

On the Influence of Release Engineering on Software Reputation

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Abstract—A successful release engineering should allow for a fast and controlled release process. Consequently, shipping features earlier than competitors or avert damages more quickly might be beneficial for a software's reputation.

In this paper, we investigated the influence of release engineering on the user's perception of software. To this end, we analyzed the release engineering practices and market shares of web browsers. We found indications that a reasonable application of release engineering is beneficial for the software's reputation. However, flaws in the implementation, as well as an inadequate communication of introduced changes, effects the reputation negatively.

I. INTRODUCTION

Release engineering is often underestimated and not valued as a significant part of software engineering. Small teams developing a small application might not need a sophisticated release process. However, when the software grows in complexity and more people get involved in its development, a defined release process is required [1]. This means that a company, first, has to put some effort in establishing this process, and, second, has to have personnel dedicated to release engineering. These visible costs often retain managers to perform elaborate release engineering.

In order to convince managers to invest into proper release engineering, we need more than just the usual, often technical, arguments. An improved reputation of the product due to a methodical release engineering, might be one of those arguments; as product releases are the changes visible to the user. Therefore, we investigate whether a successful release engineering indeed has a positive effect on the user's perception of a software and its reputation.

Examining this research question, we encounter two obstacles: First, release engineering is tightly coupled to the software engineering process and the product itself. Thus, extracting the factors that influence the software reputation is next to impossible. Second, the term reputation depends on its context and, obviously, has a subjective nature. Based on the term's definition given by the Oxford English Dictionary [2], our understanding of *software reputation* is: "An opinion of a software product that is shared by a group of people". Still, it is difficult to determine a software's reputation as it is a result of a complex and subjective evaluation process over

a longer period of time. Moreover, it may vary depending on the background of the observed group.

With this in mind, we conducted a case study on web browsers and their market share. Here, on one hand, the reason is that both Google and the Mozilla Foundation (hereafter referred to as Mozilla) recently changed their release process for their web browsers Chrome and Firefox [3], [4]. On the other hand, there is publicly available market share data for a longer period of time. For this study, we reduced the term software reputation to the market share of the web browsers.

In this paper, we will present the methodology and results of our study in section II. Then, in section III, we discuss the results of the study and future work. Finally, we conclude this paper in section IV.

II. CASE STUDY

Web browsers seem to be suitable for our study. On one hand, they are used by almost any computer user, and thus, their market share is distributed over a large number of users. On the other hand, web browsers are neither a niche product, nor do they have exceptional requirements like, for example, safety-critical applications do.

In 2010 and 2011, Google and Mozilla replaced their traditional release cadence by a *rapid-release cycle* for their web browsers Chrome and Firefox, respectively [3], [4]. This change was only possible as a result of a change in their release engineering. Both companies manage to release a new version every six weeks and security fixes within a couple of hours, while other companies struggle to release a new software version in a year. Thus, we can argue that Google as well as Mozilla apply a successful release engineering.

In this study, we look for a correlation between the release engineering applied on web browsers and their reputation. A case study approach was chosen due to time constraints. Subsequently, we briefly describe our methodology and present our results.

A. Methodology

The direct influence of release engineering on software reputation is not determinable. Hence, we decided to analyse the market share of web browsers over a longer period of time and compare it to their release cadence (cf. figure 1). Here,

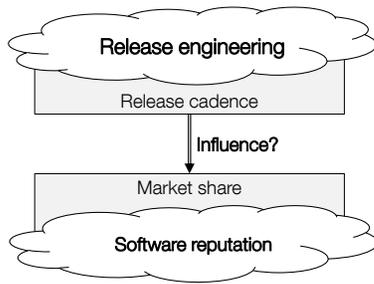


Fig. 1. Influence of release engineering on software reputation?

we assume that a software product’s reputation and its market share correlate. As subjects for our study we picked Chrome, Firefox, and Microsoft’s Internet Explorer [5], [6], [7], since both, Chrome and Firefox, had a change in the release cycle, and, in contrast, Internet Explorer had none. Moreover, we compiled data on release dates [8], [9], [10] and market shares from the third quarter of 2008 until the fourth quarter of 2013. This time interval covers about two years before and after the switch to the rapid-release cycle of Chrome and Firefox, which should suffice for an analysis.

We extracted the information on the web browsers’ global market shares for the desktop versions from two popular web traffic analyzers: StatCounter and NetMarketShare [11], [12]. Both use a similar mechanism to derive the market share of a web browser: The web traffic analyzers cooperate with variant web pages, allowing them to collect the web browser’s information, which is included in each request. StatCounter claims that their stats are based on over 15 billion page views per month recorded across more than 3 million websites [13]. However, both tools report different numbers because StatCounter counts the so called “page hits”, whereas NetMarketShare tries to reduce the page hits by the same person to “page visits” [14].

B. Results

The compiled data for Chrome, Firefox, and Internet Explorer is depicted as charts in figure 2, figure 3, and figure 4, respectively. Here, the abscissa covers the time interval from Q3 2008 until Q4 2013 by quarter-year steps. The ordinate is two-folded: The left-hand side shows the absolute number of releases per quarter presented as a column chart. The right-hand side shows the relative market share in percent plotted as a line chart.

The first stable version of Chrome, version 1.0, was released in December 2008. Since the release cycle change in July 2010, Google released its web browser every six weeks, resulting in two releases per quarter on average. As figure 2 shows, there is a significant difference in the market share numbers from StatCounter and NetMarketShare. In Q4 2013 the difference is almost 30%. Still, both analyzers indicate a gain in Chrome’s market share.

Like Google, Mozilla too switched to a six-week release cycle in April 2011, also leading to about two releases per quarter. However, in contrast to Chrome, Firefox’ market share significantly diminished – as implied by the two web traffic

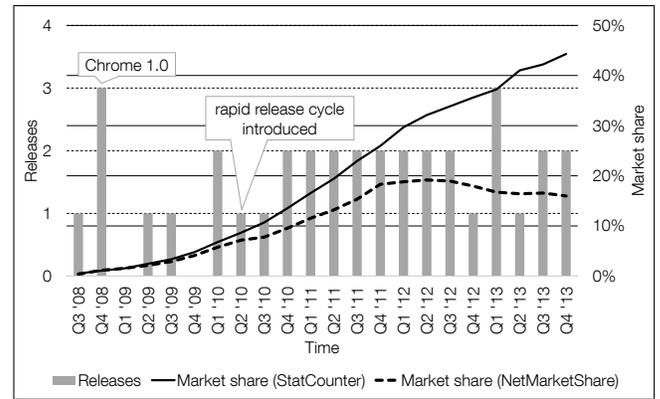


Fig. 2. Chrome – Releases and Market Share

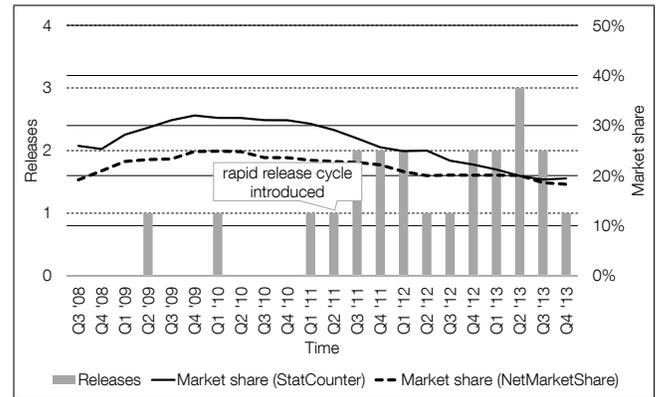


Fig. 3. Firefox – Releases and Market Share

analyzers – after the introduction of the rapid-release cycle (cf. figure 3).

As mentioned earlier, Microsoft did not change their release cycle for Internet Explorer. Their average major release interval is about one and a half years. Although – similar to Chrome’s market share results – in Q4 2013, StatCounter and NetMarketShare disagree by about 30%, both analyzers show a strong to moderate decrease in market share for Internet Explorer (cf. figure 4).

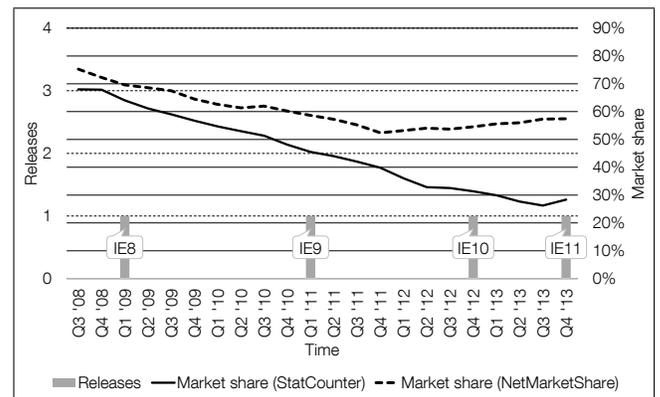


Fig. 4. Internet Explorer – Releases and Market Share

III. DISCUSSION

Unfortunately, the results of this study seem to not support our claim and need to be interpreted with strong caution. On one hand, we choose market share as a representative for reputation. For web browsers, we assumed that users can choose freely and switch back and forth; however, in general, we cannot assume that a product's reputation and its market share correlate. On the other hand, there are many more influence factors on software reputation, e.g., experience, force of habit, advices from experts, design decisions. Nevertheless, we will try to interpret the results and the divergent market-share trends for the three browsers.

To begin with, StatCounter and NetMarketShare value different things, use different data sets, and are not counting the same numbers [14]; it is no surprise that their market share reports do not agree. In fact, both analyzers perform what they believe is the best analysis they can do. Moreover, the huge disagreement in market share at the end of our study is probably due to the change of NetMarketShare's traffic counting mechanism in the beginning of 2012 [14]. Here, NetMarketShare wanted to act counter to Chrome's pre-rendering of web pages [15]. As a consequence, NetMarketShare's trends for all browsers leveled off. In essence, this reflects how a counting technique influences the resulting market shares, and thus, particular caution should be exercised interpreting this data.

The results show a steady rise of Chrome's market share after the adjustment of their release cycle. This seems to support our research question (cf. [16]). However, Google also placed a massive marketing push at that time. In contrast, Firefox lost market share after their introduction of the rapid-release cycle. However, these findings seem to be consistent with the complains and fears of users, which went public with Mozilla's announcement in 2011.

For Firefox users, the rapid-release cycle was the greatest uncertainty. In particular, system administrators were afraid that Mozilla's frequent releases will break stable environments, e.g., tools, extensions, and corporate web pages working with Firefox, and introduce more severe bugs. Consequently, becoming a huge burden for the IT departments [17], [18]. Moreover, corporate rules often demand that new product versions have to be evaluated before they are installed. Moreover, administrators cannot or do not want to devote additional effort on updates every six weeks [19]; thus, demanding a long-term support for Firefox. An unfortunate comment from Asa Dotzler, community coordinator for Firefox marketing, declaring the consideration for corporate users superfluous, made the upset even worse [20]. Along with the system administrators, also web and extension developers feared that they would not keep up and new releases would mean broken APIs [19]. Furthermore, some private users voiced misgivings in several article comments, e.g., as a reaction to Dotzler's comment at [20]. Last but not least, in 2012, even former Mozilla developer Jono DiCarlo stated "rapid releases killed Firefox's reputation" [21]. As a result, a lot of users switched to Chrome and other web browsers in the first year.

Mitchell Baker, Chair of the Mozilla Foundation, quickly acknowledged the complexity and difficulty of the raised issues by the new release process [22]. Despite this, she argued that

the rapid-release cycle is the right way for their web browser; however, "there is work to be done to make the rapid release process smoother and hopefully more useful [...]" [22]. Even a Chrome developer defended Mozilla's release strategy on Google+, emphasizing an important aspect though: automatic updates without any prompts are a necessity for Firefox [23]. In Google's Chrome, such an update system is one of the core features and was developed even before version 1.0 [24]. Moreover, Google has successfully prevented stigmatisation of Chrome's version numbering, since users were not aware of updates; thus, did not mind the fast release cycle. In order to ease the maintenance for users, Mozilla introduced an extended support release (ESR) and implemented *silent updates* in 2012 [25], [26], [27]. However, the latter were only updates with "one less prompt" [27]. The possibility for truly silent updates without interrupting the user's work flow came with version 26 in December 2013 [28].

We know now that the lack of silent updates for Firefox was one of the major reasons, if not the only one, users were bothered by Firefox' updates and, with requiring administration rights on Windows machines, system administrators had a high maintenance effort [21]. After the first year with Firefox's rapid releases, corporations observed that their fears did not become true or were mitigated by the introduced solutions. Hence, one can argue that Firefox's reputation was not diminished by their new release strategy, but mostly because of, first, inadequate communication regarding the meaning of the new release cycle and, second, technical foundations of Firefox were not yet ready for rapid releases.

In 2013, Firefox gained reputation again. For example, former FESCo chairman Thorsten Leemhuis discussed in a Heise.de article the many advantages of the rapid-release cycle and its inspiring example for other projects [29]. Furthermore, with that release strategy, Mozilla introduces new features in small pieces. This is, on one hand, an important aspect to stay competitive, and, on the other hand, users seldom need to re-learn the whole software, but rather adapt to new features continuously.

Conversely, Internet Explorer's decreasing market share over the past few years, as indicated by StatCounter, might be a consequence of its infrequent releases. Not being able to keep up with the fast-changing Internet, Internet Explorer loses the feature battle with other browsers, and thus, also market share. Equally important, Microsoft was not able to quickly close several security vulnerabilities, so public authorities like the German Federal Office for Information Security had to suggest users to use other web browsers than the Internet Explorer [30], [31], [32]. As one result, other web browsers, e.g., Firefox, registered an increase in the number of downloads [33]. Only after Microsoft continued the development of Internet Explorer and released it with increased regularity, NetMarketShare registered a slight increase in market share again.

Consequently, we believe that a successful release engineering positively affects the product's reputation (cf. Chrome discussion). However, applying a release strategy, which diverges from the product's technical capabilities (cf. Firefox discussion), or inappropriate for the product class (cf. Internet Explorer discussion), might even effect the reputation negatively. Last but not least, Google and Mozilla show that their

rapid releases do not negatively effect quality and, along with silent updates, even boost security [34], [35].

IV. CONCLUSION & FUTURE WORK

In this paper, we investigated whether release engineering has an influence on software reputation. Contrary to our expectations, our study does not yield a solid conclusion. However, we found indications that the software reputation benefits from a reasonable application of release engineering. In this regard, release engineers have to consider the environmental requirements of a software. Meaning, users should neither wait for features nor should they perform unnecessary updates.

We believe that the introduction of the rapid-release cycle for web browsers was inevitable. Since web browsers are an interface for the fast developing and changing Internet, they need to keep up with the given pace and deliver new features just when they are ready. Otherwise, web browsers become a limiting factor of the Internet. However, we think that a rapid-release process is not appropriate for all kinds of software, e.g., safety- and security-critical applications. Those require time to ensure stability and high quality. Yet, release engineering practices like Google's or Mozilla's can be useful for these applications, too, since they enable fast delivery of fixes. All in all, we can learn from the history of release engineering of web browsers.

Since this research is more of a preliminary investigation, it has thrown up many questions that need further investigation, clarifying the influence of release engineering on software reputation. As reputation is of subjective nature, conducting a qualitative research among a representative group, instead of performing a quantitative analysis, is more appropriate. We assume that the results might yield a sound reason why release engineering is an important aspect of software engineering and why it is worth an investment.

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