# Developers Motivation in Agile Teams

**Conference Paper** *in* Conference Proceedings of the EUROMICRO · September 2012

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2012 38th Euromicro Conference on Software Engineering and Advanced Applications

# Developers motivation in agile teams

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***Abstract*— A motivated individual is one of the cornerstones of agile software development. Although motivation has been recognized and studied in the software development field, little research has examined motivation in agile teams. Our study aims to provide a better understanding of what motivates software developers in agile environments. We conducted a systematic review of motivators in the agile context, classifying the results using the MOCC model of software engineers' motivation. Additionally, we performed three case studies in agile companies to both confirm our findings and gather new motivators. Our results suggest that motivation in the agile context is slightly different from the overall view of motivation in software development in general.**

***Keywords: Motivation, Agile software development, human factors, Systematic literature review, Multiple-case study***

## I. INTRODUCTION

Motivation is one of the most frequently cited causes of software development project failure [9]. In Software Engineering, motivation is reported to have the single largest impact on practitioner productivity and software quality management, and continues to be 'undermined' and problematic to manage [6]. The outcomes of motivated software developers are high quality work performance, retention, improvements in project delivery time, adherence to budget, and improved project success [23].

A motivated individual is one of the cornerstones of agile software development [8], explicitly mentioned as one of the twelve principles in the agile manifesto. This principle states: "Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done" [1]. Therefore, managing and fostering motivation is critical for maintaining such agile methodology premise.

Although motivation has been recognized and studied in the software development field, little research has examined motivation in agile team members. Since agile development has become mainstream in software development [26], an understanding of motivators could help manage agile teams more effectively.

Our study aims to provide a better understanding of what motivates developers in agile teams to perform better. To answer this question, we divided our research into two parts: (1) we systemically analyzed studies on software developer's motivation in the agile methods context, providing a comprehensive literature review and (2) we conducted an multiple-case study in three agile companies, both exploring and confirming motivators.

The paper is organized as follows: Section II presents the theoretical model we used to describe and analyze data throughout or research. Section III describes the overall research design. Section IV presents the results of the systematic literature review on motivation in agile teams and the results from case studies, and Section V discusses the main findings and implications. The last section concludes the paper and describes future work.

## II. RELATED WORK

Motivation refers to the initiation, direction, intensity, and persistence of behavior [23]. It is a soft factor, hard to quantify and it "often takes a back seat to other factors that might be less important but are easier to measure" [15]. Over the last 30 years, there have been several research efforts to understand and model motivation in software engineering [23]. However, much of this work has been isolated from classical motivation theory, leading to different nomenclatures and hampering the synthesis of existing findings.

To this end, Sharp et al. [23] present the MOCC model (Motivators, Outcomes, Characteristics and Context) to organize the knowledge about motivation in Software Engineering. The model was constructed from previous empirical evidence generated in Beecham's systematic review on motivators in software engineering. Figure 1 presents the MOCC model.

Motivators can be intrinsic (derived from the pleasure of doing the work itself) or extrinsic (related to factors external to the job, such as working conditions) [13], as shown in Figure 1. The motivators inherent to software engineering are all intrinsic factors as they solely relate to software engineering [23]. Software engineer's characteristics orientate the individual towards certain motivation factors, while motivators themselves influence the strength of individual characteristics. Characteristics of software engineers are influenced by contextual factors, most specifically the individual's personality and the environment in which they are practicing. Finally, there are many possible external signs or outcomes of motivated software engineers, such as productivity, adherence to budgets, low absenteeism and improved project success.

978-0-7695-4790-9/12 $26.00 © 2012 IEEE
DOI 10.1109/SEAA.2012.45

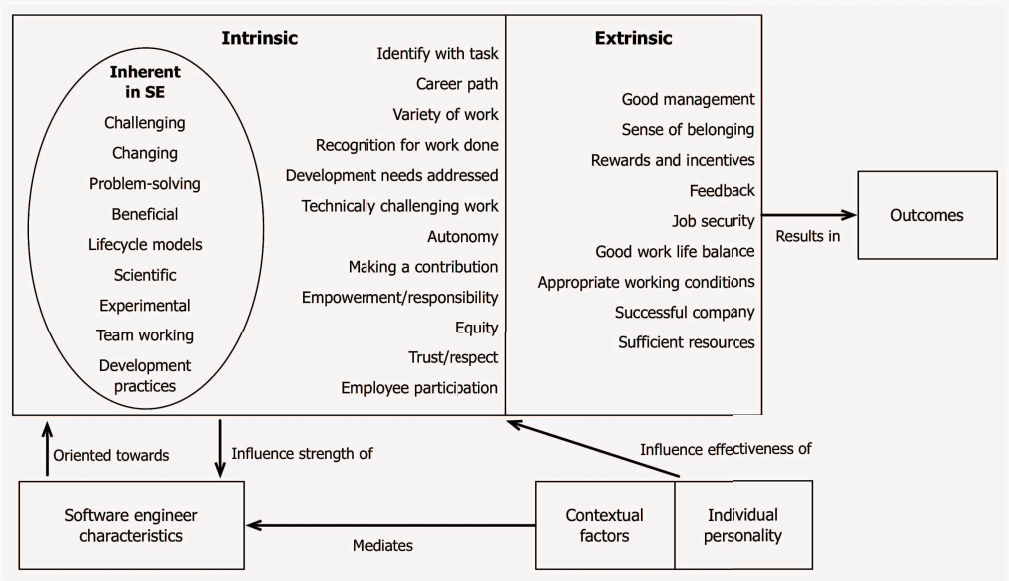


Figure 1. Motivators, Outcomes, Characteristics and Context (MOCC) of motivation in Software Engineering [23]

## III. RESEARCH METHOD.

We aim to answer the research question (RQ): ***"What (de)motivates Software Engineers in agile environments to be more (less) productive?"***. To answer our RQ, we divided our study into two phases[1].

**Phase I** aimed to identify motivators and demotivators in agile teams from the literature. We had to make a choice between perform a new systematic review or use results from available systematics reviews carried out by other researchers. We decided to reuse information from two systematic literature reviews on general software engineering motivators [6,10]. The last one is already an extension of the first, conducted by Beecham. Together, they answer the following research question: "What (de)motivates Software Engineers to be more (less) productive?", based on papers from 1980 to August 2010. We followed the same protocol, searching for studies from August, 2010 to August, 2011. Since we were interested only in agile teams (de)motivators, we thus added one more exclusion criterion removing all studies that were not conducted in agile environments.

Considering the results of those two systematic reviews, our data collection was performed in four steps:

- Filtering the results from Beecham [6] and França et al. [10] considering our new exclusion criterion[2];
- Extension of the Beecham's Protocol [4,6] to add our new exclusion criterion, covering the period from August 2010 to August 2011;
- Performing backward snowball from the selected papers, searching for additional references on agile motivators. The amount of papers found was small enough to allow this snowballing process.
- Extraction of motivators and demotivators from the final list of papers.

After the data collection, we classified each motivator or demotivator according to the intrinsic or extrinsic categories provided by the MOCC model (Figure 1). This process ensured the use of a common language to describe the motivators, since there are many terms and synonyms to describe them.

**Phase II** aimed to gather data regarding general motivators of agile team members in industry and also specific motivators related to the use of agile methods. We thus conducted a multiple-case study [28] in the Brazilian IT industry. This phase of our study is part of a broader study on performance factors in agile teams Throughout the research, we monitored key motivators and de-motivators in agile teams.

Our goals in this phase were three-fold: (1) to provide more empirical evidence on motivators in agile teams from industry; (2) to validate the MOCC model usefulness to analyze empirical data from case studies; and (3) to provide comparable results of motivators between the literature review we have provided in Phase I and the multiple-case study results.

The criteria for case selection included the following: (1) companies using agile methods (XP [3] or Scrum [24]) for at least two years; (2) companies in different business segments, geographical location, size, structure, and culture; (3) agile projects with at least four co-located developers and in progress for at least six months.

Data collection was carried out in three Brazilian companies, from September 2010 to February 2011. The unit of analysis is a set of three development projects, one in each company. We interviewed, mostly via face-to-face meetings, 18 team members within the 3 companies, including

[1] The detailed protocol is available at www.ime.usp.br/~claudia/motivation

[2] One of us (Santana, C.) also worked on the first extension of Beecham's systematic review [10].

developers, project managers, and product owners, also considering different experience profiles. The researcher informed all participants of the main research goal, but did not give further details, which could have biased their opinions on the research subject. We encouraged interviewees to talk about general motivators in the current project and company, as well as specific motivators in the agile environment.

We used thematic analysis to analyze the data, a technique for identifying, analyzing, and reporting patterns (or themes) found in qualitative data [7]. To reduce the data, we dissected the text into manageable and meaningful text segments using a coding framework. This is a common procedure in qualitative research. After all the text was coded, we went through the text segments in each code (or group of related codes) and extracted the salient, common, or significant themes in the coded text segments. We next went through the selected themes and refined them further into themes that are (i) specific enough to be discrete (nonrepetitive) and (ii) broad enough to encapsulate a set of ideas contained in numerous text segments [7].

Thematic analysis has limited interpretative power beyond mere description if it is not used within an existing conceptual framework [7]. We thus adopted the MOCC model [23], presented in Section II, to classify each theme we found. We use both *Motivators of software engineers* and *Motivational aspects of software engineering* to interpret our themes. We also filtered results by frequency, reporting just motivators with at least two related mentions. Finally, we assigned <NEW> when the motivator was new in comparison to the MOCC model.

### A. Companies and Projects Profiles

Company A is a large financial corporation with over 500 IT employees, which had previously used plan-driven development processes. The company managers decided to adopt agile methods to increase team productivity, and they have been using them for two years. The organizational structure and coordination are primarily vertical [11], where project managers usually implement coordination processes. Project 1 is a re-development of an existing system for the financial market involving several institutions. The project started in March 2010 and is estimated to last for approximately two years. The team adopted several XP [3] and Scrum [24] practices and used one-week iterations.

Company B has been delivering e-commerce and infrastructure services for over ten years and has used only agile methods to develop software. It employs approximately 120 developers. The organizational structure and coordination are primarily horizontal [11], where coordination processes are usually provided by an individual team member who communicates directly with other members or users on a one-to-one basis. Project 2 is a new development of an e-commerce service in a market with other competitors. The project also started in March 2010 but does not have a specific deadline, as they are developing software as a service, with continuous improvement and new functionalities. The project adopts several XP, Scrum, and Lean principles and practices.

Company C is an important player in Internet content and access provision in Brazil. The organizational structure and coordination are primarily vertical [11], but the hierarchy is smaller than Company 1. The IT department employs approximately 200 developers and had also previously used plan-driven development processes. They have applied agile methods since 2008. Project 3 is the maintenance of a recommendation system for products from several virtual stores. The project adopts mainly Scrum practices and some XP and Lean principles and practices. Table I summarizes the companies and projects profiles, describing part of their context.

TABLE I. COMPANIES AND PROJECT PROFILES

| | ***Company A*** | ***Company B*** | ***Company C*** |
|---|---|---|---|
| **IT Size** | 400 | 120 | 200 |
| **Project focus** | Re-development project: Financial system | Product development: E-commerce service | Product development: Recommendation system |
| **Method** | Scrum + XP | Lean + Scrum + XP | Scrum |
| **Experience with agile methods** | 2 years | 10 years | 2.5 years |
| **# Interviews** | 3 full-time developers, 1 part-time developer, 2 product owners, 1 scrum master, 1 project manager **Total = 8** | 1 project manager/ coach, 1 product owner, 3 developers **Total = 5** | 3 full-time developers, 1 QA, 1 webmaster, 1 scrum master **Total = 5** |

## IV. RESULTS

We describe below results from the systematic review and the multiple-case studies, focusing on answering our RQ posed in Section III.

### A. Results of the Systematic Review

At the end of the first step (filtering), we selected 7 studies [5, 8, 15, 17, 18, 20, 25]. After the snowballing phase, 5 more studies were included [2, 14, 19, 21, 27]. Thus, we found and analyzed twelve papers. Table II presents the overall result after the four steps of our systematic review. Due to space limitations, we present here a summary of the results obtained from our review.

The highlight finding is the fact that working with agile development motivates the developers themselves. Table II shows that *Software process/lifecycle* is cited as motivator by seven authors. Conversely, one study reported evidence on the lack of confidence in agile methods [8] as a demotivator. In fact, some selected studies [15, 18, 20, 25] just provide this (de)motivator as a result. Unfortunately, they did not provide an in-depth exploration, which would allow the extracting of underlying reasons on why software engineers found the agile lifecycle a (de)motivator.

*Teamwork* is cited as motivator by 4 papers, while one

TABLE II. MOTIVATORS OF AGILE INDIVIDUALS FOUND IN THE LITERATURE

| *General motivators* | *Motivators in agile development* | *Demotivators in agile development.* |
|---|---|---|
| Autonomy | [14] | |
| Changing | | [5] |
| Development Needs Addressed (e.g. training opportunities to widen skills; opportunity to specialize) | [5], [17] | |
| Feedback | [27] | |
| Good Management (senior management support, team-building, good communication) | [5], [14], [19] | |
| Work/life balance (flexibility in work times, caring manager/employer, work location) | | [17] |
| Identify with Task (clear goals, personal interest, know purpose of task, how it fits in with whole, job satisfaction; producing identifiable piece of quality work) | [2], [21] | [17] |
| Software process/lifecycle (software development, project initiation and feasibility studies, and maintenance) | [5], [14], [15], [18], [20], [25], [27] | [8] |
| Problem Solving | [14] | |
| Recognition of work done (for a high quality, good job done based on objective criteria) | [2] | [17] |
| Rewards and incentives (e.g. scope for increased pay and benefits linked to performance) | | [5] |
| Sense of belonging/supportive relationships | | [5] |
| Teamwork | [5], [14], [17], [27] | [14] |
| Variety of Work | [17] | |

author finds problems when the couple in pair programming has conflicting personalities. *Good Management* is cited 3 times as motivator due to the open communication and workload balance in agile projects.

Agile practices were not explicitly cited as a (de)motivator factor. Instead, they were related to many motivators, such as pair programming supporting learning (*Development Needs Addressed)* and team momentum (*Teamwork*). Other practiceswere cited as support for motivators such as code sharing, sustainable pace and self-management.

Our results are different from those published by Beecham et al. [6] and França et al. [10] in terms of number of citations. While *Identify with task* and *Good Self Image* were the most cited motivators in [6] and [10] respectively, *Software process/lifecycle* was the most cited motivator factor in our study. Other aspect is about the quality assessment [4]. Using the same quality criteria proposed by Beecham [4], seven papers present low quality, while three present excellent quality and reliability on the research.

### *B. General Motivators in Agile Teams*

During the data analysis, we identified 33 general motivators in the three agile companies. We organized them into patterns and then classified using the MOCC model [23], seeking to standardize the description of each motivator using a common language. Finally, 11 motivators emerged from data as general motivators in agile teams, as shown in Table III. We ranked the motivators by their relative frequency in the results. The most frequent general motivator we found is *technically challenging work* (M1), in which work is not mundane and is technically challenging [12]. Despite being the most frequent motivator, it is definitively stronger in Company A. It is hard to precisely define the reasons for this specific result. However, considering the company context, there are some clues. First, the project in Company A involves many other financial institutions and it is the first agile project adopting the technology of automated acceptance tests instead of conventional document-based requirements specification. The project is a priority for the company and the system has to interact with many legacy systems. This challenge probably provided special motivation for team members. Another consideration is that many team members we interviewed in Company A are new in the Company, or at least new in the business unit, which may provide more technical challenges. This also might explain why *Problem solving* (M11) appeared only in Company A.

*Team working* (M2), *Identify with the task* (M3), *Employee participation/involvement/working with others* (M4), and *Development needs addressed* (M6) are motivators mentioned at least thrice. Except *team working* (M2) and *Development practices* (M10), all of them are motivators not inherent to Software Engineering. They are intrinsic motivators related more generally to the work. Just one of them, *Good work/life balance* (M9), is an extrinsic motivator. Therefore, it seems that intrinsic motivators not necessarily related to Software Engineering are the most important motivators on the studied agile teams.

Only one motivator appeared in the three companies: *Development needs addressed* (M6). It is described as existence of training opportunities to widen skills and opportunity to specialize [23]. The interviewees stated knowledge sharing and high level discussions as the concrete path for specialization and training. Agile development promotes intensive communication as a way to foster knowledge sharing and team building. Another issue

TABLE III. CROSS-CASE ANALYSIS OF GENERAL MOTIVATORS IN AGILE TEAMS

| General Motivators | | Company A | Company B | Company C |
|---|---|---|---|---|
| M1 | Technically challenging work | ●●●● | ● | |
| M2 | Team working | ● | ●● | |
| M3 | Identify with the task (clear goals, personal interest, know purpose of task, how it fits in with whole, job satisfaction; producing identifiable piece of quality work) | ●●● | | |
| M4 | Employee participation/involvement/working with others | ●● | | ● |
| M5 | Working in a sucessful product | | ● | ●● |
| M6 | Development needs addressed (e.g. training opportunities to widen skills; opportunity | ● | ● | ● |
| M7 | Autonomy | ● | | ● |
| M8 | Equity | ● | | ● |
| M9 | Good Work/life balance (flexibility in work times, caring manager/employer, work location) | ● | | ● |
| M10 | Development practices (object oriented, XP and prototyping practices) | ● | ● | |
| M11 | Problem solving (the process of understanding and solving a problem in programming terms) | ●● | | |

mentioned was the company's know how as a good way to specialize. This is a company's intangible asset or intellectual capital that goes beyond the agile team.

During the motivators classification, we decided to describe a new motivator *Working in a successful product* (M5), not present in the MOCC model. In fact, the model describes a similar motivator named as "working in a successful company" [23]. In our results, interviewees were not only proud to work in a successful product, but also demonstrated a strong commitment to the product performance in the market. If the product goes well, team members feel motivated. If a rival product threatened their product in the market, they behave competitively. Thus, we noticed an impressive alignment between agile team members and companies' business goals, which give them a new motivator. This result appeared in Companies B and C only, which is somewhat expected, since Company A was not developing a product.

We noticed similarities between Companies A and C regarding motivators possibly related to the companies' organizational structure. *Employee participation/ involvement / working with others* (M4), *Autonomy* (M7), and *Equity* (M8) emerged as motivators just in these two primarily vertical, hierarchical companies. These motivators seem to be promoted because of the agile team arrangement, since vertical structures are well-known inhibitors of strong involvement between employees, also limiting equity and autonomy [11]. Both companies were previously organized to segregate teams by their specialization. Now, the employees are working in *whole teams* [3], i.e., agile teams with all skills and functionalities needed for creating the product (developers, testers, designers, technical writers, and customers). In contrast to their previous experience, this new organization seems to be a great and noticeable motivator. Those motivators did not appear in Company B, whose structure is horizontal and which embraces agile methods longer than the others.

Finally, one development practice – *whole team* – was mentioned as a motivator in Companies A and B. The practice emerged without any specific question regarding agile methods, it appears in the context of general motivators. We believe that, in Company A, this motivator is related to the company structure (as mentioned before). Company B had just hired specialists in user experience (or user interface/UI), solving existent problems in the project. Thus, the team feels comfortable to deliver better software, because they had the needed capability.

### C. Agile development influence on Motivation

We identified 38 motivators in the three agile companies, and classified them using the MOCC model [23]. Finally, 9 motivators emerged from data as specific agile methos motivators in teams, as shown in Table IV. We called 'agile motivator' to stress that those motivators are originated from the question "What does motivate you in agile software development"? An immediate consequence of this question is that all subsequent motivators will be strongly related to two MOCC motivators - Software process/lifecycle and Development practices.

The most frequent agile motivator is *Feeling of progress/accomplishment (AM1)*, which is the individual perception of goal achievement, without any formal recognition. This factor is not present in the MOCC model. In the three studied companies, the interviewees mentioned such feeling as an important motivator when using agile methods. Frequent deploys based on frequent prioritized requirements, daily tasks performed in pairs, visibility of project progress through tracking, and responding to changes were the specific agile practices mentioned in the context of the feeling of progress/accomplishment. An interesting and surprising result is that most agile motivators appeared just in Company A. Despite the fact we interviewed more team members there, we notice that many agile motivators seem to be a reaction to the highly vertical and bureaucratic environment in the company. *Lack of bureaucracy in the*

TABLE IV. CROSS-CASE ANALYSIS OF SPECIFIC AGILE DEVELOPMENT MOTIVATORS IN AGILE TEAMS

| Motivators | | Company A | Company B | Company C |
|---|---|---|---|---|
| AM1 | <NEW> Feeling of progress/accomplishment | ●●●● | ● | ●●● |
| AM2 | Development needs addressed (e.g. training opportunities to widen skills; opportunity) | ●● | | ●● |
| AM3 | <NEW> Lack of bureaucracy in the development process | ●● | | ● |
| AM4 | Technically challenging work | ● | | ● |
| AM5 | Good management (senior management support, team-building, good communication) | ●● | | |
| AM6 | Feedback (from the job, from supervisors, on goal accomplishment) | ●● | | |
| AM7 | Employee participation/involvement/working with others | ●● | | |
| AM8 | Experiment (trying something new, experimentation in order to gain experience) | | | ●● |
| AM9 | <NEW> Elimination of waste (e.g., Automated acceptance tests as executable requirements, don't have to execute tests manually all the time) | ●● | | |

*development process (AM3)* (new factor not present in the MOCC model)*, Good management (AM5), Feedback (AM6), Employee participation (AM7)* are examples of agile motivators that predominate in Company A.

Agile practices appeared addressing developer needs (AM2) of specialization and training. Team members highlighted the constant learning and knowledge sharing due to the adoption of the methodology. The result occurred in Companies A and C, both with specialized and separated teams in the past. Thus, agile practices helped the companies to overcome organizational silos, providing an environment for cross fertilization of knowledge.

Another new motivator we found is *Elimination of waste* (AM9), which is the use of practices that foster efficiency. An example is the use of automated acceptance tests as executable requirements, saving time of specification and test execution. The result appeared in Company A, the only company that fully adopted automated acceptance tests. Surprisingly, Company B – that adopts Lean concepts – did not mention any motivator related to waste – an important principle in Lean Software Development [22].

Finally, Company B did not mention motivators specifically related to agile practices. We noticed, in the study, that most interviewees never worked before with another methodology. Thus, it seems that agile methods motivates more the team members that experienced other methodologies before, making possible a comparison between them. This process possibly leads to an increased motivation (in many dimensions), as shown on Table IV in Companies A and C.

During the data analysis, we observed a relationship between technical agile practices, such as Acceptance automated tests and Pair programming, and some motivators (both from the MOCC model or from new motivators we found). Figure 2 shows a Kiviat chart with the relationship between agile practices identified as motivators and their underlying motivation factor. *Acceptance automated tests* are related to five different motivators: *Elimination of waste, Lack of bureaucracy, Technically challenging work, Identify with the task*, and *Experiment*. The last three ones are strongly related to the adoption of a new practice, leading to challenges, experimentation in order to gain experience and, lastly, providing a perceptible gain in the quality of work (identify with the task). Finally, *Pair programming* is related to *Change, Feeling of accomplishment/progress,* and *Development practices in general* (when the practice itself is mentioned as a motivator).

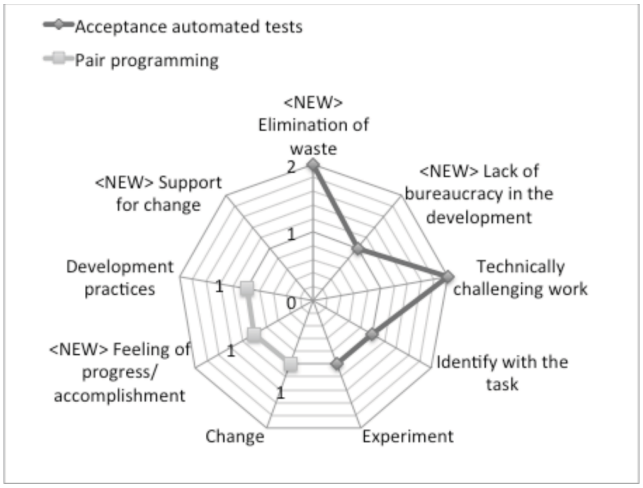


Figure 2. Underlying motivators of agile technical practices

## V. DISCUSSION

Our results from the systematic literature review on agile motivators, considering the number of citations, are partially different from Beecham et al.'s results on software engineers' motivation [6]. In our systematic review the most cited motivators of agile practitioners were: (1) Using Agile Methods and (2) Teamwork, while Beecham [6] states: (1) Identify with Task and (2) Employee participation involvement or working with others. This evidence suggests that the most noticed motivators are different for agile projects and for software engineering in general. However, due to the limited number of studies found (12) and their quality, this assertion should be better investigated in the future.

Based in our systematic review results, we did not find any study focused on general motivators in agile teams. We

believe that our case studies are the first ones. We aimed to understand motivation from a general point of view, not only asking specifically about agile methods. We believe this protocol is more likely to generate unbiased motivators regarding agile teams.

We found 11 general motivators in the case studies. 5 motivators confirm our systematic literature review: Team working (M2), Identify with the task (M3), Development needs addressed (M6), Autonomy (M7), and Problem Solving (M11). These motivators, therefore, are strong in agile teams. We also found 9 agile motivators, 3 of them confirmed the review results: Development needs addressed (AM2), Good management (AM5), and Feedback (AM6). The strongest result, therefore, is that agile methods address development needs of specialization and training (M6/AM2), since we found it twice in our case studies, and also in the review.

7 motivators emerged only in our case studies; we did not find them in our systematic literature review. They are: Technically challenging work (M1), Employee participation /involvement/working with others (M4), Equity (M8), Development practices (M10), Technically challenging work (AM4), Employee participation / involvement / working with others (AM7), and Experiment (AM8). Our results suggest that those motivators are also important for agile teams and should be further investigated.

In addition, we found 4 new motivators in our case studies: Working in a product that is successful (M5), Feeling of progress/accomplishment (AM1), Lack of bureaucracy in the development process (AM3), and Elimination of waste (AM9). They denote that agile development not only helps on a better alignment between IT and business (M5), but it increases the sense of contribution (AM1) and supports process improvement (AM3 and AM5). All of them motivate the team members. It is important to note that *waste* is the term used by team members during the interviews. It is not necessarily related to the Lean development concept.

We found that agile teams have Good Work/life balance (M9), considered as a motivator. Conversely, McHugh et al. [17] found that teams feel stressed due to the frenetic pace of agile work, having to always deliver every day and sometimes working overtime when the pressure is very intense. Thus, there are variables influencing teams to consider or not agile methods good providers of life balance. Comparing our companies' profiles to McHugh's companies, the major difference that may explain the opposite results is the Length of time since agile implementation. Our teams are, at least, 2-year experienced on agile, while McHugh's are between 9 months and 2 years. Thus, experience in using agile may bring the balance needed to foster motivation. However, this should be better investigated in future studies.

### A. Limitations

This study has some limitations, which exist in any research project. Considering the Systematic Review, the decision about reusing results of available Systematic Reviews and also being more restrictive since we added more exclusion criterion, may cause a loss of context of the whole research. In our snowballing process, we found 5 new papers from which four of them [2,14,1 9, 21] where not considered in the original Beecham's systematic review [6], while the paper [27] did not appear in França's [10] extension. We do not know if they were not returned or even discarded by the researchers.

Qualitative findings are highly context- and case-dependent. To promote credibility, we adopted well established research methods and developed an early familiarity with the organizations culture through preliminary visits. Although we have used a purposive sampling of informants, we tried to include as many participants as possible from each team, considering similarities, dissimilarities, redundancies, and varieties to acquire greater knowledge of the wider group.

Despite the cases were carried out only in Brazil, we believe that our results can be used in the future for comparison with other countries. To promote transferability, we described the selection and characteristics of each case, including context and settings, data extraction, and the synthesis process.

## VI. CONCLUSION

Agile development emphasizes the importance of the human aspects of developers [12]. Managing developer motivation has become critical to achieve successful agile projects. Motivation is, however, a complex topic, little studied in the agile development field. Our contribution was to provide a synthesis of the state of the art of motivators in agile teams, through a systematic review. We also provided results from a multiple-case study on motivation factors in three Brazilian agile companies.

Our results suggest that motivation in the agile context is slightly different from the general view of motivation in software development. Some motivators become more important in agile teams, as well as new motivators emerge. We also noticed the importance of the context to establish a cause-effect relationship between agility and motivation. We call for research focused on a better description of context variables that capture relevant information to support motivation analysis in light of theoretical models. Finally, we found a relationship between past experience and motivation. Agile development seems to be more motivating for teams that worked before with other methods. We aim to better explore this finding in future studies.

## ACKNOWLEDGMENT

We thank the companies and their employees for their contribution to this project. This research is supported by FAPESP, Brazil, proc. 2009/10338-3, and CNPq, Brazil, proc. 76661/2010-2.

## REFERENCES


[1] Agile Manifesto, "Agile manifesto", available in http://www.agilemanifesto.org, 2001. Last visit 02-02-2012.

[2] Asproni, G. "Motivation, Teamwork, and Agile Development," Agile Times, vol. 4, Feb. 2004, pp. 8-15.

[3] Beck, K. and Andres, C. "Extreme Programming Explained : Embrace Change" 2nd Edition. Addison-Wesley Professional. 2004.

[4] Beecham, S., Baddoo, N., Hall, T., Robinson, H. and Sharp H. "Protocol of a Systematic Literature Review of Motivation in Software Engineering," Tech. Report No. 452, Faculty of Eng.and Information Sciences, University of Hertfordshire. 2006.

[5] Beecham, S., Sharp H., Baddoo, N., Hall, T and Robinson H. "Does the XP environment meet the motivational needs of the Software Developer? An Empirical Study," Proc. of Agile 2007, IEEE Computer Society Press, pp 37-45.

[6] Beecham, S., Baddoo, N., Hall, T., Robinson, H. and Sharp, H. "Motivation in software engineering: A systematic literature review," Inform. Softw. Technol., vol. 50, no. 9-10, pp. 860–878, 2008.

[7] Boyatzis, R. E., "Transforming qualitative information: thematic analysis and code development," Sage Publications. 1998.

[8] Conboy, K., Coyle, S., Xiaofeng W. and Pikkarainen, M. "People over Process: Key Challenges in Agile Development," Software, IEEE, vol.28(4), pp.48-57, July-Aug. 2011.

[9] Demarco, T. and Lister, T., Peopleware – Productive Projects and Teams, Dorset House, 1999.

[10] França, A. C. C. and Gouveia, T. B. and Santos, P. C. F. and Santana, C. and da Silva, F. Q. B. "Motivation in software engineering: A systematic review update," Evaluation & Assessment in Software Engineering (EASE), 15th Annual Conference, pp.154-163, 11-12 April 2011.

[11] Galbraith, J. R., "Designing Complex Organizations," 1st Edition.Addison-Wesley Longman Publishing Co., Inc., Boston, MA, USA. 1973.

[12] Tracy, H., Sharp H., Beecham, S., Baddoo, N. and Robinson H. "What Do We Know about Developer Motivation?" IEEE Software, Vol. 25(4). IEEE Computer Society Press. 2008.

[13] Herzberg, F. The Motivation to Work, 2nd ed., Chapman & Hall, London, 1959.

[14] Law, A. and Charron, R. "Effects of agile practices on social factors," Proc. Workshop on Human and Social Factors of Software Engineering (St. Louis, Missouri, May). HSSE '05, pp 1-5, 2005.

[15] Mannaro, K., Melis, M. and Marchesi, M. "Empirical analysis on the satisfaction of IT employees comparing XP practices with other software development methodologies," Proc. of XP2004, pp. 166–174 2004.

[16] McConnell, S. "Problem programmers," Software, IEEE vol. 15(2), pp. 126-128, 1998.

[17] McHugh, O., Conboy, K. and Lang, M. "Motivating Agile Teams: A Case Study of Teams in Ireland and Sweden," International Research Workshop on IT Project Management. 2010

[18] Melnik, G. and Maurer, F. "Comparative Analysis of Job Satisfaction in Agile and NonAgile Software Development Teams," Proc. XP2006, LNCS 4044, pp32-40, 2006.

[19] Murru, O., Deias, R. and Mugheddu G. "Assessing XP at a European Internet Company," IEEE Software, vol. 20(3), pp. 37-43, 2003.

[20] Oreg, S. and Nov O. "Exploring motivations for contributing to open source initiatives: The roles of contribution context and personal values," Computers in Human Behavior, vol. 24( 5), pp. 2055-2073, 2008.

[21] Poole, C. and Huisman, J. "Using Extreme Programming in a Maintenance Environment," IEEE Software, vol. 18(6), pp. 42-50. 2001.

[22] Poppendieck, M. and Poppendieck, T. "Implementing Lean Software Development: From Concept to Cash," Addison-Wesley, 2006.

[23] Sharp, H., Badoo, N., Beecham, S., Hall T. and Robinson, H. "Models of motivation in software engineering," Information and Software Technology , vol. 51(1), Butterworth-Heinemann. 2009.

[24] Schwaber, K. and Beedle, M. "Agile Software Development with Scrum," 1st Edition. Prentice Hall PTR, Upper Saddle River, NJ, USA. 2001.

[25] Tessem, B. and Maurer, F. "Job Satisfaction and Motivation in a Large Agile Team," Proc. of XP2007, vol. 4536, pp 54-61, 2007.

[26] West, W. and Grant, T. "Agile Development: mainstream adoption has changed agility", Forrester, available from http://www.forrester.com/rb/Research/agile_development_mainstream_adoption_has_changed_agility/q/id/56100/t/2, January 20, 2010. Last visit 02-02-2012.

[27] Whitworth, E. and Biddle, R. "Motivation and Cohesion in Agile Teams", Proc. of XP 2007, LNCS, vol. 4536, pp. 62–69. 2007.

[28] Yin, Robert K. *Case Study Research: Design and Methods (Applied Social Research Methods)*. Sage Publications, Inc, 2008