

A Recommendation for Swag Technologies to Utilize Stack Overflow as a Learning Resource

Introduction

Swag Technologies is a start-up Vancouver-based company that designs, manufactures and markets various automotive embedded systems. Swag Technologies' software engineers utilize a learning resource to aid in their development of software. The goal of this paper is to evaluate five different learning resources and determine the best learning resource for Swag Technologies' software engineers to utilize as a work tool. In general, Stack Overflow is the best learning resource for Swag Technologies' software engineers to utilize as a work tool to aid in their work-related development of software.

Problem Description

In the past year, Swag Technologies' revenue has dropped due to software defects in manufactured products. The company's revenue has also dropped due to firmware updates for products being pushed back frequently. These issues have been attributed to the incompetence of Swag Technologies' software engineers. Swag Technologies imposes a requirement on the company's software development team to deliver bug-free product code on schedule. Swag Technologies' board of directors has professed that Swag Technologies cannot afford to terminate employees who break this requirement because the company

struggles to hire replacements. Additionally, the provision of training in software development and time-efficiency to employees is time-consuming and expensive.

Swag Technologies' training procedure for the company's software engineers involves advocating the use of Quora as a learning resource. On Quora, users ask questions and other users answer those questions. Quora is used as a resource for Swag Technologies' software engineers because the website can provide answers to work-related questions quickly. Swag Technologies' software engineers refer to Quora whenever they have questions about their work that they cannot ask their co-workers or supervisors.

Software engineers who lack software development and programming experience may use Quora as a reference point for understanding concepts related to their work. Strict company policy requires that Swag Technologies' software engineers refer to exactly one learning resource only. Swag Technologies requires that Swag Technologies' software engineers reference only one learning resource as a work tool because Swag Technologies aims to minimize the company's chances of receiving a copyright infringement lawsuit.

Swag Technologies' quality assurance engineers have determined that Swag Technologies' software engineers are referencing low-quality information from Quora, resulting in Swag Technologies' software engineer's production of low-quality code. The low-quality product code being produced by Swag Technologies' software engineers causes software defects in the company's manufactured end products. Additionally, refactoring of the low-

quality product code during the software development process results in delayed working code delivery, leading to delayed firmware updates for shipped products.

Evaluation

Swag Technologies' board of directors have proposed a review of Swag Technologies' policy of utilizing Quora as a learning resource for Swag Technologies' software engineers. This evaluation examines Quora as a learning resource, as well as 4 other learning resources alternative to Quora. The evaluation will determine the best learning resource to be utilized for Swag Technologies' software engineers. The four alternatives to Quora are Stack Overflow, Coursera, edX and SlideShare.

Topic	Experts	Non-experts	Users
Business	74	698	772
Mathematics	94	683	777
Politics	114	742	856
Sports	82	533	615
Technology	68	632	700
Combined dataset	432	3288	3720

Tab. 1. Dataset comparing the amount of non-expert to expert users on Quora.

The primary advantages of utilizing Quora as a learning resource for Swag Technologies' software engineers is that Quora is a question-and-answer website. Swag Technologies' software engineers can seek answers to work-related questions that they may have without

needing to consult their supervisors or co-workers. Additionally, Swag Technologies' software engineers can obtain answers to their questions quickly on Quora [2]. However, as presented in [3, Tab. 1], Quora's user base has a low ratio of experts to non-experts. Because Quora's user base has a low ratio of experts to non-experts, there is a high chance that Swag Technologies' software engineers may get low-quality answers to the questions that they ask on Quora. Additionally, as presented in [3, Tab.1], there are a low number of experts on Quora who can answer questions related to technology, not to mention programming and software development.

Quality	Question Count	Answer Count
Very Bad	28611	4958
Bad	126436	25655
Good	404099	974005
Very Good	12534	21256

Tab. 2. Dataset depicting the quality of answers and questions on Stack Overflow.

Similar to Quora, Stack Overflow is a crowdsourced question-and-answer website [4, p.1]. On average, questions asked on Stack Overflow are answered in minutes to an hour [4, p.1]. Stack Overflow is a great resource for Swag Technologies' software engineers because Stack Overflow provides quick answers to immediate questions. Swag Technologies' software engineers can rely on asking questions on Stack Overflow because as presented in [5, Tab. 2], the quality of answers on Stack Overflow is mostly good. The difference between Quora and Stack Overflow is that Stack Overflow is primarily a resource for software developers [4, p.1].

Stack Overflow is ultimately a better learning resource than Quora for Swag Technologies' software engineers because the focus of questions and answers is narrowed down to programming-related issues, and, answers to immediate questions can be obtained quickly.

Coursera is an online learning platform that works with universities to offer courses in a wide-variety of subjects including computer science [6]. Classes taken via Coursera are typically scheduled and run between 4 to 10 weeks long [6]. In comparison to Quora and Stack Overflow, Coursera is not a question-and-answer website. Although Coursera provides its users with valuable information, Coursera does not provide its users quick answers to current problems. Coursera is not a viable resource for Swag Technologies' software engineers because Swag Technologies' software engineers are too time-constrained by Swag Technologies' software development process to engage in a full-length course whenever they encounter a work-related programming issue.

Similar to Coursera, edX is an online learning platform which offers courses from Harvard University and MIT [7]. Although edX offers Harvard and MIT quality information, Swag Technologies' software engineers cannot effectively use edX as a learning resource for work because their questions to work-related issues need to be answered quickly.

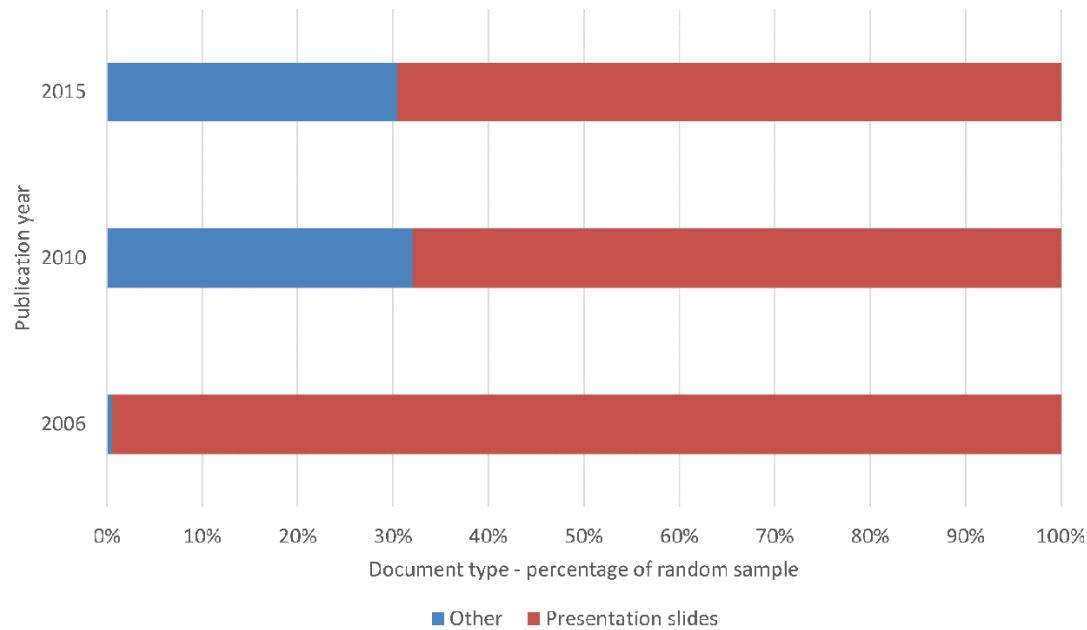


Fig. 1. Bar chart depicting the ratio of presentation slides to other documents on SlideShare.

SlideShare is an online-platform which focuses on sharing content via presentation slides and documents [8]. Unlike Quora, SlideShare has a predominately professional user base [8]. Because SlideShare has a predominately professional user base, the information on SlideShare is more feasible for Swag Technologies' software engineers to use for reference for software development and programming-related issues. However, although SlideShare has a predominately professional user base, it is more difficult to access information on particular topics. This is because about two thirds of uploaded SlideShare documents are presentation slides - as illustrated in [8, Fig. 1]. SlideShare is not a viable learning resource for Swag Technologies' software engineers because Swag Technologies' software engineers do not have the time to search through SlideShare's presentation slides for answers to their work-related issues.

Conclusion

Based on the evaluation of the 5 different learning resources, this survey paper concludes that Stack Overflow is the best learning resource to be utilized for Swag Technologies' software engineers. Swag Technologies' software engineers can obtain answers to their work-related software development and programming issues quickly from Stack Overflow. Stack Overflow is also primarily a resource for software developers, therefore, Swag Technologies' software engineers are ensured that they receive quality answers to their questions.

Stack Overflow is a robust online-platform which can easily be accessed with an internet connection. With regards to the future of Swag Technologies, the most important aspects to consider when utilizing Stack Overflow as a resource for Swag Technologies' software engineers is a corporate internet connection and a reliable network. Future expansion of Swag Technologies will require a bigger, more reliable network and a fast, corporate internet connection. If Swag Technologies were to expand and become a multi-location business, a reliable network and internet connection at each location would be the only requirement for each location to be able to access and use Stack Overflow. If company downsizing were to occur, the only action to be taken would be to reduce the size of the company's network. In any scenario, Swag Technologies will need to maintain its IT department accordingly, depending on whether Swag Technologies expands or downsizes.

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