizations themselves. In cases I and II, both belonging to Group A, the issue of strategic scope was more emphasized. In Case II, the strategy elements were aimed at aligning software development with the client's business strategies. In Case I, the teams have sought to influence the client's strategic planning by acting as an active actor in the process, helping them to chart their business objectives and developments, and directing software solutions to maximize the client's business results. In the survey, just over 40% of respondents indicated making some strategic alignment between a client's software development projects (S11). In focus groups, it was possible to understand some subtleties in the implementations made by agile teams.

B. Deep Knowledge of Customer Needs

The results also indicated that in order to increase customer value in their software solutions, agile teams are required to adopt strategies that deepen understanding of customer needs. As mentioned, defining customer value is the main challenge in value creation. By definition, the value creation process aims to make the customer better off in some respect. Then nothing is more fundamental than the team seeking to understand with data and facts, rather than making assumptions, the contextual reality of the customer, and

devising ways to improve it. Here, the results indicated a broad set of elements that make up the strategies used by agile teams. The customer's direct involvement in the solution to be developed is often mentioned among focus group participants, which is a relevant foundation for the team to understand the customer's reality. Customer reality includes not only the client organization but also its customers and users.

Teams should view in-depth knowledge of customer needs as an incremental and continuous process. It is a knowledge that needs to be validated and measured so that the solutions are appropriate to the customer's reality. For this, continuous cycles of experimentation and learning are used, mainly by organizations with 100% of agile and more experienced teams regarding the adoption of the methodology (Group A). In the survey, 53% of respondents indicated using experimentation and learning cycles (S7) as a strategy. The idea is for the team to use short, continuous development cycles, which receive customer feedback on the parts of the software solution under construction and are tailored to suit the customer's needs as much as possible. Each software requirement is only a hypothesis, which needs to be substantiated by facts and data. In order for this customer knowledge process to be objectively and measurably evaluated, the companies studied employ metrics. This kind of experiment-driven approach to requirements [71] is also an emerging theme in Software Engineering research today. Most survey respondents (51.5%) mentioned using metrics related to product quality (for example, defect rate) and development process (such as rework rate and cycle time) to gauge customer value. These types of metrics tend to be shallow as to the purpose of the measurement. In Group B companies, formed by organizations with less experience and agile adoption level, this assessment is also performed by collecting feedback from various internal (such as commercial and support) and external sources, but in a qualitative format and not always in a structured manner. In Group A, metrics related to customer product use experience and metrics that seek to measure the impact on the customer organization resulting from the built product are used at all levels (operational, tactical, and strategic). Besides, some specific tools (such as Google Analytics and Adobe Analytics) are adopted to assist in this measurement process. These latter metrics appear to be more consistent in gauging how much the customer improved after the team-developed solution than the defect rate and cycle time metrics identified in Sub-phase 1 of the study. However, these metrics require professionals to have new skills and abilities but they are still poorly adopted by agile teams today [56].

C. Autonomy

From the evidence provided by the participants in this study, it can be stated that the autonomy of the development team to actively participate in decisions about the most appropriate solutions to customer problems is a crucial element in value creation. This autonomy does not strictly refer to a certain freedom of action, as it is also described as a sense of responsibility for delivering value, with which team members feel 'owners' of the product, not just for technical aspects of the product. The development team even mobilizes other areas of the company to achieve its goals, such as marketing, sales, and customer support.

Here again, it is possible to see a distinction between groups A and B organizations. In Group B, formed by organizations with less experience and agile adoption level, for example, prioritization is usually driven by customer representatives or a steering committee, with low involvement from the development team in decision making about the product. An immediate consequence in these contexts is the narrow focus of developers on product coding and little responsibility for customer improvement. In Group A, on the other hand, greater autonomy is given to the teams. For Group A organizations, it is not a single customer representative (such as a product owner), or a steering committee, that defines the direction of the product, but the development team, with active customer collaboration, that through processes continuous experimentation and specific metrics explore solution possibilities and validate what will really increase customer value. In some cases, such as the Case III, the responsibility for the profitability of the developed product is even attributed to the members of the development team. They are responsible for drawing up action plans to continuously optimize the results. Not only in Case III but just over 27% of survey respondents also indicated that their organizations use some measurement of the value generated for the customer of the teams with criteria in the organizational performance evaluations.

D. Barriers to Strategy Adoption to Create Customer Value

Based on the organizations studied, it was observed that to adopt strategies to create customer value is necessary to overcome some barriers. In addition to the inherent challenge of discovering what is value for the customer, mentioned earlier is, it is observed that the customer is not always willing to “collaborate” with this objective (however counterproductive this may seem). The client may not allow the team to execute its value-oriented work model, either for internal reasons or for not satisfactorily meeting the demands of the software development team. In the survey (Phase I), the main reason for not adopting strategies to increase customer value is the immaturity of the customer (57.1%). In some scenarios, cited by the focus group participants, access to the client's strategic levels is not released or there is no availability for the client and its users to be appropriately involved in co-creating high-value solutions. It is worth noting that the barriers mentioned, both in the survey (Phase I), and in the case study focus groups, express only the software development team’s point of view.

On the other hand, development teams may not have the maturity needed to focus on customer value. In some more limited cases, the developers' focus is restricted to coding features. In others, even though the team is aware of the emphasis on value, it may not have the necessary competencies and skills, such as, for example, the proper use of product success metrics or specific tools.

To gain more clarity about the barriers associated with adopting strategies to create customer value, it would be interesting to investigate the client's perspective during this

process. This complementary evidence could shed light on unknown problems and challenges for agile software development teams.

E. Implications for theory and practice

In Agile Software Development, few studies discuss the creation of value, considering observable processes and results, especially from the customer's perspective. For example, the approaches and techniques used in practice by agile teams and their impact on value creation receive little attention from research [12], [16]. The findings of this investigation shed light on the elements that make up the strategies used in agile teams today to create customer value, such as delivery management and metrics-driven development. The results indicated the strategies to create value are fundamentally related to the focus on value for the client, the deep knowledge of the client's needs, and the autonomy of the agile team. These strategies need to be considered, by leaders and members of agile teams, when seeking to improve their customers in some aspect. Possible explanations are also offered on how strategies for creating value for the client suffer from variations of adoption by agile teams depending on the organizational context, especially among companies with different levels of adoption and agile experience.

The findings suggest that companies may need to revise their metrics to monitor the results of value creation. The use of appropriate metrics directly influences the ability to measure results. The results indicate that most organizations use metrics of product quality and processes, as indicators of value creation for the customer. The finding corroborates the previous studies that reported the software industry's immaturity in effectively measuring customer value [13], [29]. On the other hand, metrics-driven development and continuous experimentation are used by some agile teams as a way of emphasizing, for everyone involved in product development, that value creation is a priority and needs to be monitored constantly. Being able to apply a value metrics-oriented process is challenging and, apparently, poses a problem for both the corporate level and the agile team. When a metrics-oriented process is applied, the results shown appear to be satisfactory. New research must be carried out to improve the understanding of the challenges for adopting a software development process-oriented to value metrics, considering the customers' perspective, as well as the skills and knowledge necessary to implement this type of strategy.

Agile teams must be aware of the influence and magnitude of the challenges of using strategies to create customer value. In the view of agile software development teams, as previously discussed, the challenges, for the most part, are directly related to gaps in the customers themselves. As pointed out in previous research [31], and confirmed by the results of this study, the understanding of what is value for the client presents itself as a “key” challenge. In addition, the lack of collaboration, availability, access to executives and users (and even the lack of competence), are examples of what teams find in their clients when they propose to create value. The client's resistance to executing the value-oriented work model has a disturbing effect on the teams, making it a particular challenge for managers and leaders. Managers and team members must learn to recognize the client's signs of difficulty or resistance and outline actions to mitigate the problem in both the team and the client. Clearer demonstrations of the pre-sale value-oriented work model can be useful in helping clients to align themselves with the team development process and obtain better results, as well as enabling the team to deal with the variability of freedom of each customer regarding the creation of value, implementing individual adaptations - and in the team to seek as much as possible - as far as possible, elements of the strategy that best adapt to the reality imposed by the customer. On the other hand, agile teams need to learn to adapt their work process to the challenges imposed by the environment and culture of their customers. The “ideal” working model proposed to serve a client is not always valid for others. Customer resistance to a value-oriented approach can have many causes, including the way the agile team interacts with its customer. Agile managers and team members must be aware of the difficulties faced in the relationship with the client and seek to adapt to the context of each client. Frequent and transparent communication can be useful in this learning process between the agile team and the client. Constantly remembering that the creation of customer value is the increase of the client's well-being [4] so that he improves in some aspect [5], can help ensure the agile team's work focus. Ultimately, who should be satisfied with the improvement provided by the software developed is the customer and not the agile team.

There are many possible directions for future research based on the results obtained. Identifying the effectiveness of strategies adopted in agile teams from the customer's perspective is a challenge, but it should not be overlooked. Research into the challenges of adopting a software development process geared to value metrics can help teams learn more about their own ability to create customer value. Team members must be instructed to understand and deal with the competencies and skills necessary for this purpose, in the same way, that researchers and companies must investigate appropriate strategies and tools for the coordination and monitoring of results. More research is needed to identify the links between the theoretical components of value creation, in order to establish clarifying cause-and-effect relationships that help improve this process in agile teams.

VI. Threats to validity

To mitigate the possible threats to the validity of the study, a set of mitigation strategies were adopted during its configuration and execution.

In Phase I, some mitigation recommendations by Yin [59] were considered. Construct validity is related to problems that may arise due to the inadequate design of the survey instrument, which may not be adequately measuring what to measure. This question is considered to have been mitigated since the questionnaire was designed interactively and updated by the authors based on results from the literature

and findings from Phase I of this work. Besides, five experts in agile methods validated the questionnaire for its integrity and readability, in addition to six other professionals participating in pre-test reporting feedback comments. Internal validity is concerned with questions, such as confounding factors or irrelevant respondents, which could introduce a systematic or biased error in the study results. Two measures were taken to mitigate this threat: (I) respondents were asked about their experience with agile methods to ensure that all respondents were agile practitioners (participants who responded that they have no experience with agile methods were disqualified from the survey); (II) the anonymity of the participants was ensured to avoid apprehension of the evaluation. External validity refers to the extent to which findings in a study are applicable outside the context of the study. As the sample used in this study was accidental, the results are only generalizable for the agile teams and companies that share similar characteristics to the teams and companies of the survey participants - as previously mentioned. However, a series of actions, such as advertising this survey on online forums and groups related to agile methods, as well as a snowball approach, were taken to obtain a broad representative sample of the target population. And finally, reliability refers to the effects on results when researchers perform data collection and analysis. In this study, only frequencies and percentages were used to explore strategies for creating customer or potential relationships for future research efforts. Also, only complete responses were considered for analysis, so incomplete responses were not subjected to any type of subsequent follow-up to increase the response rate.

In Phase II, aiming to mitigate the threats to validity, the recommendations of Lincoln and Guba [72] were adopted. They proposed four main characteristics that qualitative studies must observe: credibility, confirmability, reliability, and transferability. To provide credibility, well-established research methods were adopted, and familiarity with the processes of the organizations was sought through introductory workshops. Even though we used an objective sample of participants, we tried to include, among the participants in each focus group, a variety of profiles (for example, software developers, managers, and architects) and experiences, as well as having as many representatives as possible different teams from the organizations. The objective was to acquire a better knowledge of the group. Data from three different qualitative sources were also triangulated: observations from participants (workshops), documentation (process and commercial), and interviews (focus groups). Besides, quantitative data were used, through a web-based survey, to complement the understanding of the data already collected. The credibility of a thematic synthesis also considers how well the codes and themes cover the data, that is, no relevant data can be excluded, and no irrelevant data can be included without first a careful and systematic analysis [63] be done. The codes were analyzed and grouped systematically, considering several different companies and data sources. The data was frequently referenced to ensure that the codes were representative and to verify the relationship between codes and themes. Confirmation is concerned with the way the data obtained is encoded and classified and whether other researchers and experts would agree with the way that data was encoded and organized [72]. In this study, qualitative data were coded by the first author and validated by the second author. Coding disagreements were discussed and resolved by consensus. Reliability is concerned with the stability of the data, that is, the degree to which the data changes over time and the adjustments made in the researchers' decisions during the synthesis process [72]. Cruzes and Dybå [63] suggest, for this, complementary coding methods and establish an audit trail that would allow an external reviewer to verify the codification process. However, due to the non-disclosure agreements made with the companies participating in the research, it is not possible to make the details of the audit trail available to external researchers. Transferability seeks to ensure that discoveries can be transferred to other configurations or groups [63]. In this study, the selection process and the characteristics of each case were described to promote transferability, including the context, settings, data extraction, and synthesis process, in addition to verbal citations in the main findings.

VII. Conclusion

This work described how the strategies to create customer value are implemented in practice by the agile software development teams, involving hundreds of IT professionals in Brazil and five software companies. For this, a national survey and case studies in five organizations were combined, providing empirical evidence on research questions.

In this study, customer value was defined as “making the customer better off” [42], a definition taken from the perspective of the Business and Marketing areas, which has been studying this theme for decades. In this perspective, customer value means that, after being served by a value creation process, customers are or feel better than before. While agile methods, such as Extreme Programming and Scrum, propose to increase customer satisfaction through early and continuous deliveries of value software, the process of creating customer value does not appear to receive greater attention from researchers. The few existing studies do not address the core concept of value, focusing on more traditional concepts in the area of software development, such as the delivery of a product with an internal quality or with adequate usability.

The main contribution of this work is the general synthesis of the multiple aspects involved in creating customer value, placing agile software development as a job that requires a focus on value, a deep understanding of clients' needs, and the necessary autonomy of the team to outline the best strategies for this purpose, instead of being restricted to internal or external aspects of the product. The investigation made it possible to verify the relevance of creating customer value in companies that use agile methods, to understand their context of use and adopted metrics, in addition to describing the perceived challenges and benefits. In addition to the previous contribution and responding to RQ1, this research not only discusses the importance of creating customer value for agile teams but also verified it through a

survey in the Brazilian Information Technology sector. 378 responses were collected from professionals in 123 different software companies, showing that almost 90% of organizations claim to use one or more strategies to create value for their customers. Creating value for the customer is therefore an important issue when developing software products and services in companies. In addition to increasing satisfaction, companies seek to improve customer retention through these strategies. The main challenges are to define what is value for each customer and to obtain their collaboration. The most adopted metrics for creating customer are the number of defects per period and the amount of work in progress, which indicate a maturity gap while the ability to measure value for the client in agile teams. Companies reported a significant improvement in communication by using strategies to create value during software development, followed by increased customer satisfaction. As there is no similar evidence in previous research to contrast with the results obtained, this discovery opens a new direction for further research on value creation in agile teams.

Another important aspect obtained from the empirical results was the verification of the factors that influence the adoption of strategies to create value for the client in agile teams, which responded to RQ2. Based on the responses collected through a survey, a correlation analysis showed that there is a greater adoption of strategies to create customer value in agile teams that belong to organizations with a higher level of adoption and experience agile. The results of the analysis also showed that the factors of the team context, such as the type of product developed and the type of customer served, are not correlated with practically any specific strategy. The identification of these influencing factors can later help other teams, and the discovery allows for further research in this regard.

The barriers faced by agile teams to adopt strategies to create value for the client were analyzed, according to RQ3. Agile teams need to overcome several barriers so that they can implement a software development process that creates value for the customer. From the perspective of agile teams, most of the barriers are related to the client, especially the non-acceptance (or limitation) of a value-oriented work model. However, organizations need to train their teams to deal with the variability of freedom for each client in terms of value creation, aiming to seek, as much as possible, elements of the strategy that best fit the imposed reality. Organizations also need to learn to adapt to the context and culture of each client, allowing frequent and transparent communication, above all, understanding that the client, and not necessarily the agile team, must be satisfied with the improvement provided by the developed software.

In this work, the point of view of the agile team members was adopted to investigate the strategies for creating customer value. New empirical research is needed on the creation of value in agile teams and their barriers to adoption, considering the perspective of other roles involved, especially those of customers. New discoveries in this, also new, perspective can complement the knowledge presented in this thesis and help in the elaboration of new theories and hypotheses, as well as improve the current practices of software development in organizations.

As future work, it is also important to develop a conceptual framework (theory) for the study of the process of creating customer value in agile teams, allowing greater focus on the studies and a more in-depth discussion about the effective results [58]. The framework can include details about the factors that affect the customer value creation, and how the impact can be assessed, in order to establish clarifying cause-and-effect relationships that help to improve this process in agile teams. An evaluation of the theoretical model by action research studies can also bring relevant results to the area. Another possible direction for future research would be to assess the role of adaptability in influencing factors for adopting strategies to create value for the client. Changes in the business context and other demands for adaptability greatly influence the choice of strategies for creating value. Further research is needed to investigate the characteristics of the individual, team, and organizational adaptability that promote or hinder the use of these strategies. These studies can also characterize a time of adaptation for a team. Another interesting line for possible future work is the investigation of metrics that drive learning and changes in the process of creating customer value. Further studies are needed on how metrics can support learning and changes in the process of creating customer value in agile teams. The new research should investigate the challenges for adopting this type of metric during software development, as well as the skills and knowledge necessary for adoption, aiming to guide agile teams later. The association between the moments of adaptation of the team and the metrics of customer value can also be studied.

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