Navigating Challenges: How Data Scientists Balance Code and Management

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1. Introduction

In the ever emerging technological advancement and for the fact that the technological world is expanding at a very fast pace, the position of a Technical Lead also known as Tech Lead is equally as complex in the way that they weave the three dimensions of technology as stated by (1, 2) management and leadership in one intricate manner as stated by (3, 4). In addition to starting the software creation process (5), Tech Leads are also faced with organizational challenges constituent of dealing with others (6, 7). This dual role means that they have to code in order to maintain their integrity while at the same time supervise plans (8), convene with other stakeholders, and manage training (9). These challenges are even magnified by what is referred to as agile methodologies where a lot of changes are needed due to other emerging needs and also managing of other many cycles of development (3, 10). First of all, the most efficient Tech Leads manage to set and achieve technical goals connected with the development of IT systems and organizational goals, which are inalienable parts of IT systems development (11), such as code optimization and architectural decision-making (12), the organization of the working schedule and distribution of the resources, which do influence a team's success and their integration into the project (7, 11).

Hence the focus of this review is on identifying how Tech Leads deal with these complexities. It will assess how the Tech Leads delegate coding and management tasks and the impact that this has on productivity, project performance, team morale and staff stress levels.

2. Methodology

The systematic review procedure for this investigation was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standards (13).

2.1 Data Strategy and keywords

This study searches for pertinent research articles published between 2010 and 2024 were place on Springer Link, Elsevier, PubMed, and Google Scholar databases. Among the important search phrases used were "technical lead," "software management," "balancing coding and management," "agile leadership," and "team performance."

2.2 Inclusion and Exclusion Criteria

The review's commitment to accessibility and comprehensiveness was demonstrated by its inclusion criterion, which mandated that papers be published in English. The systematic review included the most recent and pertinent research in the area by considering articles published between 2010 and 2024. In addition, we eliminated articles that were relevant to the topic of the review, but we kept all of the original source material.

2.3 Screening of Articles

When databases containing pertinent articles have been searched. We evaluated the papers using their titles, abstracts, and full text reads. Five publications in all were chosen for additional screening and quality evaluation.

2.4 Quality Appraisal Tools

The internal biases and data dependability of each study should be assessed using the CASP technique (14). These crucial criteria were used to evaluate the validity and reliability of the selected research.

3. Results

The primary findings from the five articles that were chosen and categorized according to how Tech Leads oversee the distribution of coding and management responsibilities and the outcomes of their tactics are presented in this part. Figure 1 shows the procedures for the elimination, systematic review, and article selection.

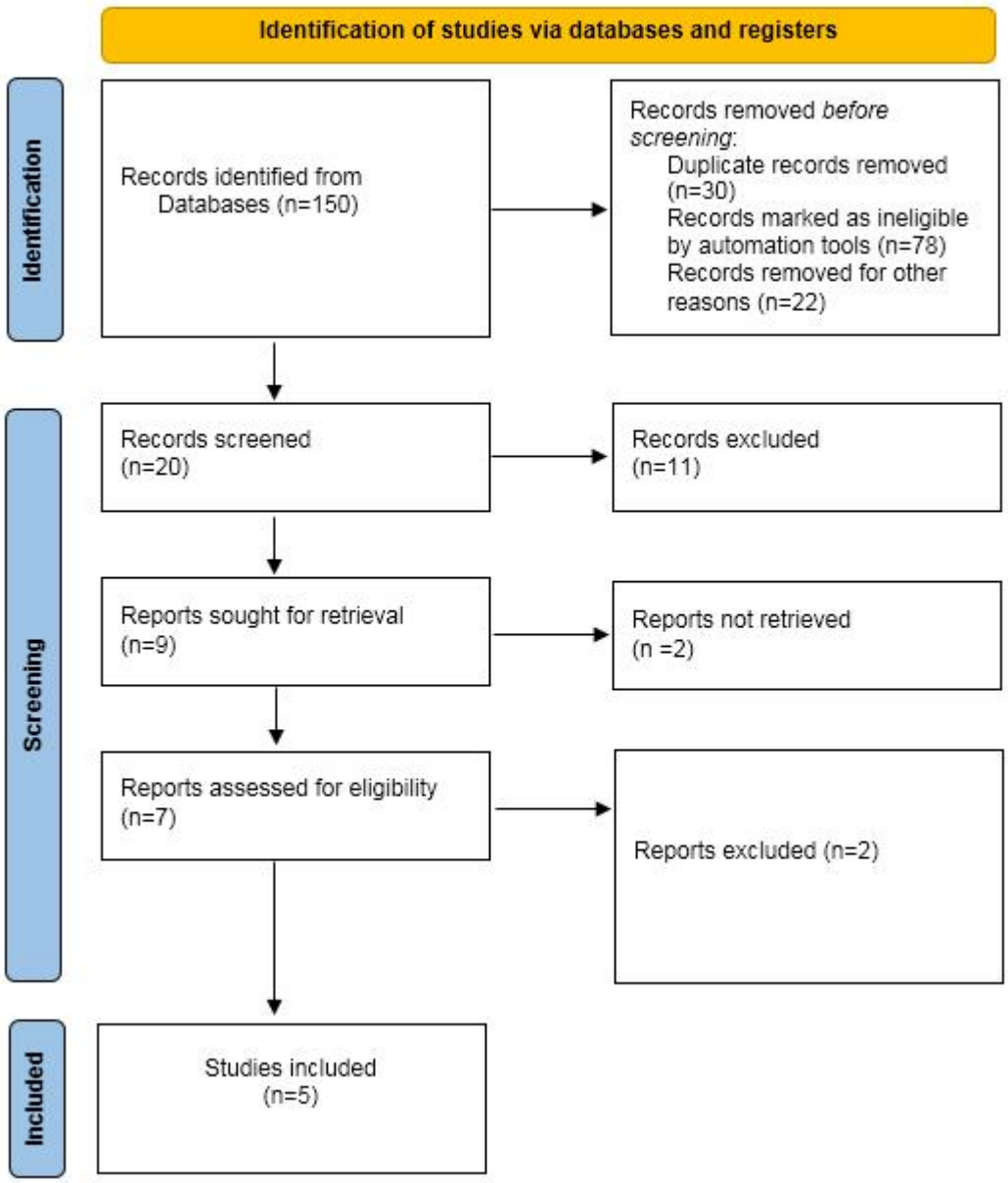

Figure 1: PRISMA Diagram

Table 1: Studies Overviews

Author and year	Aim	Design	Findings
Ernst et al., (2015)	utilized to capture a variety of issues with software quality	surveys	Technical debt mostly arises from architectural decisions.

Li et al., (2015)	An organized mapping analysis of technological debt and its handling.	Systematic review	Technical compromises that may help a software system in the near term but may be detrimental to its long-term health are metaphorically represented by technical debt (TD).
Alves et al., (2016)	determine management tactics, indications that may be utilized to locate technical debt.	Mapping study	Beneficial for understanding software should be really helpful for managing and identifying technical debt.
Brown et al., (2010)	Better strategies for handling the long-term consequences of temporary expedients are needed for software-dependent systems.	Model based study	In the agile development community, the technical debt metaphor is becoming increasingly popular as a means of comprehending and discussing these kinds of problems.
Marcoux, (2022)	The administration of web applications via the perspective of a senior software engineering project	case study	As online apps gain popularity and more people use them to do many computations and data processing on their clients' computers, data management procedures for these web applications' front ends must be taken into account.

3.1 Technical Expertise and Management Skills

Most of the reviewed studies are concerned with the problem of balance between focus on technical competencies and the acquisition of managerial competencies (6, 8, and 9). It's important for Tech Leads to remain technically competent to be able to support the team while at the same time they have to develop leadership and management competencies (7). Some research showed that being able to code and retain writing abilities leads to the team members respecting the authority of the Tech Leads and improves performance (9, 10). However, due to constraints in time, it becomes challenging to provide appropriate time and effort expected in either coding or management (6). A study highlighted the issue of time division by stating that schedule

organization of individual time slots for coding and managerial work would help Tech Leads to address these two conflicting roles (8). One research also supported this by pointing that, Tech Leads who carry out the coding practices themselves have better chances of making the right technical decisions, which brings good results to the project (9).

3.2 Leadership Styles in Technical Teams

Leadership styles also have a significant implication on the manner that Tech Leads manage their affairs. Research showed that changing the leadership style by encouraging people to follow their example of leading change positively impacts the morale and performance of a team (10). For instance, Technical Leads whose approach was transactional, concentrating on achieving results and paying less attention to interpersonal relations at the workplace, exhibited lower team satisfaction and engagement (7, 9). Moreover, agile methods put even more emphasis on team-driven and flexible leadership. Research revealed that practicing the servant leadership model where the Tech Lead opts to support the subordinates' needs more than their own is effective in enhancing unity and a positive energy in the team regarding project completion (6, 8).

3.3 Team Performance and Project Success

The very fact that a Tech Lead is capable of both coding as well as managing suggests a straight correlation between the efficiency of the whole team and the success of the project at hand (7). Several researchers noted a positive relationship between effective leadership and team performances, especially where agility is promoted (8, 9, 10). In more balanced roles with responsibilities of a technical and managerial point of view, the teams by the conducting of Tech Leads had higher level of engagement, lower turnover rates and better overall project performance (6). It shows that Tech Leads who were challenged when it came to the management of both responsibilities exhibited increased stress levels and burnout will eventually drop productivity (8). This study identified that the Tech Leads, who were affected by burnout, exhibited reduced performance, particularly regarding coding tasks, which influenced decision-making and team performance (10).

3.4 Strategies for Managing Workload and Preventing Burnout

In order to handle the pressures of the job, most Tech Leads resort to several measures to avoid work stress and fatigue (8). There was a consensus that time management was crucial and that

techniques like separating coding work from the managerial role well were helpful (9). Other methods involved delegating particular tasks to senior developers or project managers which would relieve the Tech Leads and help them better manage their time (6). Other research also pointed to the fact that since the two skill sets need to be continuously updated, it can be beneficial for Tech Leads to work on these competencies, for example by attending leadership or a coding boot camp (7). There are other practices that were also deemed to be effective in supporting an individual in being able to handle tasks that are associated with being a Tech Lead and these include; in mentoring, new Tech Leads are put under the tutelage of seasoned Tech Leads (10).

4. Conclusion

In conclusion, the work of Technical Lead requires not only technical skills and expertise but also the management skills. Albeit, such dynamics can illustrate how effectively or otherwise one is able to balance these two roles may determine the output in a team or a particular project or even the wellbeing of an employee. The usual challenges are as follows: time, work and stress which have solutions in form of planning, assigning tasks and staff trainings. This is helpful in comprehending and defining the advice and issues for the current and potential Tech Leads with varying levels of expertise in their organizational industry as the technology continues to change.

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