

What is Agile, Which Practices are Used, and Which Skills are Necessary According to Brazilian Professionals: Findings of an Initial Survey

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Abstract—According to changes in the concept of quality of software products in recent years and in the profiles of professionals and customers, more and more companies prioritize agility and quality of their deliveries in order to meet their demands. A new way to guide the development of projects, which is adapted to this recent reality, is becoming increasingly popular in the IT market around the world: Agile methods. To maximize the benefits of adopting agile methods, professionals need to well understand their concepts. The goal of this study is to identify the understanding that IT professionals located in some influential IT capital in Brazil have about such methods; how and which agile practices are being used in practice, and, finally, what are the main skills professionals need to work with such methods. A questionnaire-based survey was conducted and results show that: there is a strong evidence that professionals have a good understanding of the fundamental values of agile methods; Scrum and XP are the most popular methods; and behavioral and cultural factors have higher influence over the difficulty of adopting agile than technical factors.

Keywords—Agile Development, Agile Practices, Agile Skills, Brazilian IT Professionals, Survey.

I. INTRODUCTION

Agile methods have been gaining ground in the Information Technology (IT) market. These methods promise to assist self-manageable teams and to continuously add value to the customer. They are also less bureaucratic and more flexible to changes. Many companies are interested and looking forward to adopt them. To maximize the benefits of adopting these methods and having the organization innovating its work processes, however, IT professionals need to well understand their foundation and concepts.

Therefore, we designed a study organized in two main phases. In Phase 1, reported in [1], we aimed to initially explore what Brazilian IT professionals consider about agile methods. For instance, what they understand the concept of agile is, how they use it, and which skills they consider relevant for a professional using agile methods. Inspired on the findings from this interview-based exploratory study, we designed a

survey study (Phase 2), reported in this paper. Our survey aimed to provide a broader characterization of the Brazilian population, better expressing what the Brazilian market has to say about agile development.

Our survey was conducted from March to August, and had the participation of 173 professionals from several locations of Brazil. Respondents demonstrated that they grasp the main concepts about agile development; reported that Scrum and XP are the most used methods, and that self-management and communication are the most relevant skills a professional should have to work with agile methods. These results are presented and discussed in details in the next sections as follows: Section 2 presents related work. Section 3 motivates our study. Section 4 presents the research method. Section 5 reports on the findings while Section 6 introduces the limitations of our study and Section 7 discusses the results and concludes the paper.

II. RELATED WORK

Melo et al. [2] conducted a study to identify the state of the art on agile methods in Brazil in relation to teaching, research and practice in industry. To identify how these methods have been adopted in practice, the authors conducted a survey organized in two stages. First, it was distributed a quantitative questionnaire on the practice of agile methods in Brazil and then a qualitative study was conducted to give credibility to the data found in the first stage and also to serve as a basis for a better statistical analysis of the obtained data. The online questionnaire of the first stage was organized into 19 questions. The questionnaire remained open for six months. It total of 471 responses were obtained. The main reasons for adopting agile as reported by the respondents were: increased productivity (91%), managing the exchange of priorities (86%), and improve the quality of software (83%). Respondents also indicated the major concerns faced when adopting agile methods: lack of documentation, predictability, prior planning,

and control in management. Regarding the adopted practices and methods, their study indicated: Scrum (51.2%), Scrum and XP (22.5%), Lean (4.2%), Iteration Planning, Retrospective meeting, Test unit, Daily Meeting and Refactoring as the most frequently cited by the respondents. When investigating on causes that led to failure in the adoption of agile methods, the main responses were: lack of experience with agile methods (16.3%), culture/philosophy of the company at odds with the main agile values, external pressure to follow the traditional practices cascade, lack of PO and trained customers, low expectations of management, lack of scope and issues control to manage external dependencies (especially in non-agile teams). Other answers that stood out were: the ability to change the organizational culture (50.7%), availability of personnel with required skills (43.3%), general resistance to change (41.3%), adoption of institutionalized process in the organization, lack of discipline and belief in agile methods, interpersonal issues, and employee turnover.

In the second stage of their study, they conducted 7 semi-structured interviews in 7 different companies, seeking for different company sizes, locations, business areas, and level of experience of the interviewees with agile methods). As a result, they obtained the following data: Key methods and practices adopted were: XP, Scrum, Lean, Kanban, Unit Testing and TDD. Main advantages in adopting the mentioned methods were: more satisfied customers with short deliveries and added value and customer collaboration with the development process having a shared responsibility. Respondents revealed that social factors and the difficulty in employing long-term cultural change are the main causes that restrict the full adoption of the methods. In addition, some respondents highlighted the technical barriers such as, IT problems within projects that end up affecting greater adoption of agile practices such as: continuous development, automated builds and continuous integration, stating also that it is difficult to adopt practices such as refactoring. Having as the main future challenge, the action of involving agile values and principles in different contexts and implement the company's agility to take real advantage from the agile methods.

Rodríguez and colleagues [3] conducted a survey about the adoption of Agile and Lean in the Finnish software industry. The study aimed to identify: (i) what is the current stage of adoption of agile practices in the Finnish software industry, (ii) what are the reasons that lead to the adoption of such methods, (iii) the impacts in terms of the benefits of adopting such methods, (iv) what are the limitations and factors that can challenge their adoption, and (v) what are the reasons for not adopting agile methods. A total of 4,450 professionals were contacted and about 400 professionals, representing 200 different organizations, responded to the survey available online (response rate of approx. 9%). Results indicated that 60% of participating companies adopt agile methods (objective i). Among the main reasons for adopting the methods (ii), are the following factors: increased productivity (67%), increased product quality and service offered (62%), reduced development cycle time and time-to-market (58%), improving

the quality of the development process (48%), and increased ability to work with changes made to the requests (43%). Respondents indicated that the main expected benefits are (iii): improve team communication (50%), increased ability to work with changes made to the requests (50%), increased productivity (50%), improvement of the development process (49%), and improvement of the knowledge needed to develop work (49%). Among the factors that challenges the adoption of the methods (iv), the most frequently cited were: top management commitment (50%), collaboration between staff and client (48%), change of culture in the form of work (47%), and difficulty in measuring the success of the adoption of the methods (48%). Finally, the most cited reasons for the non-adoption of agile methods (v) were: lack of knowledge and training in the subject (47%), and traditional organizational culture (43%).

The annual survey developed by Version One seeks to identify the state of the art of adopting agile methods in the world. The 2011 edition (Version One 2011) found that 80% of 6,042 respondents work in companies using agile methods in some extent. Scrum was mentioned as the most widely adopted method (response rate of 53%), followed by the adoption of a mix of Scrum and XP (14%). They identified the practices of daily meetings (78%), planning Sprint (74%), and unit testing (70%) as the most frequently adopted by the companies.

Another interesting study was conducted at Microsoft [4]. The authors found that 32% of the organization's projects are adopting Agile, Scrum being the most adopted (65% of the population). Code standards and continuous integration practices were cited as the most adopted by the teams as peer programming and test-driven development (TDD) were cited as the least used.

III. MOTIVATION AND RESEARCH GOAL

Literature reports discrepancies between the adoption of agile methods in practice and their original theoretical proposals. For instance, companies decide to adopt agile methods and do it by simply introducing Scrum stand-up meetings in their traditional routines [5]. Heikkilä et al. [6] report that the average time to developing requirements in a large Scrum organization was considerably longer than the one proposed by Scrum [7]. While it is still to be found whether such discrepancies are harmful to the results produced by software organizations, we are interested to learn whether these divergences come from the lack of knowledge about what the core of agile theories propose.

This study main goal was to conduct an analysis of Brazilian market and IT professionals located in influential IT capitals, in order to have a better understanding of (i) how much they know about agile methods, (ii) how much of it is actually being used in practice, and (iii) if they are trained properly, having the specific characteristics and skills expected to work with such methods.

IV. RESEARCH METHOD

This research was organized in two phases: a qualitative investigation to explore the topic (Phase 1) and a quantitative phase to confirm and generalize the preliminary findings (Phase 2). Phase 1, reported in [1], aimed to collect initial insights on the topic. It is important to highlight that we did not aim to generalize the results, i.e., we do not claim that our preliminary findings characterize the behavior of the Brazilian market. They were indicative of what takes place in the referred market and also shed some light on what to investigate in a large-scale during next phase. In Phase 2, with the analysis of the results obtained from the questionnaire used in the first phase and using the studies of Melo et al. [2] and Rodríguez and colleagues [3] as inspiration, the quantitative questionnaire was prepared for large-scale application in order to confirm or not the conclusions reached in the previous step, thus providing a broader and more recent view of the Brazilian market regarding the topics of interest as expressed by our research questions, presented next.

A. Research Questions

The research questions for this study were as follows:

- *RQ.1. What is the understanding that IT professionals have about agile methods?*
- *RQ.2. Do IT professionals adopt agile methods in practice? If yes, which ones and which practices of each method?*
- *RQ.3. What are the skills considered necessary for IT professionals to adopt agile methods in their daily activities?*

B. Survey Design

This questionnaire has been prepared having the literature review and data gathered from Phase 1 as a reference. It also went through the review of three qualified specialists in the matter. During the preparation of the questionnaire it was carried out a detailed analysis of the survey in Finland [3]. It was identified that such research could not be fully replicated due to differences in objectives and in the job profiles to be investigated. However, it was possible to use some questions with minor adjustments, resulting in a similar questionnaire that meet our goals. In its final version, the quantitative questionnaire was organized into three separate job profiles, each according to professional experience in agile methods of respondents. These profiles been:

- (PP1) currently working with agile methods;
- (PP2) not currently working but have worked with agile methods in the past;
- (PP3) not currently working and have never worked with agile methods.

This research, for statistical purposes, was applied in Brazil without location constraints. The survey was released in software development association lists using the list of the Brazilian Computer Society, and social media such as LinkedIn and Facebook.

In this phase of the research we chose to do the analysis of the results categorized by research questions, linking each question of the questionnaire to a certain research question. In addition, there were additional questions in the questionnaire that would facilitate the understanding of the respondent background. These questions were categorized as "Other matters". Below follows the questionnaire questions, which we shorten to 'SQ' (survey question), organized by research question.

1) *RQ.1. What is the understanding that IT professionals have about agile methods to be aware whether it is appropriate for them to work using such methods?*

- SQ.5 & SQ.19: Which agile principles that are/were applied in the project in question? Rank their importance.

2) *RQ.2. Do IT professionals adopt agile methods in practice? If yes, which ones and how much of each?*

- SQ.1: Are you currently working with agile methods?
- SQ.4 & SQ.17: Which agile methods you adopt/adopted practice(s) or artifact(s) in your day-to-day work?
- SQ.6 & SQ.20: Which of the agile practices used/have been used in the project in question? Rank their frequency of use.
- SQ.7: What factors that challenges the adoption of agile methods? Classify the degree of difficulty associated with its adoption.
- SQ.8: How would you rate the impact of the following limitations associated with the adoption of agile methods in the project in question? Rank their importance.
- SQ.9: How the adoption of agile methods has affected/impacted in the following items of the project in question? Rank as was its improvement.
- SQ.14: What are the reasons why you are not adopting agile methods in the project in question?
- SQ.18: What were the reasons that made you/your team abandon the use of agile methods? Rank their importance.
- SQ.27: What is the level of adoption of agile methods in the company you work for?

3) *RQ.3. What are the skills considered necessary for IT professionals to adopt agile methods appropriately in their daily activities?*

- SQ.10 & SQ.21: From the personal skills listed below, which you deem important for IT professionals working with agile methods to have? Rank their importance.
- SQ.11 & SQ.22: Among the personal skills listed below, which ones are/were present among the project team members in question? Rank their importance.
- SQ.12 & SQ.23: Among the personal skills mentioned below, which ones do you believe are miss-

TABLE I
SURVEY QUESTIONS CATEGORIZED BY PROFILE STREAMS

Profile	Survey Questions	Total of Respondents
All streams	SQ.1	173
PP1	SQ.2, SQ.3, SQ.4, SQ.5, SQ.6, SQ.7, SQ.8, SQ.9, SQ.10, SQ.11, SQ.12, SQ.13, SQ.27	66
PP2	SQ.17, SQ.18, SQ.19, SQ.20, SQ.21, SQ.22, SQ.23	33
PP3	SQ.24	74
PP2 & PP3	SQ.14, SQ.15, SQ.16	107

ing/lacking among members of the project team in question?

4) Other Matters

- SQ.2: How long the project in question uses agile methods?
- SQ.3: How long have you participate/participated in this project?
- SQ.13: Would you like to stop working with agile methods?
- SQ.15: Which of the alternatives below are adopted today in the project in question?
- SQ.16: Have you worked with agile methods in the past?
- SQ.24: Do you plan to work with agile methods and agile practices in the future?
- SQ.28: What is the average duration in weeks, of an iteration/sprint in the project in question?
- SQ.32: How many projects do you work simultaneously?

5) Background

- SQ.29: What kind of company do you work for?
- SQ.30: How many employees does your company have?
- SQ.31: How many employees does the IT department in your company have?
- SQ.33: What is the typical size of a software development team that you work for?
- SQ.34: Where is your company allocated?
- SQ.35: What is the company's name?
- SQ.36: What is your age range?
- SQ.37: What is your highest education level?
- SQ.38: Which of the following roles best describes your current position?
- SQ.39: How many years of experience in software development do you have?
- SQ.40: How many years of experience with agile methods do you have?
- SQ.41: What state do you live?
- SQ.42: What city do you live?

Table I features the mapping of the survey questions by the three separate profile streams mentioned before with its respective number of respondents.

V. FINDINGS

For this phase of the study, 173 IT professionals participated (66 representing PP1, 33 representing PP2, and 74 representing PP3). Their distribution concentrates in: Porto Alegre, Rio de

TABLE II
SQ.5 & SQ.19: AGILE PRINCIPLES APPLIED IN THEIR PROJECT, RANKED RANKED BY IMPORTANCE AND VOTES.

Values	Extremely important	Very important	Important	Little importance	Unimportant
Value people and interactions over processes and tools	42	27	17	11	0
Prioritize working software over extensive documentation	40	24	21	10	0
Seek more customer collaboration over contract negotiation	40	27	21	5	1
Respond to changes over following a plan	33	37	23	2	2
Know the value of the product by the customer perception	36	36	19	4	1
Avoid work that does not add direct value to the customer	33	30	28	5	0
Seek continuous improvement	43	35	13	5	1
Prioritize oral communication among stakeholders	39	26	24	8	0
Seek simplicity in solving problems	32	47	14	3	0
Be transparent in work and communication with colleagues	46	35	12	3	0
Adapt to changes easily	40	38	16	2	1
Inspect the work of all team members	13	27	30	16	6
Limit work in progress	16	28	26	18	3

Janeiro, São Paulo, Minas Gerais, Amazonas, Pernambuco, Santa Catarina, Distrito Federal, Goiás, Paraná, Paraíba, Pará, Piauí, and Tocantins. The job that best represents the position of the respondents work led to a categorization into four areas of software development for demographic analysis: 28 are Managers; 69 are Software Developers; 17 are Quality Assurance Analysts; and 59 are working on other positions. Their educational levels vary between: Master (33), Specialization (38), and Undergraduate (91). From the respondents, 135 work in private companies, 28 in public companies, and 10 work in mixed capital companies. Regarding the average years of experience in IT they have: None (3), 0 to 2 year (21), 3 to 5 year (51), and more than 20 years of experience (16). In Phase 2 of the research, as mentioned before, we chose to do the analysis of the results categorized by research questions, linking each question of the questionnaire to it. Here follows our findings:

1) RQ.1. What is the understanding that IT professionals have about agile methods?

Survey questions 5 and 19 of the questionnaire were the only questions linked to RQ.1. Respondents recognized the importance of most listed agile principles, none of the agile principle listed was pointed as unimportant by more than 25% of respondents and mostly the principles were indicated as important to more than 85% of the respondents. From the 13 options representing agile principles, only 2: "Inspect the work of all team members" and "Limit work in progress" (34 respondents total) were identified with little importance. "Adapt to changes easily" was pointed as the most important for 94 respondents, considering "Extremely Important", "Very Important", and "Important" (see Table II).

2) RQ.2. Do IT professionals adopt agile methods in practice? If yes, which ones and which practices of each method?

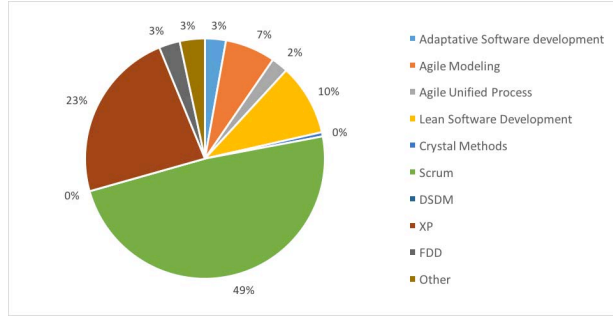


Fig. 1. SQ.4 & SQ.17: Agile methods or practice(s) adopted in their day-to-day work, and percentage of votes.

TABLE III
SQ.6 & SQ.20: AGILE PRACTICES USED IN THEIR PROJECT, RANKED BY USAGE AND NUMBER OF VOTES.

Agile Principles	Always	Usually	Sometimes	Rarely	Never
Backlog of the product	63	21	6	3	6
BDD	4	18	20	11	45
TDD	12	13	20	16	38
Short and frequently deliveries	46	32	9	6	5
Burndown chart	32	18	18	9	21
Continuous integration	33	25	10	11	20
Kanban	50	14	8	3	24
Release planning	39	38	12	3	7
Planning poker	32	15	16	10	26
Pair programming	7	16	35	20	21
Collective code ownership	25	31	22	7	14
Code refactoring	15	35	33	9	7
Sprint planning meeting	61	23	9	2	4
Sprint retrospective meeting	51	19	15	7	7
Sprint review meeting	46	23	12	11	7
Daily meetings	51	27	8	10	3
Scrum of scrum meetings	13	16	16	13	41
Test unit	29	23	16	18	12
Other	5	7	4	1	77

Survey questions 4 and 17 asked what were the agile methods adopted by professionals. The method named as most used by respondents was the Scrum, followed by XP, Lean and Agile Modeling (see Figure 1). It is important to note that Scrum has a much higher usage (49% of respondents using it) than XP (23% of respondents using it).

Survey questions 6 and 20 asked what agile practices professionals were using in their day-to-day work and how often (refer to Table III). Respondents mentioned "Sprint planning meeting" (93%), "Backlog of the product" (90%), and "Release planning" (89%) as the most frequently used.

Analyzing the factors that challenges the adoption of agile methods, the greatest obstacle pointed out by most of the respondents was a "cultural change" in the company. Factors such as "resistance to change" and "customer collaboration", were also cited as high difficult when adopting agile methods. On the other hand, technological and technical factors, such as: "Tools

TABLE IV
SQ.7: FACTORS THAT CHALLENGES THE ADOPTION OF AGILE METHODS, RANKED BY DIFFICULTY ASSOCIATED WITH ITS ADOPTION AND NUMBER OF VOTES.

Factors	Very High	High	Moderate	Low	Very Low
Steep learning curve	3	10	22	15	11
Need for specialized skills	4	12	25	12	9
Scalability of agile methods	3	13	23	11	6
Decreased predictability	4	15	23	13	7
Resistance to change	12	17	14	10	9
Customer collaboration	11	16	16	11	7
Tailoring agile practices	4	18	18	11	11
Synchronizing activities	5	17	16	13	9
Defining business value	7	17	16	15	3
Cultural change	15	23	14	4	6
Difficulties in translating agile principles from development teams to the rest of the business	8	17	12	11	6
Top management commitment	12	19	12	10	7
Measuring agile success	4	11	21	10	11
Fixed price contracts	8	19	13	6	4
Inappropriateness of existing technologies/tools	3	8	10	12	23
Inadequate documentation	6	10	26	10	9
Loss of management control	9	5	10	19	19
Lack of formal guidelines	3	10	12	11	20
Inadequate training	7	10	18	11	10
Difficulty of self-management	6	13	19	16	8
Other	2	5	3	2	0

and inappropriate technologies" and "Lack of formal guidelines" were indicated as low levels of challenge for the adoption of agile (see Table IV).

When asked about the impact that adoption of agile methods has caused in the project they were working, it was observed that most respondents pointed out positive impacts in the project, with improvements noted by more than 90% of the professionals, on items such as: "productivity", "ability to adapt to change", and "team communication" (see Table V). None of the listed items has been cited as a negative impact by more than 10% of respondents, representing a significant satisfaction with the results obtained using agile.

Those who do not adopt or who have abandoned the use of agile methods were asked about the reasons for the non-adoption or abandonment and the results indicated that the reasons for not using resemble the factors that challenges the adoption of the same, such as "cultural change", "Lack of knowledge and training" and "resistance to change" (see Figure 2).

- 3) *RQ.3. What are the skills considered necessary for IT professionals to adopt agile methods in their daily activities?*

Three questions were asked to the respondents about the skills to work with agile methods, namely: what personal skills are important for working with agile methods and their importance; from these personal skills, which were present and how important they were in the respondent's software development team; and finally, from the same personal skills which were lacking in the team.

TABLE V
SQ.9: HOW THE ADOPTION OF AGILE METHODS HAS
AFFECTED/IMPACTED IN THE FOLLOWING ITEMS OF THEIR PROJECT,
RANKED BY IMPACT AND NUMBER OF VOTES.

Impacts	Significant Improve- ment	Improvement	No Effect	Worst	Much Worst
Software Quality	29	27	7	2	0
Product Quality	28	28	7	1	0
Productivity	30	33	2	0	0
Cost Reduction	8	27	18	2	2
Time-to-market	19	21	12	2	0
Value creation	27	21	13	0	0
Ability to adapt to changes	24	37	3	1	0
Organizational transparency	21	19	17	0	0
Team communication	38	23	3	0	0
Learning and knowledge creation	28	28	6	1	0
Align between IT and business objectives	25	32	6	0	1
Reduced risks	16	31	12	3	0
Waste and excess activities	21	36	7	1	0
Stakeholder satisfaction	19	33	7	1	0
Customer understanding	17	31	13	3	0
Customer collaboration	19	32	11	1	0
Team collaboration	43	18	1	1	0
Other	2	2	3	0	0
Inadequate training	7	10	18	11	10
Difficulty of self-management	6	13	19	16	8
Other	2	5	3	2	0

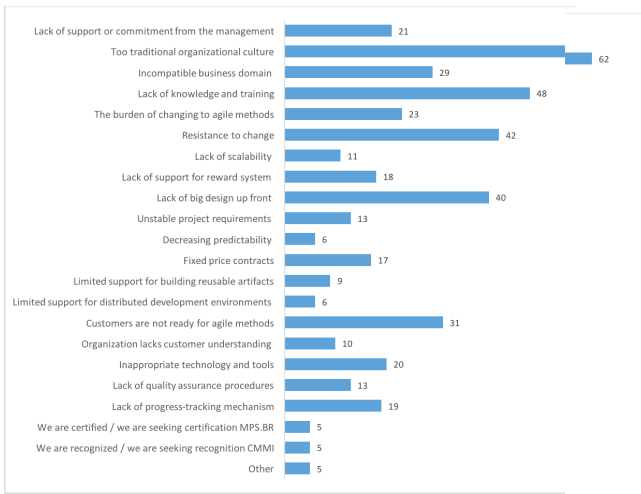


Fig. 2. SQ.14: Reasons why they are not adopting agile methods in their project, ranked by votes.

Survey questions 10 and 21 show that professionals believe that "mutual trust and respect", "communication", and "commitment" are the most important to work with agile methods. As for the survey questions 11 and 22 pointed out that the personal skills that was more present were "commitment" and "responsibility". The survey questions 12 and 23 which asked about what skills were lacking, respondents indicated as the main skill "Self-management" (see Figure 3). Based on their answers, it seems that professionals know which skills are needed to work with agile methods in line with the literature, as "Self-management" and "communication" skills are, according to the same, most appropriate skills. Even though these skills were not the most cited, they obtained a

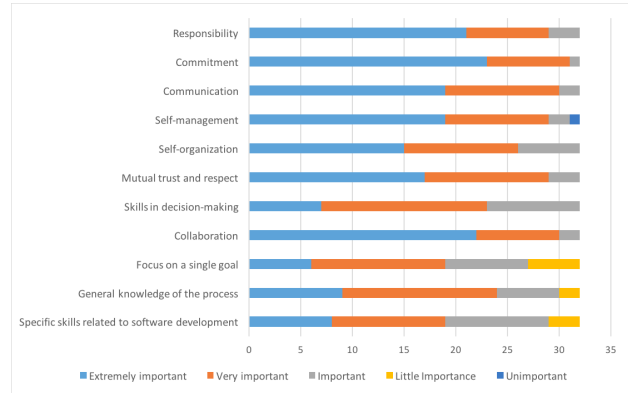


Fig. 3. SQ.10 & SQ.21: Which skills they deem important for IT professionals working with agile methods to have, ranked by importance and number of votes.

significant number of respondents confirming their importance.

VI. LIMITATIONS

As work limitations, we faced the following:

- Short term to conduct academic research: This work was developed as part of a course work of an undergraduate program in Computer Science. Due to the time stipulated by the schedule of completion of the course work (one year), we were bounded to perform literature review, design the study, and conducted the survey per se during this limited time. We performed each of the activities involved in the two phases of our study as closely together as possible to maximize the time for having the survey questionnaire open though.
- In the short time we had for data collection, we faced some challenges finding respondents in different states of Brazil due to the lack of a national-wise list of IT companies (like available in Finland and used by Rodríguez et al. [3] or local contacts in industry. Thus, we aimed for social media websites such as Facebook and LinkedIn, and also contacted professors who work with industry in several technological parks across the country. They shared our invitation and mediated contact with a large number of respondents.
- The chose to use Qualtrics¹ as the tool to put our online questionnaire up given that the University has an account free of cost to students. Despite the practical use this tool offers to control flow of questions and dependencies among them, the tool (or the account the University has) has some limitations as reported next:
 - Technical issues after a certain number of responses were in: Once 200 responses have been provided, despite the survey has been completed or not, the tool showed the inability to analyze the data dynamically. To prevent data loss, we replicate the questionnaire

¹<http://qualtrics.com>

in a second account and distributed the new questionnaire link again. The duplication allowed us to ensure data collection but hampered the analysis to a certain extent;

- Mandatory questions unanswered: Some alternatives of mandatory questions were not responded by a few respondents, suggesting that the tool has limitations as per imposing mandatory questions. We made a manual inspection on the gathered data and discarded incomplete answers from mandatory questions when applicable.

VII. DISCUSSION AND FINAL CONSIDERATIONS

Simplicity in the software development process, less hierarchy on institutions where the commitment for the product development is becoming more horizontal, more recognition of direct communication between people, including customer proximity in the process as a whole, enabling constant feedback and therefore less striking, are characteristics sought by agile methods and have been confirmed by the final results obtained in this study.

This paper presented the results of a research that aimed to identify: the understanding that Brazilian IT professionals, and consequently the IT market, have about agile methods; how much of practices related to these methods are being used in practice; and what are the main skills people need to work with such methods. The study was organized into two phases: an exploratory qualitative study and a confirmatory quantitative survey. In both phases, experts on agile development were consulted in advance to obtain feedback on the questions that would be presented to respondents, seeking to confirm whether the questions were appropriate for the achievement of expected results with the research.

In the first stage, reported in [1], a select group of specialists was chosen to answer a questionnaire with open questions, having a total of 24 respondents. This phase brought satisfactory results with respect to the basic understanding of the professionals interviewed about agile methods, use of agile practices in their day-to-day work, as well as skills they believe are necessary to work with such methods but there was a low quote of personal skills directly related to agile methods. In this second phase, we sought to confirm the data obtained in the first step by applying an empirical questionnaire with closed questions. At this stage were collected 173 responses, representing 13 states. As found in the first phase, there was a satisfactory outcome of the proposed research since we were able to confirm the data gathered in the first phase.

At this stage the agile practices used in day-to-day by these professionals were most exploited, as well as the skills they believe are necessary to work with agile methods finally reaching the initial objectives of the research in question. There are strong evidences that Brazilian professionals do have a good understanding of the philosophy behind agile and that they would be willing to adopt it on their daily work even knowing the the challenges for adoption. Also, evidences

shown that there's still room for the adoption and mentoring on how to better take advantages of some agile practices.

When comparing this study with the others mentioned in Section 2, it is worth noting that: (i) as found in research Melo et al. [2], Scrum was named as the most widely used method, followed by XP, in the Brazilian market; (ii) among the factors that challenge the adoption of agile methods, the most cited were "cultural change", "resistance to change", and "customer collaboration" which is in agreement with the results found by Melo et al. [2] and Rodríguez and colleagues [3]. (iii) Regarding the personal skills, respondents identified, in a satisfactory percentage, what are the key skills needed to work with agile methods such as "self-management" and "communication", as reported by the literature.

The key contribution of this research is to introduce to academy and industry an overview of how professionals are understanding and using Agile Methods in the Brazilian market today. What differs this from Melo et al [2] is that our study only focuses on the industry getting to know their point of view and what literature says it should be done/applied.

Our next step is to further analyze the data gathered trying to find patterns separated by professionals profiles. We want to better understand if there is any difference or similarity among them, among their genders or even their job positions. As a future work, we encourage the extension of our questionnaire to also include questions regarding scaled and distributed agile methods.

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