

Ramp-up Journey of New Hires:

Do strategic practices of software companies influence productivity?

Ayushi Rastogi
IIIT-Delhi, India
ayushir@iiitd.ac.in

Suresh Thummalapenta
Microsoft Corporation,
Redmond, USA
suthumma@microsoft.com

Thomas Zimmermann
Microsoft Research,
Redmond, USA
tzimmer@microsoft.com

Nachiappan Nagappan
Microsoft Research,
Redmond, USA
nachin@microsoft.com

Jacek Czerwonka
Microsoft Corporation,
Redmond, USA
jacekcz@microsoft.com

ABSTRACT

Software companies regularly recruit skilled and talented employees to meet evolving business requirements. Although companies expect early contributions, new hires often take several weeks to reach the same productivity level as existing employees. We refer to this transition of new hires from novices to experts as *ramp-up journey*. There can be various factors such as lack of technical skills or lack of familiarity with the process that influence the ramp-up journey of new hires. The goal of our work is to identify those factors and study their influence on the ramp-up journey. We expect the results from this study to help identify the need of various types of assistance to new hires to ramp-up faster. As a first step towards our goal, this paper explores the impact of two strategic practices, namely distributed development and internship on the ramp-up journey of new hires. Our results show that new hires in proximity to the core development team and new hires with prior internship experience perform better than others in the beginning. In the overall ramp-up journey, the effect of the two factors attenuates, yet nevertheless better compared to their counterparts. Product teams can use this information to pay special attention to non-interns and use better tools for distributed, cooperative work to help new hires ramp-up faster.

Keywords

Ramp-up; new hires; software developers.

1. INTRODUCTION

‘Software developer’ jobs were reported as best jobs in 2013 with an expected growth rate of 30% by 2020 [1]. Software companies constantly strive for recruiting skilled and talented employees to meet the ever-increasing workforce requirement and to compete in the fast evolving global mar-

ket. These new hires range from fresh college graduates without any prior industry experience to professional developers with several years of experience. Although companies expect early contributions from new hires, they often take several weeks to attain the same productivity level as existing employees [2]. We use the term *ramp-up journey* to refer to this journey of new hires from novice to experts. There are various reasons why the ramp-up journey spans up to several weeks. In case of college graduates, despite extensive curricula, there are still gaps between what graduates learn in college and what they need to know to be productive in a typical work environment [3] [4]. Furthermore, companies vary in practices and processes which also impacts the ramp-up journey. The goal of our work is to identify such aids and impediments and make recommendations that reduces the time to ramp-up of new hires. Some of our findings may already be known in the industry, however, there exists no empirical evidence drawn from a systematic analysis of software engineering data. We believe that product teams can use the results from this study to adopt best practices.

As a first step towards our goal, in this paper, we explore the impact of two strategic practices—distributed development and internships—on the ramp-up journey of new hires. We chose these two practices due to their widespread adoption by software companies. First, companies adopted distributed development as a strategic response to increasing concerns such as skill set unavailability, acquisitions, and government restrictions [3]. However, distributed development has its own challenges such as restricted and delayed communication, and less shared project awareness. Owing to these challenges, it is interesting to understand the influence of distributed development on the ramp-up journey of new hires. In particular, we are interested in studying how proximity to the core of a team in a distributed-development environment influences the ramp-up journey of a new hire. Second, companies make huge investments in internship programs. For example, analysis of different product groups at Microsoft suggested that between 7 and 26% of new hires in those groups had prior internship experience at Microsoft. Apart from giving industry exposure to students, companies view internship programs as a means to identify prospective employees and assess their strengths in real workplace situations [5]. Given its significance, we plan to understand whether new hires with prior internship experience ramp-up faster than others.

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from permissions@acm.org.

ISEC '17, February 05-07, 2017, Jaipur, India

© 2017 ACM. ISBN 978-1-4503-4856-0/17/02...\$15.00

DOI: <http://dx.doi.org/10.1145/3021460.3021471>

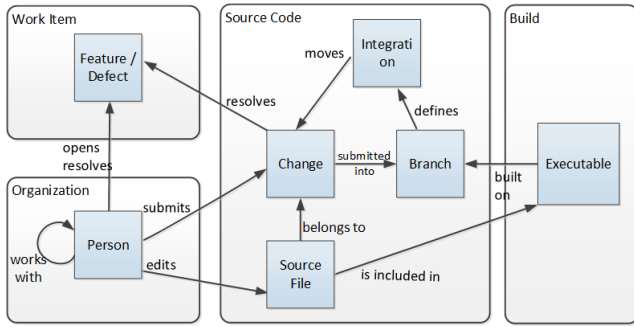


Figure 1: Data collected by Codemine

To study the impact of these two practices on the ramp-up journey of newly hired software developers, we quantitatively analyzed the software engineering data of code check-ins in version control systems along with the employee information data of eight large, popular product teams at Microsoft. We used code check-ins as a measure of productivity, since every software developer is expected to write code to either develop new features or make bug fixes, and all changes are checked-in into version control systems. We examined check-ins in the master branch that will be part of final product. In particular, we measured two aspects of code check-ins. First, we measured the amount of time taken to make the first code check-in. The first check-in is an important milestone in the ramp-up journey, since it indicates that a new hire has gained working knowledge of the engineering system. Second, we measured the ramp-up time that represents the time taken by new hires to reach the same productivity level as existing employees. Specifically, we measured productivity in terms of three metrics representing different granularities of observation: frequency of check-ins, lines of code changed and the number of files changed. We examined the frequency of check-ins as being indicative of the familiarity with the process followed by different product teams. However, frequency of check-ins alone may not help in analyzing effort and span of knowledge required by new hires to achieve the development tasks at hand. Therefore, we examined other metrics related to source code: lines of code changed and the number of files changed. Lines of code changed serves as an indicator of the effort spent by new hires and the number of files changed indicates the breadth of the knowledge of the project acquired by new hires. These measures, that is, check-in counts, lines of code changed, and files changed have also been used in literature to measure developer’s contribution [11] [12]. We expect that these measures translate to a reasonable degree of proficiency around the product and the code base.

To the best of our knowledge, our study is the first to measure the impact of these two strategic practices on the ramp-up journey of new hires. Although there exists prior work that explored the impact of distributed development on software quality [3], its influence on the ramp-up journey of new hires is not analyzed. Similarly, the impact of internship on the ramp-up journey of new hires is not investigated.

Our results indicate that proximity to the core team and internship experience influences the time required to make first check-in. We found that new hires working close to the core team or who had prior internship experience tend to take less time for making the first code check-in compared

Table 1: Start-end dates of the product releases under analysis

Products	Start Date	End Date
Azure	2011-01-01	2013-12-31
Bing	2009-12-30	2013-11-12
Exchange	2010-10-01	2013-08-31
Office	2011-09-01	2013-08-31
SQL Server	2009-07-01	2012-03-06
Windows	2009-10-22	2013-07-01
Windows Phone	2010-07-03	2014-02-03
Windows Server	2009-10-22	2013-07-01

to others. The influence of the two practices decreases as the ramp-up journey progresses. Nevertheless, they perform better than their counterparts. In our future work, we plan to extend our study to include a wide variety of factors such as impact of prior industrial experience, etc. We expect that the results from this study will help identify the various types of assistance that may help improve the ramp-up journey of new hires. Further, identifying the best practices per product team using the quantitative measures presented in this study may help other product teams in easy adoption.

2. BACKGROUND

CodeMine [10] provides a data collection framework for all major Microsoft development teams. It collects information from version control systems and stores data about changes, sources, branches, and code integrations in a normalized schema. CodeMine also stores data about builds, work items, and organizational data. After normalization into a common schema (see Figure 1), CodeMine creates relationships between different artifacts. For example, CodeMine associates work items with source changes to capture the fact that a change was made in response to a work item. Similarly, CodeMine associates builds and source code to capture which changes appeared for the first time in a particular build. Once the relationships are built, CodeMine exposes all collected and interpreted data as a service. As a consequence, CodeMine is ideal for learning about the practices used across teams and for developing a set of metrics that can be used to characterize product development events and trends.

3. METHODOLOGY

We conducted quantitative analysis on the version control system data and employee information stored in CodeMine [10]. We analyzed data corresponding to the recent releases of eight large, popular product groups at Microsoft: Azure, Bing, Exchange, Office, SQL Server, Windows, Windows Phone, and Windows Server. Table 1 presents the duration of releases of all products that were analyzed in our study. To identify new hires for the study, we identified all employees in the software development role who joined Microsoft as full-time employees (FTEs) during the periods specified in Table 1. This also included employees who worked with the company as interns or vendors and converted to full-time positions. We consider the rest of the employees engaged in software development in each product team as existing employees.

To study the impact of distributed development, we classified all new hires into two categories: employees hired within United States (US) and employees hired in the rest of the countries (Non-US). In Microsoft, bulk of developers for all

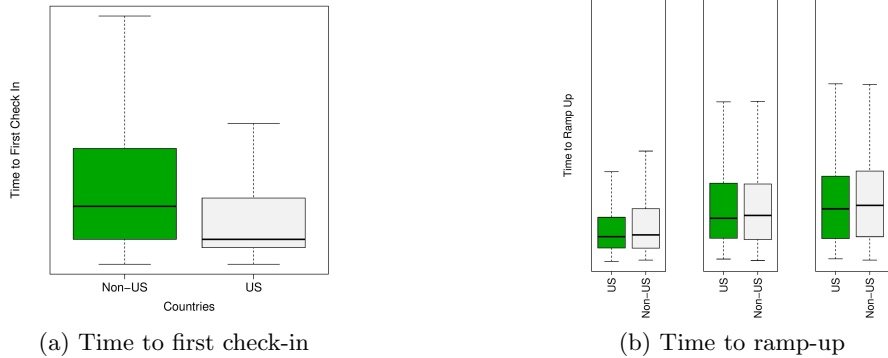


Figure 2: Impact of proximity to core team on the ramp-up journey of new hires

product teams are in the US. Therefore, the preceding classification helps us understand the differences in the ramp-up journey when new hires are in proximity to the core team. Similarly, to study the impact of internships, we classified all new hires into two categories: employees who had prior internship experience at Microsoft (Interns) and others (Non-Interns).

For each new hire, we measured the following: the *time to first check-in* as duration from the joining date of an employee to the date on which the employee makes first code check-in into the version control system. To measure the ramp-up time, we first created a baseline for each team in terms of three metrics: frequency of check-ins, lines of code changed, and the number of files changed. To create the baseline, we identified peer employees for each new hire as existing employees who work on the same product as the new hire. We calculated baseline as the median frequency of check-ins, lines of code changed, and the number of files changed by peer employees. For each new hire, we computed the *time to ramp-up* for each metric by calculating the duration it takes for the new hire from the joining date to the date on which the new hire reached the baseline for that metric.

We plot the results for the new hires in US and Non-US to study the impact of distributed development. We also plot the results for the Interns and Non-Interns to study the impact of internship.

4. ANALYSIS RESULTS

4.1 Does proximity to core team influences the ramp-up journey of new hires?

Figures 2a and 2b show the ramp-up journey of new hires with respect to the time to first check-in and ramp-up time respectively. We present the box and whisker plot where the horizontal axis shows the geographical location ('US' and 'Non-US') and the vertical axis shows the time. The unit of time is normalized in the study to anonymize results for confidential reasons.

In Figure 2a, the percentage decrease in the median time to first check-in for new hires in 'US' relative to the new hires in 'Non-US' is $\approx 57\%$ when measured in weeks. Thus, new hires in the 'US' make early first check-in compared to new hires in the 'Non-US'. Similarly, in Figure 2b, the percentage decrease in the median time to ramp-up for the new hires

in 'US' relative to the new hires in 'Non-US' on check-in counts, lines changed and files changed is $\approx 8\%$, $\approx 6\%$ and $\approx 4\%$ respectively measured in weeks. This implies that the three metrics used to measure the ramp-up time, i.e., check-in counts, lines of code changed, and the number of files changed show only a marginal difference in the median ramp-up time among new hires in 'US' and 'Non-US'. New hires in 'US' takes marginally less time than their 'Non-US' counterparts.

Other than the median, there exists a significant difference in the time to first check-in between 'US' and 'Non-US' new hires (as quartiles in Figure 2a). However, the difference is marginal in the case of time to ramp-up (refer Figure 2b). Our observations suggest that proximity to the core team does help the new hires in the beginning, however, the effect decreases in the overall ramp-up journey.

4.2 Does internship influences the ramp-up journey of new hires?

Figures 3a and 3b show the impact of internship on the ramp-up journey of new hires. In these figures, the horizontal axis shows the engagement of new hires as 'Interns' vs. 'Non-Interns', whereas, the vertical axis shows the time to first check-in and the ramp-up time, respectively. The unit of time is anonymized and is in weeks.

In Figure 3a, the median time to first check-in reduces by $\approx 33\%$ for 'Interns' relative to 'Non-Interns' when measured in weeks. New hires who had a prior internship experience at Microsoft tend to make early first check-in compared to other new hires. In Figure 3b, the percentage decrease in the time to ramp-up for 'Interns' relative to 'Non-Interns' on check-in counts, lines changed and files changed is $\approx 10\%$, $\approx 6\%$, and $\approx 5\%$ respectively. Thus, interns ramp-up faster compared to non-interns, however, the time difference is marginal compared to the time to first check-in (refer Figures 3a and 3b). We observe similar patterns for other quartiles.

Our observations indicate that familiarity with people, process, and product acquired during the internship indeed influences the time to first check-in. However, the effect attenuates in the long run as non-interns only take marginally longer to ramp-up than their counterparts. This observation implies that among other factors, internship experience does help new hires to ramp-up faster.

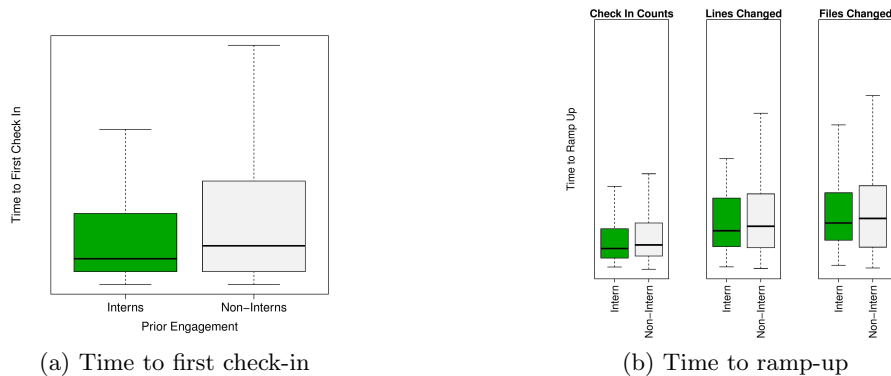


Figure 3: Impact of internship on the ramp-up journey of new hires

5. RELATED WORK

There exists a large body of research that suggests change in university curricula to ease integration of college graduates into companies. Begel and Simon [6] conducted qualitative analysis and reported that inexperience with the corporate environment induces problems for university graduates. Further, Sim and Holt [7] identified patterns in which new hires familiarized themselves with the team and discussed its impact on ramp-up. Raderwacher and Walia conducted a systematic literature review to identify the most common areas of deficiency in university graduates from academia or industry job perspectives [13].

Another class of research, examines the influence of team practices on the productivity of new hires. Dagenais et al. [8] emphasized the role of mentor and good documentation on the productivity of new hires. Ostroff et al. [9] observed that new hires with mentors have a better understanding of the organizational issues and practices. While these studies look into team practices and curricula to study their influence on the productivity of new hires, they do not explore the comprehensive list of factors that might influence the ramp-up journey of new hires. This study is a first step towards our long-term vision of identifying various factors that serves as aids and impediments in the ramp-up journey of new hires.

6. THREATS TO VALIDITY

6.1 Internal Validity

- *Data accuracy:* The accuracy of the results of this study depends on the accuracy of the data on which it is built, e.g., some data may be missing or incomplete. We believe that this is only a minor threat. For the study, we used the CodeMine tool, which attempts to capture software development activities as accurately and completely as possible. Several production systems at Microsoft are built on top of CodeMine and its accuracy has been extensively verified.

6.2 Construct Validity

- *Activities in other product groups:* We analyze commits in the eight product groups, which constitute a vast majority of the Microsoft workforce. We do not capture contributions in other product groups, if any.

- *Activities other than code check-ins:* New hires engage in a wide variety of activities other than code check-ins. This may influence the observed time to first check-in and the time to ramp-up.

6.3 External Validity

- *Application of results to product divisions within and outside Microsoft:* We analyzed eight large, popular product teams, which constitute the majority of Microsoft’s engineering workforce. We, therefore, believe that the results are widely applicable to product divisions in Microsoft. We do not claim that the findings and recommendations presented in this study extend to any organization and product team. While findings may not generalize, the research methodology can be applied to other contexts as long as there are sufficient data points to compute a baseline productivity of existing employees.

7. CONCLUSION

We studied the influence of two strategic practices—distributed development and internships—on the ramp-up journey of new hires by quantitatively analyzing the software engineering data of eight large, popular product groups at Microsoft. We observe that new hires in proximity to the core team or with prior internship experience tend to make early first check-in, an important milestone in the ramp-up journey indicating the familiarity with the engineering system. However, in the overall ramp-up journey, the impact of these factors subsides. Product teams can use this information to help new hires ramp-up faster. Nevertheless, they positively influence ramp-up journey.

It is to be noted that we do not claim causality in this study. Future studies should dig deeper into the factors like influence of interns working with the same product or others, cultural differences, etc. in attempt to completely explain ramp-up journey.

8. ACKNOWLEDGMENTS

We would like to offer our special thanks to Christian Bird, Michaela Greiler, Trevor Carnahan, and Fei Huang for reviews, and Alok Bhayana for the data.

9. REFERENCES

- [1] <http://www.forbes.com/sites/jacquelynsmith/2013/04/04/the-25-tech-companies-hiring-the-most-right-now/>.
- [2] Survey Identifies Greatest Challenges When Starting a New Job, <http://accountemps.rhi.mediaroom.com/new-job-challenges>, [Online; accessed 11-March-2015].
- [3] C. Bird, N. Nagappan, P. Devanbu, H. Gall and B. Murphy, "Does distributed development affect software quality?: an empirical case study of Windows Vista", in *Communications of the ACM*, 2009, 52(8), 85-93.
- [4] E. Brechner, Things they would not teach me of in college: what microsoft developers learn later, in *Companion of the 18th annual ACM SIGPLAN conference on Object-oriented programming, systems, languages, and applications*. ACM, 2003, pp. 134-136.
- [5] http://articles.economictimes.indiatimes.com/2014-05-23/news/50055346_1_interns-hsbc-india-citi-india.
- [6] A. Begel and B. Simon, "Struggles of New College Graduates in their First Software Development Job", in *SIGCSE*, Portland, Oregon, USA, 2008.
- [7] S. E. Sim and R. C. Holt, "The ramp-up problem in software projects: a case study of how software immigrants naturalize", in *Software Engineering*, 1998.
- [8] B. Dagenais, H. B. R. K. E. Ossher and M. P. Robillard, "Moving into a New Software Project Landscape", in *ICSE*, 2010.
- [9] C. Ostroff, "The Role of Mentoring in the Information Gathering Processes of Newcomers during Early Organizational Socialization", in *Journal of Vocational Behavior*, 1993.
- [10] J. Czerwonka, N. Nagappan, W. Schulte and B. Murphy, "CODEMINE: Building a Software Development Data Analytics Platform at Microsoft", in *IEEE Software*, 2013.
- [11] G. Robles, S. Koch, J. M. González-BARAHONA, J. Carlos, "Remote analysis and measurement of libre software systems by means of the CVSAly tool" in *Proceedings of the 2nd ICSE Workshop on Remote Analysis and Measurement of Software Systems (RAMSS)*, 2004, May.
- [12] A. Alali, H. Kagdi, J. I. Maletic, "What's a typical commit? A characterization of open source software repositories" in *Program Comprehension*, 2008, June. The 16th IEEE International Conference on (pp. 182-191). IEEE.
- [13] A. Radermacher and G. Walia, Gaps between industry expectations and the abilities of graduates, in *Proceeding of the 44th ACM technical symposium on Computer science education*. ACM, 2013, pp. 525-530.