Motive Metrics: A Jira Plug-In for Personality, Motivation and Performance Tracking

Akash Saggar [1], An Cao [1], Jie Xiang Fan[1], Jiten Verma[1], Kunj Dave[1],
Sharan Sharabinth[1], Dulaji Hidellaarachchi, and John Grundy
Department of Software Systems and Cybersecurity, Faculty of information Technology
Monash University, Melbourne, Australia
{asag0003, acao0002, jfan0010, jver0007, kdav0006, ssha0054}@student.monash.edu,
{Dulaji.Hidellaarachchi, John.Grundy}@monash.edu

***Abstract*—Requirements Engineering (RE) is an essential part of Software Engineering (SE). As RE activities rely heavily on people, the success of RE is influenced by the human aspects of the team involved. In this research, we develop a prototype application, called *Motive Metrics*, to improve RE activities by allowing managers to track developers' personality and motivation and monitor their impact on developer performance and satisfaction. The tool takes the form of an extension to Jira and was developed through rapid prototyping. The effectiveness and usability of the tool were evaluated by student teams split into managers and team members. When evaluating *Motive Metrics*, 45.5% of participants rated 4 out of 5 for the application's effectiveness in capturing personalities, but only 9.1% of participants rated 4 out of 5 for capturing motivations. *Motive Metrics* is likely ineffective in monitoring satisfaction and performance, as 45% of participants rated 1 out of 5 in comfort in sharing their responses. Our evaluation results also show that *Motive Metrics* might not be beneficial in tracking the influence of motivation on the outcome but slightly more beneficial in tracking the influence of personality on RE task performance.**

***Index Terms*—Requirements Engineering, Software Engineering, Human Aspects, Personality, Motivation, Performance, Satisfaction, Software Practitioners**

I. Introduction

Software engineering (SE) involves different types of work, such as software requirements engineering, software design, software construction, and software testing [1]. Among all these tasks, requirements engineering (RE) is considered a fundamental and critical part of SE to ensure the quality of the final outcome of the project [2]. Verner et al. [3] show that as many as 40% of projects that failed have key problems of poor requirements. RE-related activities include eliciting, analysing, documenting, validating and maintaining software requirements [4] [5]. Nowadays, RE is considered to be a continuous, iterative and collaborative process where RE activities involve and rely heavily on people who are involved in those activities. Hence, like every other team activity, software development, including RE, is highly dependent on individual performance and their collaboration with team members.

Human aspects in software engineering are human-related characteristics of people that can become make-or-break issues in software projects [6]. Identification of the effects of different individual human aspects and combinations of different human aspects in SE activities is an emerging area of study to which researchers are paying more attention. From recent research, it has been identified that among a variety of human aspects, personality and motivation are considered to be highly important factors by software practitioners, measured by their impact on the quality and success of RE activities [7].

We were inspired by a tool for tracking developer emotions during RE [8]. This is a Trello plug-in used to capture the emotions of software practitioners when performing requirements engineering. We wanted to explore how we can incorporate human aspects of personality and motivation of software practitioners when involved in RE activities. However, no tool that incorporates software practitioners' personality characteristics and motivation and tracks their performance and satisfaction to improve RE activities has not been designed or developed to date. The possibility of such a tool in enhancing RE-related activities by tracking human aspects and their impact on performance and satisfaction is a question we explore in this research.

We developed such a tool via rapid prototyping to investigate the possibility of improving RE activities and the overall SE process via the interplay of personality, motivation, satisfaction and performance during RE. Our prototype tool is built as a plug-in to a popular project management application, Jira. The Jira plug-in, we name *Motive Metrics*, is used to track the personality and motivation of software practitioners and monitor their performance and satisfaction. Our initial prototype was evaluated with student software development teams to identify its potential usefulness as well as to identify key drawbacks to improve the plugin in future.

We make the following key contributions to this research:

- We designed and developed a novel project management support application as a Jira plugin that potentially improves RE activities by monitoring software practitioners' personalities, motivation, performance, and satisfaction;
- We carried out a user evaluation to identify the effectiveness, usefulness and drawbacks of our prototype application and overall concept for such a tool; and
- We identified a number of possible future work directions and improvements to our prototype application based on our user evaluation.

[1]These authors contributed equally to this work

II. Motivation

Consider Sarah, a software engineer managing a small team. Sarah would like to better understand her team members' personalities and motivational differences. She thinks these impact their performance on RE-related tasks and would like to better manage her team, taking these team differences into account. Sarah wants to track her team's self-rated and peer-rated performance and satisfaction on tasks, to better understand the impact of personality and motivation on performance and satisfaction. Ideally, Sarah would appreciate these features being integrated with the project management tool used by their team, Jira. We aimed to design and implement a Jira plugin capable of assisting such a software engineer and their manager to evaluate the utility of tracking software practitioners' personality, motivation, performance and satisfaction to improve the RE activities and overall SE process. We wanted to answer the following research questions:

RQ1: Can a plugin for project management tools be created to help capture developers' personality and motivational influences on RE activities? – We wanted to extend an industry-standard PM tool, such as Jira, for this study.

RQ2: Can a plugin for project management toolseffectively monitor developers' satisfaction and performance associated with their RE tasks? – To effectively analyse personality and motivational influences, our plug-in must keep track of changes in satisfaction and performance when performing tasks.

RQ3: Is such a tool beneficial for managers and team leaders in tracking the influence of personality and motivation on satisfaction and performance? – If managers are able to use the data to discover patterns and implement changes in their RE processes that lead to positive outcomes, the tool will be beneficial.

III. Our Approach

Our objective was to build a Jira plug-in prototype which captures different human aspects of *team members* whilst working on RE-related activities and displays them for *managers* to monitor and see. The human aspects of interest are personality, motivation, satisfaction, and performance. Our tool allows *team members* to rate their overall motivation with their assigned RE-related work task, as well as allow them to select from a list of motivators and demotivators to express their motivation for doing such work. The tool also allows *team members* to add a score to rate their performance on the task they are working on, as well as a score to represent how satisfied they are. *Team members* are also able to rate the performance of their peers by adding in a score on their assigned tasks, which remains anonymous to both their peers and their *manager*. For capturing personality, our tool incorporates a built-in IPIP-NEO-120 personality test to capture five traits and related facets of one's personality using the Five Factor Model [9].

Our prototype tool is split into two key components. *Team members* record their human aspects via their Jira Issues, and the second focuses on displaying data captured for *managers* to visualise on a separate dashboard page. The first component was focused on during the first half of development, and the second component was worked on during the second half of development. Whilst these two components were being worked on separately, the implementation of capturing personality and using this data with the human aspects recorded was being developed in parallel. Throughout the development phase, frequent demonstrations were done and using the feedback given, various enhancements were made to the prototype.

In order to evaluate our tool and determine the extent to which it could capture different human aspects, we aimed to evaluate our tool using "real" users. This would consist of a Software Engineering team with its own Jira board with RE-related tasks in it. By installing our tool onto their board, they would be able to evaluate our prototype. However, due to time constraints and the complications of allowing external users access to confidential data stored on Jira issues, we had to modify our evaluation plans to focus on using final-year Software Engineering students who would be invited to a Jira board maintained by ourselves. Upon receiving ethics approval (Monash Human Ethics Committee Approval number: 35437), we recruited Software Engineering students to use our tool and complete an evaluation questionnaire.

IV. Design and Prototype Implementation

A. Personality Testing

Our tool allows all *team members* to complete a personality test via an interface added to Jira. Weimplemented the IPIP-NEO-120 personality test including all facets and dimensions. Due to limitations with Atlassian Forge[3], in which only one project page can exist for a Forge App, the personality test is stored on the same *manager's* dashboard page. To allow multiple pages to exist, a navigation bar is built using React.js[4], and this allows us to have a separate component dedicated to the personality test. The personality test was built

Fig. 1: Personality test question interface example

using React.js, with MUI[5] components. One question is shown at a time, with *team members* required to click on a radio button to select the most appropriate answer (Figure 1).

Once *team members* have completed their personality test and have recorded their responses to different human aspects,

[3]https://developer.atlassian.com/platform/forge
[4]https://reactjs.org/
[5]https://mui.com/

managers can visualise different personality traits corresponding to the responses recorded. The Chart.js[6] library is used to illustrate the average scores for the different human aspects recorded and how they measure against different personality domains. Figure 2 shows a chart which can be filtered by personality dimensions and shows each *team member's* average score for each human aspect recorded (y-axis) and as well as their score representing how prevalent they are in that particular dimension (x-axis). Figure 3 shows the different personality dimensions (x-axis) and the number of *team members* within each range, representing how prevalent they are in that particular dimension (y-axis).

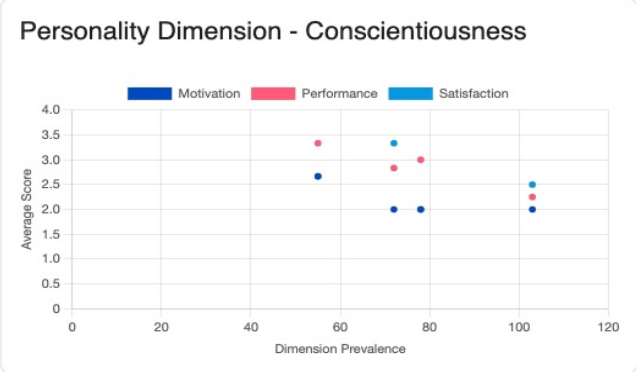

Fig. 2: Average score of human aspects by team member

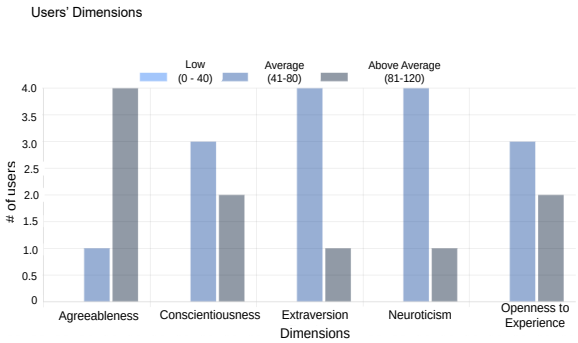

Fig. 3: Personality dimensions of team members.

B. Task Motivation

To capture *team members'* motivational factors for working on a task, a Custom Field is implemented on Jira issues that allows *team members* to add an overall motivation score and select from a list of motivators and demotivators that influence their score. We make use of Atlassian Forge modules and create a Custom Field module[7] named 'Motivation Score', which stores an object. To capture the overall motivation score, a dropdown menu is implemented with values that range from 'Low' to 'High' (Figure 4) to represent the Likert scale, which allows us to capture a level of intensity with *team members'* responses [10]. To capture a list of motivators and demotivators, a multi-select checkbox list is used. We implemented options from the list of motivators and demotivators identified by Beecham et al. [11]. All data recorded from this Custom Field is stored as a JSON object. By using the Forge API, this data can be retrieved and displayed on the Custom Field's view mode. To display motivation data for *managers* to view

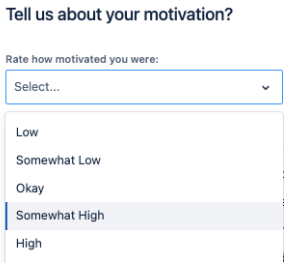

Fig. 4: Capturing Motivation Score.

on their dashboard page, the Chart.js library is used. Radar charts are used to illustrate the motivators and demotivators selected by the team (see Figures 5 and 6.)

Fig. 5: Motivators chart.

C. Task Performance Ratings

To capture the performance of *team members*, two separate features were implemented. The first is a self-assessed performance metric, which allows *team members* to rate their own performance with a task they are currently assigned to. The second aspect is a peer-assessed performance metric, which allows *team members* to rate the performance of their peers with their respective tasks.

To implement the self-assessed performance ratings, a Jira Custom Field module named 'Performance Rating' was created. Upon clicking on this Custom Field, the 'edit' mode of

[6]https://www.chartjs.org/

[7]https://developer.atlassian.com/platform/forge/manifest-reference/modules/jira-custom-field/

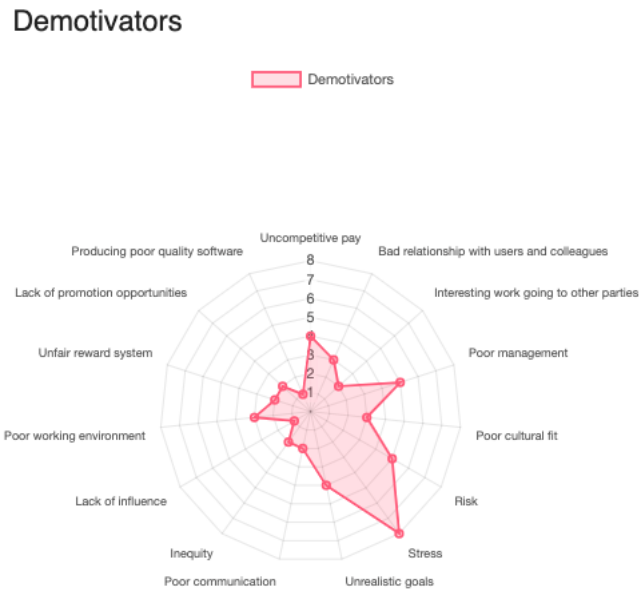

Fig. 6: Demotivators chart.

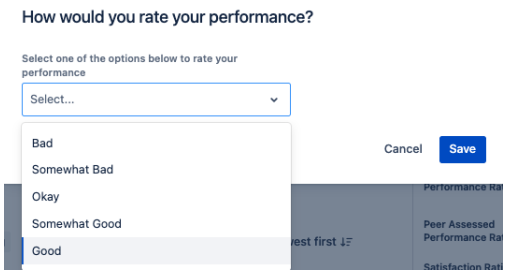

Fig. 7: Capturing self-assessed performance ratings

it is triggered, resulting in a popup where *team members* are able to select from the list of values shown to rate their own performance (Figure 7). The list of values shown range from 'Bad' to 'Good' and represent a Likert Scale to capture the intensity of *team members'* responses [12]. If a *team member* has already rated their own performance, their rating is shown as the value for the Custom Field, with changes still allowed.

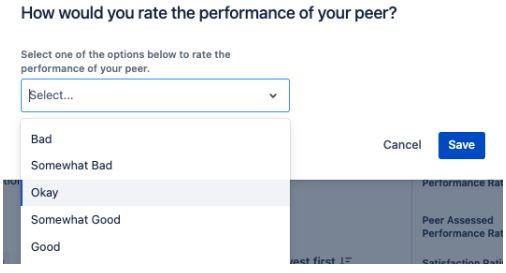

Fig. 8: Capturing peer-assessed performance ratings

To implement the peer-assessed performance ratings functionality, a Jira Custom Field named 'Peer Assessed Performance Rating' was created. A popup similar to the one used for capturing self-assessed performance (Figure 8). *Team members* are prompted that thisis intended for peer-assessed performance ratings. To ensure this data remains anonymous, only the user logged in can see their peer-assessed performance rating. The assignee of Jira issues is prevented from peer-assessing themself.

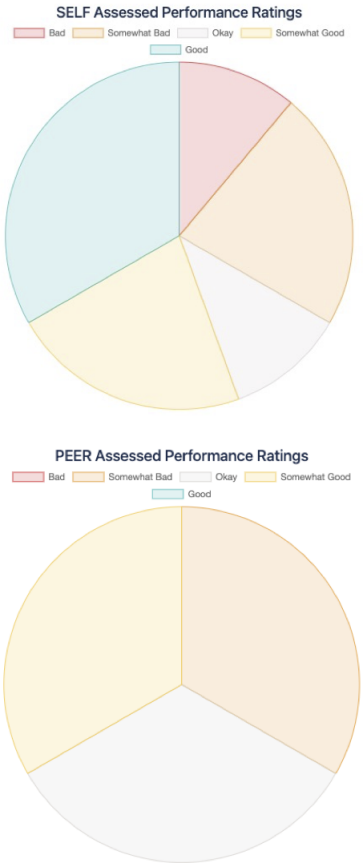

Fig. 9: Performance Ratings shown on pie charts.

Pie charts are used to display performance ratings to *managers*, capturing the occurrences of each rating for both self-assessed and peer-assessed performance ratings (Figure 9). Vertical bar charts are added to compare the two performance ratings, as well as comparing self-assessed performance ratings and satisfaction ratings within the team (Figure 10). Both sets of charts are interactive, with *managers* able to click on any label to hide a rating/data set.

D. Task Satisfaction Rating

To capture how satisfied *team members* are with their assigned tasks, a Jira Custom Field named 'Satisfaction Rating' was created. A popup allows *team members* to select from a list of values to record how satisfied they are with their assigned task (Figure 11). The list of values on the drop-down list follows the same scale used for performance ratings. A pie chart is used to show *managers* the occurrences of each satisfaction rating within the team (Figure 12). The labels on this chart can be clicked to hide a rating, making this pie chart interactive for *managers* to use.

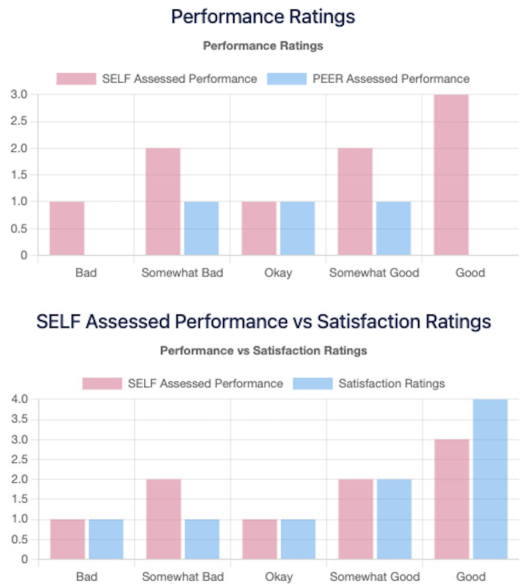

Fig. 10: Performance Ratings shown on bar charts.

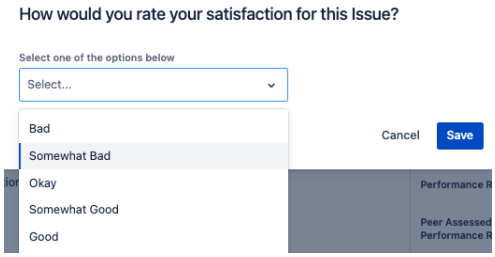

Fig. 11: Capturing satisfaction ratings.

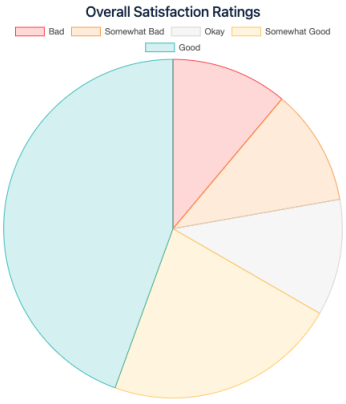

Fig. 12: Satisfaction ratings.

V. Evaluation

A. Evaluation Method

Three groups consisting of 13 students enrolled in (the Bachelor of Software Engineering (Honours) at Monash University and undertaking the Software Engineering Research Project (FIT4003) were recruited. 4 were female, and 9 were male. Participants were allocated the role of either *'team member'* (n=11) or *'manager'* (n=2). Most of these students have real-world software engineering industry experience. Participants were given access to Jira accounts created for evaluation purposes. Individuals assigned the role of *team member* were required to first complete a once-off personality test. *Team members* were then required to review each of their assigned RE tasks. Although they were not required to actually complete in detail the RE-related tasks assigned to them, they were encouraged to think about how they would feel completing the task or link it to a similar task they have done in the past. For each assigned issue, *team members* recorded their response for each human aspect captured.

For motivation, *team members* were required to specify their overall motivation score for that particular task, as well as select from the given list of motivators and demotivators that help to explain their given score. For performance and satisfaction, *team members* added their self-assessed performance and satisfaction ratings. *Team members* were optionally able to peer assess other *team members'* performance on their respective tasks. To do this, *team members* were required to go onto a Jira issue assigned to someone else, and by clicking on the 'Peer Assess Performance' custom field, they would be able to peer assess their *team member's* performance.

Individuals assigned the role of *manager* were required to click on the project page to view the dashboard for *managers*. *Managers* were then required to click on each section in the navigation bar (except the personality test) and analyse the data displayed on it. The charts used for each human aspect captured are interactive, so *managers* would be able to click on the labels to hide a rating/data set as well as hover over data to view more information. Following the completion of these activities, all participants would be required to complete an evaluation questionnaire via Google Forms. The form differed depending on the role of the participant. The answers to the questionnaire allow us to measure the extent to which our tool can effectively capture and display various human aspects.

B. Evaluation Results

RQ1 – Human aspect capture:

Results shown in Figure 13 reveal average reception from integrating the IPIP-NEO-120 personality test within the Jira tool, where **18.2% rated it a 3, 45.5% rated it a 4**. The lower ratings for the personality test can be attributed to the key issues participants experienced, such as too repetitive questions, difficulty in accurately responding to situational questions, or the application not showing results of the personality test to users. The ability to record motivational influences is also shown in Figure 13. This was rated lower, where **no users**

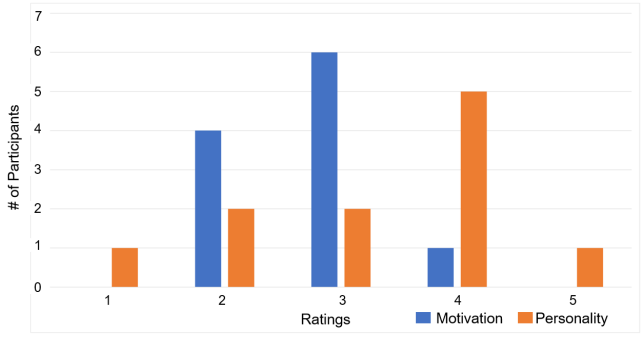

Fig. 13: "Team member" participants' response evaluating human aspects capture.

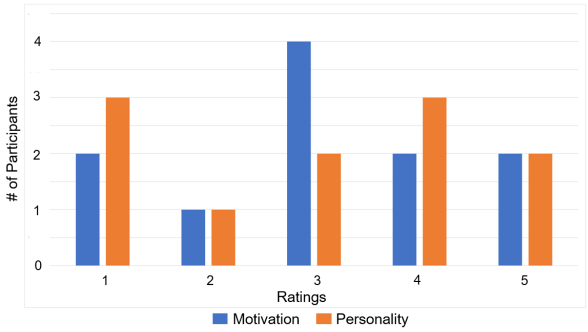

Fig. 14: "Team member" participants' comfortability sharing human aspects.

rated the component a 5, and only 9.1% rated it a 4. These lower ratings in comparison to the personality test can be attributed to the difficulty participants found using the list of (de)motivators provided, where **18.2% could not accurately express their motivation**. Participants also rated **16 of 24 motivators and 4 of 10 demotivators as 'not relevant'** to some degree.

The ability to perform human aspect capture is also influenced by how comfortable developers are with sharing data with their managers. Figure 14 sums participants' comfortableness in sharing this data with managers across both motivation and personality. The results show a high variance amongst participants' responses, with a variance of **2.4 for personality and 1.9 for motivation**, with an even spread across all ratings. This indicates that how comfortable participants are with sharing this data is highly spread.

> Participant feedback indicates that our prototype can functionally capture both personality and motivation. However, developers' comfortability with sharing data with their managers shown in varies greatly from one individual to another.

RQ2 – Developers' outcome metrics:

As seen in Figure 15, participants' responses to the effectiveness of our tool in monitoring satisfaction and performance were identical, in part due to the implementation of these components being similar. **18% of participants rated a 5 and 45% rated a 4**. The following were issues raised by participants across both components and could have had a negative impact on these ratings:

- 5-point Likert scale is not granular enough or comprehensive in capturing team outcome metrics
- Scoring is subjective, with no defined criteria
- Scoring is not free from potential bias

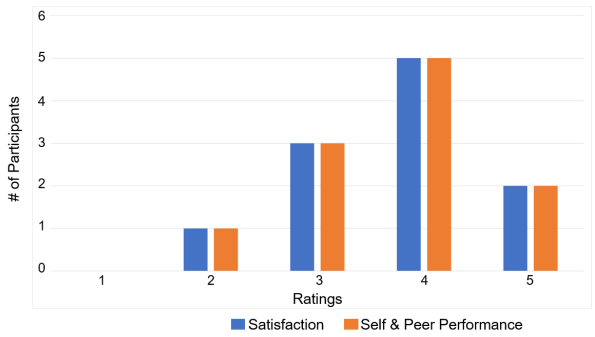

Fig. 15: Team member participant response on developers' outcome metrics monitoring.

Developers' comfortability sharing their responses with managers is similarly a potential roadblock with monitoring developers' outcome metrics. As shown in Figure 16 **45% rated 1 and only 27% rated above a 2**. This indicates that participants were not comfortable with assessing peers' performance and having that data shared with their managers. A focus on further anonymising the data that managers see and educating developers on the usage of this data, potentially through the tool itself, could see an improvement in this rating.

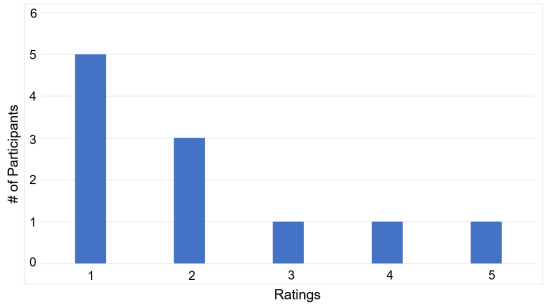

Fig. 16: Participant sharing comfortability of outcome metrics.

> Our results suggest that our tool can functionally capture developers' outcome metrics. However, our prototype tool will likely be ineffective when it comes to peer assessment, as developers do not seem to be comfortable sharing this data with their managers.

RQ3 – Human aspects influence:

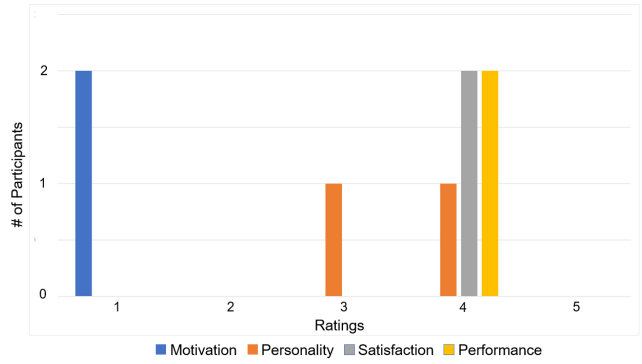

Fig. 17: Manager participant response on the tool for tracking different human aspect influence on RE tasks.

RQ3.1 – *Personality influence on developer's outcome metrics:* Tracking personality influence falls into two requirements, the ability of managers to effectively identify differences in personality and the degree to which managers can take actions based on these personality differences. As shown in Figure 17, the tool's effectiveness in tracking the **influence of personality had 1 manager participant rate 3 and the other rate a 4**.

While both manager participants could effectively identify differences in personality traits, the lower score can be attributed to participants' inability to put this information into action, as many of them did not have any prior knowledge of the personality test. This, combined with the fact that our Jira tool prototype does not currently provide any information on what each personality trait means, resulted in manager participants being able to identify differences in personality but having no understanding of what those differences meant. Tool users must have an understanding of the personality test for this feature to be effective, and how to implement this requirement needs to be further explored.

RQ3.2 – *Motivational influence on developer's outcome metrics:* Similarly shown in Figure 17, both manager participants rated the tool's effectiveness in tracking motivational influence a 1. This is likely due to the first manager participant experiencing a bug while using the Jira tool, which prevented them from properly seeing the info-graphics depicted in Figure 5. However, even after addressing this issue, the participants still rated this component a 1. As such, the current Jira tool does not allow managers to effectively track the influence of motivation, and further research would need to be done to determine the pain points of participants.

RQ3.3 – *Team's Satisfaction and Performance:* As Figure 17 shows both manager participants rated this feature a 4, indicating that the tool was effective at displaying the team's satisfaction and performance with RE tasks. This indicated participants found the tool was effective at displaying the satisfaction and performance of their team. However, our manager participants stated that they would require more information on the reasoning behind these satisfaction and performance scores so that actions could be taken.

> Our results suggest that team members' performance of and satisfaction with RE-related tasks can be well-tracked by managers using our tool. However, impact of team members' task motivation is not well understood, and impact of team members' personality is mixed.

C. Study and Prototype Limitations

Participants interacted with mock Jira issues that were prepared for them in advance. Although this was an efficient way to conduct user testing of our prototype, the results gained from this kind of usage may not be indicative of how teams would use the tool within an actual project. Our participants comprised final-year software engineering students. This may have resulted in some limitations in terms of generalising to industrial practice. Some participants did not have much industry experience and so may not use the tool in the same way an industry professional would. If performance data was made anonymous, it might not be as useful to managers, as they would not know which team members to make positive adjustments for. However, if managers are able to link team members to their motivational data, there is potential for misuse. They could potentially target individual team members and enact negative disciplinary action based on the data collected by the tool. Participant feedback received often did not come with a comprehensive explanation, limiting our ability to make corrective changes to the plugin.

D. Future Work

The personality test used needs to be redesigned to make it faster to complete. Better graphs and visualisations would be added for managers to allow them to make more insights from the collected data. Informative text would be added to assist users on various functions and interpreting the graphs. Access controls are needed to separate team member and manager data access. Needed features include the ability to add motivators and demotivators. For example, team members could record that their laptop was slow, which demotivated them. Porting the plugin to widely used platforms would greatly reduce adoption friction and make the plugin more likely to be used by industry professionals. Performing more extensive user testing with industry teams is needed.

VI. Related Work

Emotimonitor is a tool to capture the emotions of developers working within an agile framework [8]. This is a Trello plug-in that allows developers to rate their emotions on each task they perform and allowed their managers to track their emotions. Our recent systematic literature review (SLR) [6] shows a lack of research that incorporates multiple human aspects and analyses their impact in combination. We found most studies work towards either a theoretical or academic model, strategy or prototype. What may be more beneficial to the industry is a working tool that can be incorporated into real-world RE settings and used by software practitioners. A survey of

111 software practitioners involved in RE activities identified what professionals believe are important human aspects to their success [7]. This found motivation, domain knowledge, attitude, communication skills, and personality as the most significant human aspects. We focused this study on motivation and personality as they have had little research in RE [6].

DeMarco and Lister [13] conducted a survey of software practitioners and found the motivation to be one of the most frequently cited causes for software development project failures. Based on such empirical studies, Sharp et al. [14] developed a general model for the motivation of software engineers called MOCC (Motivators, Outcomes, Characteristics and Context). This describes a direct relationship between software developers' motivation and their outcomes. Since, research has found some factors that MOCC lacked and has tried to close those gaps, such as in [15] and [16].

Although MOCC suggests motivation is a key indicator of outcome, it does not model motivation as the foundational human aspect that impacts developer output. Rather, motivation is itself influenced by individual characteristics, mediated by individual personality and organizational factors [17]. This suggestz that if performance and productivity of developers are predictable from their motivation, it might ultimately be a result of their personality. Soomro et al. [18] identified this in their SLR, analyzing 35 such studies focusing on the correlation between personality and performance. They report extraversion as having the strongest influence on a software engineer's performance.

Despite the many years of literature demonstrating the impact of motivation and personality on developer outcome, we found no study evaluating a tool that can assist software practitioners in monitoring these human aspects and their impact on RE tasks. This may relate to the qualitative nature of human aspects, as McConnel [19] succinctly highlights: *"Motivation is a soft factor: It is difficult to quantify and [hence] often takes a back seat to other factors that might be less important but easier to measure."* Nevertheless, software managers in the industry should set up processes and a working environment taking into consideration the human aspects of the team if they want to drive positive outcomes.

VII. Summary

We prototyped a novel Jira plugin, *Motive Metrics*, capable of capturing, processing and presenting data relating to team members' personality and motivation and their impact on satisfaction and performance when undertaking RE-related tasks. Our user evaluation shows that *Motive Metrics* is able to capture the above data and may assist managers in analysing team performance. However, team members were not very comfortable sharing such data with their managers. *Motive Metrics* has the potential to be a useful tool for industry professionals in understanding how their team's personality and motivation impact their satisfaction and performance.

Acknowledgments

Hidellaarachchi is supported by Monash Faculty of IT PhD scholarships. Grundy is supported by ARC Laureate Fellowship FL190100035.

References

[1] R. E. D. F. Pierre Bourque, *Guide to the Software Engineering Body of Knowledge (SWEBOK)*. IEEE Computer Society, 2014.

[2] D. Pandey, U. Suman, and A. Ramani, "An effective requirement engineering process model for software development and requirements management," pp. 287 – 291, 11 2010.

[3] J. Verner, S. Overmyer, and K. McCain, "In the 25years since the mythical man-month what have we learned about project management?," *Information and Software Technology*, vol. 41, no. 14, pp. 1021–1026, 1999.

[4] D. Pandey and V. Pandey, "Importance of requirement management : A requirement engineering concern," *International Journal of Research and Development - A Management Review (IJRDMR)*, vol. 1, pp. 2319–5479, 06 2012.

[5] J. Siddiqi and M. Shekaran, "Requirements engineering: The emerging wisdom," *IEEE Software*, vol. 13, pp. 15–19, 03 1996.

[6] D. Hidellaarachchi, J. Grundy, R. Hoda, and K. Madampe, "The effects of human aspects on the requirements engineering process: A systematic literature review," *IEEE Transactions on Software Engineering*, vol. 48, no. 6, pp. 2105–2127, 2022.

[7] D. Hidellaarachchi, J. Grundy, R. Hoda, and I. Mueller, "The influence of human aspects on requirements engineering-related activities: Software practitioners' perspective," *ACM Trans. Softw. Eng. Methodol.*, jun 2022. Just Accepted.

[8] M.-A. A. El-Migid, D. Cai, T. Niven, J. Vo, K. Madampe, J. Grundy, and R. Hoda, "Emotimonitor: A trello power-up to capture and monitor emotions of agile teams," *Journal of Systems and Software*, vol. 186, p. 111206, 2022.

[9] J. A. Johnson, "Measuring thirty facets of the five factor model with a 120-item public domain inventory: Development of the ipip-neo-120," *Journal of Research in Personality*, vol. 51, pp. 78–89, 2014.

[10] P. J. Kajonius and J. A. Johnson, "Assessing the structure of the five factor model of personality (ipip-neo-120) in the public domain," *Europe's Journal of Psychology*, vol. 15, pp. 260–275, Jun. 2019.

[11] S. Beecham, N. Baddoo, T. Hall, H. Robinson, and H. Sharp, "Motivation in software engineering: A systematic literature review," *Information and Software Technology*, vol. 50, no. 9, pp. 860–878, 2008.

[12] A. Barua, "Methods for decision-making in survey questionnaires based on likert scale," *J Asian Sci Res*, vol. 3, pp. 35–38, 01 2013.

[13] J. Zec, "Peopleware: Productive projects and teams," *Software quality professional*, vol. 4, no. 2, p. 38, 2002.

[14] H. Sharp, N. Baddoo, S. Beecham, T. Hall, and H. Robinson, "Models of motivation in software engineering," *Information and Software Technology*, vol. 51, 01 2009.

[15] C. França, F. Q. B. da Silva, and H. Sharp, "Motivation and satisfaction of software engineers," *IEEE Transactions on Software Engineering*, vol. 46, no. 2, pp. 118–140, 2020.

[16] A. C. C. França, F. Q. da Silva, A. de L.C. Felix, and D. E. Carneiro, "Motivation in software engineering industrial practice: A cross-case analysis of two software organisations," *Information and Software Technology*, vol. 56, no. 1, pp. 79–101, 2014. Special sections on International Conference on Global Software Engineering – August 2011 and Evaluation and Assessment in Software Engineering – April 2012.

[17] A. Furnham, A. Eracleous, and T. Chamorro-Premuzic, "Personality, motivation and job satisfaction: Hertzberg meets the big five," *Journal of Managerial Psychology*, vol. 24, pp. 765–779, 11 2009.

[18] A. B. Soomro, N. Salleh, E. Mendes, J. Grundy, G. Burch, and A. Nordin, "The effect of software engineers' personality traits on team climate and performance: A systematic literature review," *Information and Software Technology*, vol. 73, pp. 52–65, 2016.

[19] S. Mcconnell, "Problem programmers," *Software, IEEE*, vol. 15, pp. 128, 127, 126, 04 1998.