Software Engineers’ Perceptions of Factors in Motivation

The Work, People, Obstacles

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Abstract – Recent research suggests that the motivating factors in software engineering are evolving and that our current understanding of motivation in software engineering might be out of date. This paper presents an analysis of semi-structured interviews with 13 professional software engineers. The data suggests that ‘the work’ continues to be enjoyable and that ‘people’ are important, but that ‘obstacles’ really sap the energy of software engineers.

Keywords: Motivation, Software Development, Professional Software Engineers

I. INTRODUCTION

Motivation has been reported as having an impact on productivity [9], software quality [3], and the overall success of the project [7]. Motivation has also been commonly cited as a cause of software development project failure [4].


França et al. [5] identified 8 additional motivators (team quality, creativity/innovation, fun, professionalism, having an ideology, non-financial benefits, penalty policies, good relationship with users/customer), while also stating that two of the original motivators from the Beecham et al. [2] study were not present (appropriate working conditions, sufficient resources). França et al. [5] identified one additional de-motivator from the reviewed literature (task complexity). In both systematic reviews, the frequency reported for each motivator or de-motivator varied across the different studies.

The addition of 8 motivators and 2 de-motivators supports claims that the motivation of software engineers has evolved since the majority of research was conducted [11], and suggests that motivation will continue to change as the discipline evolves, necessitating further research.

This paper presents the data from recent interviews with software engineers that explored their perceptions of factors in motivation.

II. RESEARCH METHOD

Motivation is a collection of internal processes [1] which makes it difficult to observe directly. Investigating motivation requires the elicitation of state of mind information from participants. We used semi-structured interviews in order to engage participants with the subject while eliciting their own experiences, reflections and stories in their own terms. The questions avoided the use of terminology from the motivation literature.

Data was collected during one-to-one interviews with the participants at their workplace. All of the interviews followed the same format with a framework of initial questions. The questions were open so that they did not lead participants towards specific responses. Interviews were audio recorded, and field notes were taken. A pilot study had been conducted previously to evaluate the protocol. The interviews lasted as long as it took for the participants to answer all questions, there was no time limit and the duration of each interview ranged from 24 minutes to 72 minutes.

After the interviews were conducted the participants were asked to complete a computer-based personality inventory, which they all completed within two weeks.

The personality inventory was composed of questions from the International Personality Item Pool (IPIP) proxy for Costa and McCrae’s NEO-PI-R domains [6]. Each question ranged from Very Accurate to Very Inaccurate on a 5 point single selection likert scale. The same questions have been administered in the same order to over 3.6 million people via the myPersonality project [8].

A. Interview Questions

The initial questions used for each interview were divided into three topics: demographic information, motivation factors, and the feedback they receive. The researcher also posed follow-up questions for elaboration or clarification.

The initial questions concerning motivation factors are shown below in the order in which they were asked:

1. On any of your recent work – tell me what you enjoyed about it!
2. What encourages you to go that ‘extra mile’ at work?
3. What about any of your recent work that you didn’t enjoy as much?
4. Is there something that really saps your energy at work?
5. Is there a part of being a software engineer that you prefer doing over other aspects?
6. What about other aspects of your role, what do you like doing least?
7. So it’s Wednesday morning, middle of the week. You’ve just woken up, what makes you get up and go to work as a software engineer?

This paper will focus on the demographic information, the motivation factors, and the personality inventory results.
III. PARTICIPANT PROFILE

This section presents the overall profile of the participants, based on a description of their workplace, their demographics and their personality inventory scores.

A. Participant Workplace

The participants are all full-time employees of the Red Gate (www.red-gate.com) software company. Red Gate is based in Cambridge and employs around 200 people, including 29 software engineers. Red Gate creates “ingeniously simple” products and specialises in MS SQL Server, Oracle, .NET and email archiving tools.

B. Demographics

The 13 participants are software engineers whose primary role is to develop code. They vary in their experience, ranging from 6 months to 24 years and the time they’d been at Red Gate varied between 6 weeks and 5 years. All of the participants were male. All of the participants have a degree, and 12 of those 13 degrees were in computer science or a very similar subject.

All of the participants were members of 6 different teams within Red Gate, and each team adopted an agile approach to software development, although the level of adoption varied between teams. Most of the software engineers were typically part of small development teams of 3-6 engineers.

C. Personality Inventory

Figure 1 displays the mean scores and standard deviation for the 13 participants and for 130 people who completed the myPersonality assessment and stated their job title as “software engineer”. The myPersonality data was filtered so that only participants who had completed the same 100 questions and who had also only attempted to complete the personality assessment twice were included in this analysis. This was to ensure parity in the data and to exclude respondents who may have tried to idealise their results.

![Figure 1. Personality Comparison Chart](image)

This comparison provides evidence to suggest that the 13 participants are representative of the population of software engineers.

IV. RESULTS

This section describes the analysis of the interviews briefly and presents the results.

The audio recordings of the interviews were transcribed and the analysis was conducted question-by-question. The analysis per question was inductive, identifying emergent themes related to motivation strictly on the bases of what was evident in the data.

The results presented below show the number of individual participants who discussed each theme in response to each question. Some participants raised the same theme multiple times per question, but the data presented focuses on themes from each participant rather than the occurrences of each theme.

A. Motivation Factors

This section presents highlights from the analysis of the responses to each of the motivation factor questions in turn.

![Figure 2. Question 1 Themes](image)

**Question 1 (Figure 2) on any of your recent work – tell me what you enjoyed about it:** ‘Work that is useful’ was the most frequent theme to emerge from responses of 7 of the 13 participants, with responses including “most rewarding things that I’ve found from software have been seeing people use what I’ve written and finding it useful solving problems, so when both of those happen it’s amazing” and “seeing something that you’ve built be part of something that’s just solved someone’s problem and make their world a better place and save them some time or cash or whatever, I think that’s the, that’s the really cool thing. You know it’s to see other people go wow”.

Another frequent theme (5/13) was producing good software, and this included improving on previous software; “removing or at least changing this horrible code and putting something nice and shiny in instead”. Solving problems was a third frequent theme (5/13), e.g.: “Solving the problems is good fun, so finding nice solutions, discussing them, realising they’re [not so good] and finding better solutions”.

![Figure 3. Question 2 Themes](image)

**Question 2 (Figure 3) what encourages you to go that ‘extra mile’ at work:** ‘The work’ was discussed by 6 of the 13 participants, e.g.: “I think it’s just the combination of
enjoying writing the code knowing that what you're producing is going to be cool” and “it's that thought that we're going to produce this product to a good standard and we're going to get it out when we said we're going to.”

‘Company culture’ was illustrated by one participant stating “I'm still reasonably inclined if not more so to actually put in the effort here where it's needed…” “…because of the way that Red Gate generally operates in that there is a lot of flexibility, I know that for example if it's slightly more quiet time of the project, or even if it isn't, if I need to go out in the afternoon for a house viewing or something like that then there's not a problem.”

**Question 3 (Figure 4)** what about any of your recent work that you didn't enjoy as much: ‘Obstacles’ (7/13) was a frequent theme. One participant encapsulated obstacles concisely with “your job as a software engineer is to write code and to write good code and things that make it hard are where other things get in the way”, and another participant stated “anywhere where again there are outside obstacles or be it systems that are not directly under your control which are operating badly or worked and you didn't touch anything and then they stopped working.” ‘Obstacles’ emerged as a theme from participants responding with different obstacles that got in the way of their work.

**Question 4 (Figure 5)** is there something that really saps your energy at work: ‘Obstacles’ was a frequent theme in response to question 4. ‘Obstacles’ included a range of factors including a poor code base “when you've got a large complicated poorly written code base and you have to add some small feature to it and you think well this shouldn't take very much time and it's just taking forever”, lack of project direction “not really knowing where you should be going and no one setting it is always a challenge” and complicated contingencies “like you fix something, and something else over here breaks so you fix that and it just keeps on going round and it's horrendous.”

**Question 5 (Figure 6)** is there part of being a software engineer that you prefer doing over other aspects: Some participants (4/13) enjoyed the ‘variety’, explaining “I have a variety of quite different things that I enjoy doing” and “I enjoy that I write code at all levels of the stack and that I do the testing and the development and I go off and talk to sort of essentially people who care about the product and get the requirements.”

**Question 6 (Figure 7)** what about other aspects of your role, what do you like doing least: While a few participants (3/13) stated that they did not have a non-preference “there's no particular bit that I dislike”, and some of the participants did not answer the question, each of the others gave a different response. The participants appeared to struggle to answer question 5 and question 6, and they were suitably deemphasised as further investigation is required.

**Question 7 (Figure 8)** what about other aspects of your role, what do you like doing least: While a few participants (3/13) stated that they did not have a non-preference “there's no particular bit that I dislike”, and some of the participants did not answer the question, each of the others gave a different response. The participants appeared to struggle to answer question 5 and question 6, and they were suitably deemphasised as further investigation is required.
Question 7 (Figure 8) so it’s Wednesday morning, middle of the week. You’ve just woken up, what makes you get up and go to work as a software engineer: The participants provided a range of reasons that get them up in the morning. ‘Avoiding being fired’ and ‘enjoy it’ are very contrasting responses. Seven participants said they had work to continue “it’s because I’ve left something in an incomplete point, I quite want to finish it” and “Typically because on Tuesday you left something in that isn't finished yet.”

Six participants discussed making something; “I get to create something that's useful and it's used by lots of people to help get their jobs done” and “when I go to work I've made something by the end of the day.”

V. Discussion

‘The work’ is the most frequent theme emerging from responses to the questions investigating the enjoyable and potentially motivating areas of software. It appears in responses to three of the four questions (question 1, 2 and 7). It corresponds to the most commonly reported motivator in the original systematic literature review, “technically challenging work” [2], although not exactly, as participants in this study also discuss ‘the work’ as being interesting, useful, and enjoyable which is not explicitly technically challenging work.

‘Obstacles’ is the most frequent theme emerging from responses to the questions investigating the less enjoyable and potentially de-motivating areas of software engineering. It appears in responses to questions 3, 4 and 6, and encompasses a range of different factors including being disrupted during work, being held back by other team members, lack of direction during a project, and dealing with poorly written code. ‘Obstacles’ emerged as a theme from these different factors as the participants discussed them as things that get in the way of the work. ‘Obstacles’ per se do not appear in the systematic literature review by Beecham et al. [2] or the systematic literature review update [5], but some factors that may be considered ‘obstacles’ do, for example poor communication and poor management. ‘Obstacles’ hamper the motivational potential of ‘the work’, but are not necessarily de-motivators, per se.

‘People’ was identified as a frequent theme, being discussed by 8 of the 13 participants across all the questions. Previous work presented at ESEM ’2010 [10] also identified ‘people’ as a common motivator, with 13 of the 15 participants in the study including ‘people’ in their responses. The higher incidence in the previous study [10] could be because the data was collected from self-selecting participants whereas the data in this study was collected in-situ with software engineers at their workplace.

A. Limitations

The software engineers in this study were shown by their personality scores to be representative of the wider software engineer community, but they all work in the same organisation and this might influence their perception.

Given the low number of participants and data from one company, the results can only be taken as indicative.

B. Future Work

One future research direction could be to repeat the study with a different group of software engineers from a different environment or a range of environments, in order to consider the impact of environment on perceptions of motivation.

‘The Work’ is the most commonly reported motivation factor in the literature [2], but ‘obstacles’ is not present within the reviewed literature. With 11 of the 13 participants stating that ‘obstacles’ sap their energy, it is clear that this theme requires further investigation, in order to establish whether ‘obstacles’ are perceived in other contexts, and if so what impact they may have on motivation or de-motivation.

Another possible future research direction would be to investigate the importance of ‘people’, and to identify what it is about ‘people’ that is important, with possibilities including the interaction, the collaboration, or the feedback that occurs.

Future work should also focus on connecting this research to major research in psychology and sociology.

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References


