Effective People Management Practices for Software Project Success

Marcelo Falkowski Burkard and Lisandra Manzoni Fontoura
Programa de Pós-Graduação em Ciência da Computação, Federal University of Santa Maria (UFSM), Brazil

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Abstract: Research on people management practices is crucial because they significantly influence the results of software projects, help improve decision compliance, and maintain a qualified workforce. However, there is a tendency for managers to rely on personal experience rather than evidence-based knowledge when implementing people management practices. Compiling good practices can assist managers in implementing people management practices, reducing resistance, and, at the same time, collecting indicators that can be used to evaluate the effectiveness of practices. This work documents good practices that can support people management in software projects based on the compilation of practices. To this end, we carried out a systematic literature review (SLR) to identify common problems in people management in software projects and effective practices to resolve them. Initially, SLR returned 2495 unduplicated primary studies. After a detailed analysis, 63 studies were selected and organized into nine problem categories and sixteen practices. Through a survey, these practices were validated by 31 software professionals, allowing them to be classified according to the general relevance of the practice and to resolve each associated problem. The findings reveal the predominance of interpersonal skills (soft skills) over technical skills (hard skills) and emphasize the importance of practices such as continuous feedback, open communication, and transparent management.

1 INTRODUCTION

The importance of people management in software projects is underscored by de Alcântara et al. (2018), who emphasize the need for a model to guide this critical aspect of project management. Hussain et al. (2021) and Fahmy et al. (2018) identify selecting the right team members as crucial to project success. Brandão et al. (2021) highlight the role of these practices in improving compliance with decisions and maintaining a skilled workforce.

Good practices lead organizations to ever higher performance. According to Kerzner (2006), best practices guide continuous improvements, leading to adopting new best practices. So, the practice's applicability depends on the characteristics of the project to which it will be applied. Therefore, it is up to the manager to assess when and where to use it.

Bezzina et al. (2017) highlighted the tendency of managers to rely on personal experience rather than evidence-based knowledge when implementing PM practices. Finally, Bianchi et al. (2017) identified a gap in research on the role of leaders in strategic people management, suggesting an integration of theoretical models to address this issue.

The main goal of this project is to create a collection of effective people management practices by gathering practices mentioned in recent studies (covering publications from 2016 to 2023). The collection of people management practices makes it easy to find practices appropriate to the context of each project.

The structure of this paper is as follows. Section 2 explains the methodology employed in developing this work. Section 3 offers a comprehensive overview of the systematic literature review. Section 4 describes the survey utilized to validate the practices. Lastly, Section 5 provides conclusions and suggestions for future work.

2 METHODOLOGY

The methodology of this research consists of three phases, as shown in Figure 1:
Phase 1 - Systematic Literature Review (SLR): We carried out an SLR to identify the problems related to people management that affect software development projects and which practices cited by the authors tend to solve these problems.
Phase 2 - Documentation of Practices: For each prac-

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Figure 1: The research methodology.

tice identified in the SLR, we prepared a descriptive and summary text, consolidating the information extracted from primary studies and providing a comprehensive and applicable understanding of people management practices in the context of software development projects. After documenting the practices, correlations were established between each specific practice and one or more categories of problems the practice aims to solve.

Phase 3 - Survey to validate practices: To validate the proposed practices, we surveyed professionals to evaluate the practices identified and reveal their relevance.

In Phase 1, we used a search string to select articles automatically using the review protocol proposed by Kitchenham and Charters (2007). Later, we applied the snowballing technique to search for articles from the references of previously selected articles (Wohlin, 2014). This way, we could increase the number of selected articles.

This work conducts an SLR to identify people management problems and practices, seeking recent literature to answer the following questions:

- RQ1: What people management problems were cited by the authors of the primary study that affect software development projects?
- RQ2: What practices related to people management were cited by the primary study authors that tend to solve problems in software development projects?

Based on these questions and the work objectives, we have defined the search string shown in Table 1.

Table 1: The base search string for all search engines.

Search string
(“software development” OR “software project” OR “software engineering”) AND (“human resource” OR “human resources” OR “people factor”) AND (“productivity” OR “performance”)

The exclusion criteria were defined from Kitchenham and Charters (2007). The exclusion criteria adopted were: EC1 (not primary study), EC2 (not answer research questions), EC3 (presented as a book), EC4 (published before 2016), EC5 (not published in English), EC6 (duplicate study), and EC7 (with less than 15 score points).

We performed the primary search in four databases: ACM Digital Library, IEEE Xplore, Scielo, and ScienceDirect. Only libraries that could export files in the *BibTeX* format with a summary included were considered. The results were exported in files in the *BibTeX* format, including abstracts and all metadata. ACM found 969, IEEE found 328, Scielo found 2, and ScienceDirect found 1437 articles.

The selection of studies was divided into four steps. In the first step, we imported the *BibTeX* files into the tool StArt[1], which automatically identified 241 duplicate articles. They were rejected according to the EC6, resulting in 2495 non-duplicated articles. 239 articles were published before 2016 or did not have a publication date; all were rejected according to the EC4. The StArt tool assigns a score to each article according to the number of occurrences of keywords in the title (5 points), abstract (3 points), and keywords (2 points); 2051 articles with less than 15 points were rejected according to the EC7.

In the second step, we read the titles and abstracts of the selected articles. 134 articles were rejected according to the EC2, resulting in 71 articles were selected at the end of this stage.

In the third step, we read all articles and excluded 36 according to criteria EC1, EC2, EC3, and EC5. At the end of the process, 35 articles were selected.

In the fourth step, the snowballing process was carried out, a technique used to identify additional studies based on the references of the identified articles. This technique consists of backward and forward snowballing. Backward Snowballing analyzes the reference list to identify new articles to include in the SLR. Forward snowballing refers to identifying new articles by analyzing the list of articles citing the article being examined. We applied this technique to the initial 35 initial articles.

Each article was evaluated according to the same process as steps 1, 2, and 3, considering their relevance and adequacy to the inclusion and exclusion criteria previously established for this research. As a result, 28 articles were considered relevant after the snowballing process.

The research comprised 63 articles (listed in the Review References section), including the 28 identified by snowballing added to the 35 selected ones. These articles formed the basis of the review and were used for full reading, data extraction, analysis, and composition of the final research results. The results are described below.

[1]State of the Art through SLR - available at http://lapes.dc.ufscar.br

3 RESULTS

3.1 Problems

The identified problems were categorized into 9 groups based on their similarity, representing essential aspects of people management.

Communication (16%): The wrong choice of communication tools can lead to misunderstandings and breakdowns (Shameem et al., 2020) (Margareth and Mulyanto, 2021). In big teams, communication can be difficult, which leads to low frequency (de Magalhães, 2017)(Wang et al., 2018)(Bass, 2016)(Machuca-Villegas et al., 2022)(Shameem et al., 2020). Providing adequate feedback is also crucial to prevent demotivation and burnout in the development team (Stylianou and Andreou, 2016).

Motivation (16%): Motivation is the desire to work and influences performance (França et al., 2020). Lack of motivation threatens team development (García et al., 2017) and affects productivity and effectiveness (Fatema and Sakib, 2017). Autonomy and feedback, employment policies, work-life balance, common technical challenges, innovation, rewards, good management, adequate working conditions, work involvement with others, and quality of work generated are some factors that affect motivation (de Magalhães, 2017)(Bass et al., 2018). Low-quality work and products and high turnover are some effects of low motivation (Bass et al., 2018).

Technical skills and knowledge (16%): The technical factors affecting productivity in software development include programming language and tools, software size, complexity, and product quality (Meyer et al., 2017). Selecting people with the right technical skills for a project is a complex task in project management (Fatema and Sakib, 2017). Technical knowledge is insufficient; the lack of skill in applying that knowledge negatively impacts software delivery (Nigar, 2017)(da Cunha et al., 2016). Team stability is positively related to developing skills and technical knowledge (Kula et al., 2021).

Geographical aspects (11%): Outsourcing plays a vital role in the productivity of development teams, especially for large global organizations. It can be categorized into onshore (same territory) and offshore (geographically remote) outsourcing (Bass, 2016). Offshore outsourcing can help build a presence in emerging markets while benefiting from lower costs, but cultural and language differences can negatively impact team performance and communication (Qahtani, 2020)(Shameem et al., 2020). This can lead to delays and difficulties in areas such as collaboration (Bass et al., 2018) and training (Britto et al., 2019).

Team Stability (11%): Teams with low turnover and high familiarity contribute to on-time deliveries by improving coordination and adaptability (Kula et al., 2021). Employee turnover is a challenge that managers need to mitigate due to its negative impact on productivity and quality (Kula et al., 2021). Low motivation (Bass et al., 2018) and the nature of the work performed (Bass et al., 2018) are some factors that contribute to high turnover rates.

Commitment (9%): Professionals with high commitment and technical expertise tend to identify and assess risks better, increasing the chances of project success(Machuca-Villegas et al., 2022)(Kula et al., 2021). Managers perceive greater productivity in committed professionals who combine focus and proactivity with timely and quality task deliveries (Oliveira et al., 2016)(Machuca-Villegas et al., 2022). Customer involvement is crucial in agile projects throughout the lifecycle (Tam et al., 2020).

Job Satisfaction (9%): França et al. (2020) found that job satisfaction increases employee performance and retention. Factors contributing to job satisfaction include personal and professional growth, recognition, opportunities, salary, and relationships with colleagues (de Magalhães, 2017).

Focus (7%): Developers who prefer to work on a single task at a time are called focused developers (Meyer et al., 2017). Constant focus changes can negatively impact productivity, and the state of ”flow” developers desire (Meyer et al., 2017). Small context changes lasting less than 3 minutes, like running a short script, do not disconnect developers from their previous tasks (Kohl et al., 2020).

Autonomy (5%): Team autonomy in defining and assigning responsibilities significantly impacts individuals' productivity and motivation during software development (Machuca-Villegas et al., 2022). While some argue that task assignment should be optimized through mathematical models, others believe self-management and team-defined responsibilities lead to better results(Song et al., 2020)(Chiang and Lin, 2020).

3.2 Documentation of Practices

Primary studies on people management practices in software development teams were analyzed, and 16 practices were documented. Subsequently, a description was formulated for each practice identified.

P01 - Use of Agile Practices: The use of agile methods, such as XP and Scrum, promotes efficiency and adaptability in the project. These practices can be implemented through training in agile methods to adopt an agile mindset. **Ref-**

erences: (Destefanis et al., 2016)(Britto et al., 2016)(Iqbal et al., 2019)(Ramírez-Mora and Oktaba, 2017)(França et al., 2020)(Qahtani, 2020)(Bass, 2016)(Shameem et al., 2020)(Tam et al., 2020)(Ángel Vega-Velázquez et al., 2018)

P02 - Assess personality traits and soft skills: Assessing personality traits and soft skills ensures the correct assignment of members to projects, considering technical specificities and individuals' capacity. This practice increases productivity and job satisfaction and can be implemented through personality questionnaires, performance tests (consisting of performing specific tasks such as writing computer code), or direct observation in a real situation. **References:** (Caulo et al., 2021)(Cárdenas-Castro et al., 2019)(Meyer et al., 2017)(Stylianou and Andreou, 2016)(Yilmaz et al., 2017)(Vishnubhotla et al., 2020)(Anderson et al., 2018)(Licorish and MacDonell, 2021)(Fritzsch et al., 2023)(Cunha et al., 2021)

P03 - Implement Onboarding Checklist: The creation of onboarding *checklists* assists in standardizing and ensuring the complete integration of new members into the team, reducing the acclimatization time and increasing efficiency. **References:** (Britto et al., 2019)(Britto et al., 2016)(Britto et al., 2020)

P04 - Create Channels and Promote Open Communication: Open communication and flexibility boost team efficiency. Regular meetings, online tools, and an inclusive environment help achieve this. **References:** (Dangmei, 2017), (Fatema and Sakib, 2017), (Bass et al., 2018)(Shen et al., 2018)(Xia et al., 2017)(Hidayati et al., 2020) (Ramírez-Mora and Oktaba, 2017)

P05 - Create minimal schedule: A minimal schedule helps teams focus on critical tasks and avoid delays while saving time and costs. Proper resource allocation considers individual and project factors, minimizing the need for changes during the project. **References:** (Maenhout and Vanhoucke, 2016)(Song et al., 2020)(Chiang and Lin, 2020)(Nigar, 2017)(Shen et al., 2020)(Ángel Vega-Velázquez et al., 2018)(Paredes-Valverde et al., 2018a)(Zapotecas-Martínez et al., 2020)(Mamatha and Suma, 2021)

P06 - Create a job description for hiring: Clear job descriptions prevent incorrect hiring and ensure the selection of suitable professionals for each role. They also save time and resources in hiring and increase employee satisfaction. Implementing them requires the help of human resources specialists and feedback from team members. **References:** (Nastiti and Setyohadi, 2020)(Fritzsch et al., 2023)

P07 - Provide feedback to the team: Feedback is crucial for effective project team management. It helps improve team members' morale and work quality. A trusting and respectful environment is critical, where feedback is viewed as an opportunity for growth, not personal criticism. Regular feedback meetings and peer evaluations can be helpful. Constructive feedback should be specific and objective, provide clear examples, be behavioral rather than personal, and include suggestions for improvement. Any team member can provide feedback respectfully to help the team improve. **References:** (Britto et al., 2016)(Zaouga et al., 2019)(da Cunha et al., 2016)(Dzvonyar and Bruegge, 2018)

P08 - Defining team size: The ideal team size depends on various factors, such as project complexity, team experience, and task nature. Increasing team size can improve efficiency, but only up to a point. After that, coordination costs grow exponentially, leading to decreased efficiency. **References:** (Wang et al., 2018)(Scott et al., 2020)

P09 - Challenge the team to learn new skills: Managers should encourage their team to acquire new skills through training, workshops, and incentives for continuous education. It promotes professional growth and adaptability and increases the team's competitiveness and flexibility. **References:** (Santos et al., 2016b)(Cárdenas-Castro et al., 2019)(Dzvonyar and Bruegge, 2018)

P10 - Practicing Open Management: Visible project indicators promote transparency and align goals. It increases awareness and allows proactive addressing of problems. Use physical or online tools and make measurements as a team to work towards the same goal. **References:** (Dangmei, 2017)(Fatema and Sakib, 2017)(Destefanis et al., 2016)(da Cunha et al., 2016)(Shameem et al., 2020)

P11 - Identify and manage team competencies: Mapping the necessary and existing knowledge in the team allows for effective competency management, contributing to the project's efficiency. This practice can be implemented through periodic competency assessments and personalized training plans. **References:** (Dangmei, 2017)(Hidayati et al., 2020)(Paredes-Valverde et al., 2018b)(Angelis, 2019)(Meyer et al., 2017)(Zaouga et al., 2019)(Paredes-Valverde et al., 2018a)(Bakanova and Shikov, 2020)

P12 - Create a career and succession plans: Implementing career and succession plans with training can retain talent, ensure project continuity, and identify potential successors. It involves individual meetings, development plans, mentorship, transition plans, and succession tests. Companies should identify multiple successors for each critical position and regu-

larly review and adjust plans to align with company needs and employee growth. **References:** (Nicolaescu et al., 2020)(Trinkenreich et al., 2023)

P13 - Assemble a heterogeneous team: Heterogeneous teams approach problems differently and find practical solutions. A diverse recruitment policy values gender, race, ethnicity, sexual orientation, and age. Managers should foster collaboration, idea exchange, and learning among team members to achieve common goals. **References:** (Xia et al., 2017)Canedo and Santos (2019)(Nastiti and Setyohadi, 2020)(Cunha et al., 2021)

P14 - Organizing training : Ongoing training improves skills and project efficiency. Internal or external programs and online learning are options. Formal training, work-based learning, and mentoring by experienced developers are recommended. Encourage professionals to become mentors and offer career development opportunities and recognition. Creating a learning environment and issuing certificates can recognize employee performance and skills. **References:** (Fatema and Sakib, 2017)(Shahzad et al., 2017)(Britto et al., 2020)

P15 - Job Rotation: Team rotation can be done in two ways: job-to-job and project-to-project rotation. The former allows members to acquire new skills and knowledge through well-structured programs, while the latter provides new perspectives and prevents stagnation. The ideal frequency of rotation should balance new challenges with work stability. **References:** (Santos et al., 2016b)(Santos et al., 2016a)(de Magalhães, 2017)(Santos, 2017a)(Govindaras et al., 2023) (Santos, 2017b)(Dzvonyar and Bruegge, 2018)

P16 - Use team performance indicators: The use of key performance indicators (KPIs) allows measuring and monitoring team performance, promoting continuous improvement. This practice can be implemented using project tracking software and performance analysis tools. **References:** (Oliveira et al., 2016)(Cunha et al., 2021)(Nicolaescu et al., 2020)

3.3 Survey to Validate Practices

Software professionals from various profiles validated the practices through a questionnaire, including the areas of management (54.8%), development (25.8%), analysis (12.9%), and quality (6.5%).

The questionnaire consists of 16 sections of questions, each section related to a specific practice, containing the description of the practice, a question about the general relevance of the practice, and questions about the relevance of the practice for each of the correlated target problems identified. Each question has four response options: (a) Not relevant (0 points), (b) Slightly relevant (1 point), (c) Very relevant (2 points), and (d) Absolutely relevant (3 points). The relevance of practice is the sum of the relevance for all participants divided by the number of participants multiplied by 3 (maximum score), as demonstrated in the formula below:

$$\text{Relevance} = \frac{\sum_{p=1}^{n} Relevance_p}{n \times 3}$$

The consolidated results of the practice's general relevance and solving a specific target problem are displayed in Figure 2.

		General Relevance	Communication	Motivation	Technical skills and know.	Geographical aspects	Commitment	Satisfaction	Team Stability	Focus	Autonomy
P01	Use of agile practices	82.8	79.5	56.5			73.1	64.5		79.5	76.4
P02	Assess personality traits and soft skills	84.9						72.0	66.7		
P03	Implement onboarding checklist	81.7			64.5						70.9
P04	Create channels and promote open comms	90.3	90.3			66.7					
P05	Create minimal schedule	84.9							75.3		
P06	Create a job description for hiring	83.8						73.3	74.2		
P07	Provide feedback to the team	95.7	88.2					90.3			
P08	Defining team size	83.8	67.8					77.4			
P09	Challenge the team to learn new skills	78.4		83.9	87.1			78.5			
P10	Practicing Open Management	86.0	85.0			57.0	79.5			76.3	72.0
P11	Identify and manage team competencies	78.5			84.9						
P12	Create a career and succession plan	78.5		90.3	75.3						
P13	Assemble a heterogeneous team	74.2			67.7						54.8
P14	Organizing training	79.6			84.9						
P15	Job rotation	68.8			80.6				51.6		65.6
P16	Use team performance indicators	77.4	67.7	66.7						75.2	

Figure 2: General relevance of the practice and relevance for solving each associated problem.

4 CONCLUSIONS

This study investigated people management practices in software development projects, aiming to compile best practices to be used as a reference resource by researchers and professionals involved in software development projects.

A set of practices was then developed and submitted for validation by 31 software professionals through questionnaires. It was possible to assign a numerical relevance and, from this, classify the practices as more or less relevant. The analysis of the responses from the software professionals revealed valuable insights about the relevance of the implementation and impact of these practices.

The results offer guidelines for implementing management practices in software development projects. Each practice, with its particularities, contributes uniquely to the project's success and the

team's satisfaction. However, before generalizing the findings, it is essential to consider the study's limitations, such as the variability in the professionals' responses and the specificity of the software context.

In future work, we intend to quantify the advantages of people management practices in software development projects. To achieve this, we will create a model that measures the effectiveness of proposed practices using key performance indicators (KPIs).

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