Feedback Driven-Development

Impact of Feedback Systems On The Enhancement of Software Applications

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction

  In a software company setting, the main goal is getting products out the door and keeping them sustainable. The goal with sustainability is to connect the needs of the consumer to the goals of the product. We can start off by setting a definition for the focus of this paper: feedback. As noted by Iterators in 2024, "Customer feedback is the data or information customers provide about their experience with a service or product. It reveals how satisfied they are with a product and allows development teams to understand where there is room for improvement." In my paper, I analyze different case studies in order to see if feedback can indeed improve software development technologies and the work surrounding them. Feedback can take many forms, and in our increasingly technological era, electronic feedback forms offer the best avenue for collecting valuable insights (Bakerson, 2012). The conversion to digital platforms allows administrators to efficiently gather and analyze data, ultimately contributing to large improvements within the company. In contrast to traditional forms, digital allows easier access to data, faster analysis of data, less physical space, and easier consolidation of information. As Reina M. Abraham and coauthors (2022) said, feedback serves as a compass, guiding the establishment of desired standards of proficiency in tasks. This clarity allows organizations to identify gaps in understanding and areas for refinement.

  My research topic specifically questions the impact of data-driven feedback systems on the enhancement of software applications. I argue that feedback is imperative to the growth of software development and should be prioritized by companies. I expand on this through my background where I explain the technical project I worked on over the summer and how it applies to the main points of this paper. I go into the significance of the research topic and explain my thought process behind my methodology and case study setups. I primarily use the

SCOT framework to analyze these papers and then come to a conclusion: the papers have all noted, within different settings, that electronic forms of feedback are extremely important to gauge consumer opinion.

Background

I spent this past summer working for Capital One, a bank focused on the improvement of peoples' lives through technology. Specifically, I worked in a group managing software development behind a call center platform. While the user base of Sage, a call quality platform under Capital One, increases to 16,000+ members, my goal was to find a way to democratize the ability to give feedback on the application. My solution was creating a feedback form and search features for displaying feedback.

At the end of the summer, I presented this feedback form to several heads within the Capital One space from engineers to product designers. Receiving feedback from these groups allowed me to understand how beneficial feedback can be for the general public, but more specifically, software development groups.

This idea can be extended to other software development technologies and we can analyze how feedback can assist the development of such technology the most.

Significance:

Meng-Jia Wu's paper, along with her co-authors, about the "Response Rates of online surveys in published research" offers a strong modern look at the benefits of online surveys and their potential growth as a feedback form. In this test, they examined 1071 independent online surveys, providing a strong variance in test data. Evidence showed that "use of online surveys in published research grew steadily from 40 surveys in 2007 to 255 surveys in 2014". The results of

this test conclude that the estimated mean response rate was 44.1% with a 95% confidence interval. They conclude that conducting online surveys as a medium for feedback has "become more mature" and will gain immense traction in later years (Wu et al., 2022, pg. 7).

In order for feedback to be effective, many consumers need to submit information. If a single focus group were to only submit feedback, there would be skewed information. This is an issue I have tackled previously in my work at Capital One which I delved into more detail through my technical paper. By conducting an in-depth review of perspectives from various groups, not even just software development, I can identify a lot of varying opinions about feedback and the importance of technology in this setting. This will show how to best mitigate issues surrounding feedback and promote the idea of electronic feedback even with the negative consequences behind them. In order for software developers to better use feedback, they need an improved method of obtaining and the best setup of information to receive without being too redundant or even being too lacking.

Methodology

A feedback form provides a significant form of customer satisfaction (Wu et al. 2022). Regardless of the extent to which it is developed, this piece of technology is able to inform the developer of the necessities of various social groups. I broke this system down, and analyzed the fundamentals of this relationship. In order to analyze the benefits of a feedback form, I performed case studies on five different experiments aligned with the general topic of feedback forms. I chose this method because it allows me to analyze various perspectives in various fields within the realm of customer feedback. This helped me extend my previous technical project working towards developing a feedback method for one of Capital One's departments call centers.

The data analysis method that I use is content analysis. Content analysis is a research tool used to determine the presence of certain words, themes, or concepts within qualitative data (Columbia University, 2019). I used the tool to analyze different papers and develop a general idea on the benefits of feedback and its impact on software applications. I also used statistics from the case study papers to be able to provide solid evidence on improvement of applications through the extensive use of customer feedback. Gnepp showed that data with a lower future focus, data that is more likely to anticipate changes in regulations and customer demands, would be more likely to change with positive vs negative feedback, while higher future focus would be less likely to change with positive versus negative feedback (2020). Although we don't have numerical statistics, this is just one of the many sets of data I analyzed to prove the effectiveness of feedback.

This entire paper is centered around the idea that technology cannot function by itself. Technology needs the voices of customers to be able to bring about a change within itself, whether that be major or minor. Customers are the voice of reason for any software regardless of its complexity. And so, society is needed for technology to proceed and not the other way around. That is why the theoretical framework I am using to build my case is SCOT (social construction of technology) theory. This is a theory within the field of Science and Technology studies arguing that technology does not influence human action, but rather, human action influences technology. SCOT has four basic principles: interpretive flexibility, the principle of symmetry, relevant social groups, and stabilization. Interpretive flexibility is focused on scientific findings, or in other words, "it must be shown that different interpretations of nature are available to scientists and hence that nature alone does not provide a determinant outcome to scientific debate" (Bjker, 1987). There should be flexibility in how the artifacts are designed.

"The stage of closure is defined as when the social groups *see* the problem as being solved."
(Bjker, 1987, pg. 35). SCOT is used in many cases, but it has a strong stake in this problem as we
are looking at the interaction between humans and technology (Klett, 2018). Feedback
showcases the voice of the people and influences the growth of software.

Case Studies

 I analyzed four different papers and derive a general conclusion from the consensus that
this previous research gives us.

*Case Study: Use of digital technology to give and receive feedback in clinical training: a scoping
review protocol*

 The transition to online medical education prompted by the COVID-19 pandemic led to
the need for digital feedback tools to enhance feedback practices. Reina Abraham and her
co-authors identified digital tools and applications used for feedback in medical education,
described the functions and features of these tools, explored current usage of digital feedback
tools, and identified barriers and facilitators of technology in feedback culture (Abraham et al.,
2022). Abraham's review followed a framework that checked a comprehensive search of
databases (PubMed, Scopus, etc.). Her and co-authors conducted a review of eligible studies
which included full-text articles focusing on digital feedback tools in medical education.

 Abraham's study was conducted in 6 stages: identifying the research question, identifying
relevant studies, study selection, charting evidence, extracting the evidence, and reporting
results. For stage 1, the main goal was to ask a question that would consider the effects of digital

technology on clinical training. They would then connect these questions to relevant studies. Then, they broke down the studies to include those that met a certain set of criteria. In regards to evidence gathering, they used an abstract screening tool using Google Forms and created a data extraction sheet to then summarize the data in. "Feedback that is timeous, comprehensive, directed at the task at hand and feeds forward is vital to improving competencies at both undergraduate and postgraduate medical training programmes." (Abraham et al., 2022, pg. 4). The study comes to the conclusion that feedback tools need to be explored in this current digital age and taken advantage of, specifically for those in clinical training.

Abraham and co-authors' protocol on digital feedback tools in medical education shows the importance of adapting feedback practices to meet the evolving needs of learners, particularly in the context of remote learning prompted by the COVID-19 pandemic. Digital tools offer unique advantages such as real-time feedback and self-assessment features, enhancing the quality and accessibility of feedback. However, barriers such as technical issues and resistance to change need to be addressed to optimize the use of technology in feedback culture. This is something to think about when designing a feedback structure, as it can vary depending on which platform you are on. Only then will the feedback received be the best it can be. I analyzed the interactions between customers and digital tools. There is talk about how these digital feedback tools are important to evolve the needs of learners (Abraham et al., 2022). Using SCOT, we understand the interactions between these two groups and how the tools are dependent on the needs of the customers. This supports our argument that technology is based on the needs of the customers (Hallström, 2022). Going deeper within the SCOT framework, the artifact is "an abstract screening tool using Google Forms [that was] developed and distributed to the review team" (Abraham et al., 2022). The social groups for this artifact are the authors and the review team.

Looking first at the interpretive flexibility of this artifact, the design of the form is specific to those within clinical training and in this specific case, Abraham and co-authors write many times how digital feedback is key to improvement. The closure mechanism can be shown through the paper's conclusion which states that "There exists an immense application within the medical education platform to explore this digital shift and innovation and capitalizing on how it will shape our teaching methods and tools," showing a focus on what needs to be created from the needs of the participants (Abraham et al. 2022, pg. 4). Redefining the feedback problem to focus on those in a clinical setting is what was able to give closure to the social groups in this setting. (Bijker, 1978)

Case Study: Exploring the Impact of Customer Feedback on the Well-being of Service Entities: A TSR Perspective

I looked through a research paper that was published in 2013 by Linda Alkire and co-authors who investigated the often-neglected area of positive customer feedback's influence on the well-being of service entities. This paper came out at the intersection of Transformative Service Research (TSR) and customer feedback management, with Alkire and co-authors seeking to understand how positive feedback could contribute to uplifting changes in the well-being of service entities (Alkire et al., 2014) . Alkire and co-authors' goal was to fill a gap in literature by examining the transformative potential of positive customer feedback on service entities' well-being. By adopting a TSR perspective, the researchers sought to develop a comprehensive understanding of the impacts and outcomes of positive feedback within service contexts. The authors employed a mixed-methods approach, combining an extensive literature

review with qualitative research methods. Two exploratory qualitative studies were conducted to gather insights from managers and front-line employees in service companies.

The mixed-methods approach allowed the researchers to capture diverse perspectives and experiences related to positive customer feedback. Linda and co-authors identified various categories of positive feedback, including compliments and expressions of gratitude, and explored their impacts on well-being of front-line employees. The Positive Feedback Model (PFM) proved to be a key outcome of the study, providing a framework to understand the mechanisms through which positive feedback influences well-being. Additionally, the comparison of managerial and employee perceptions highlighted nuances in understanding and managing positive customer feedback within service organizations. This paper contributed to the TSR literature by illuminating the transformative potential of positive customer feedback. The study provided a valuable foundation for future research in this area by developing the PFM and offering insights into managerial implications. The findings highlighted the importance of fostering a culture of appreciation and gratitude within service organizations to enhance both employee and customer well-being.

We can use the SCOT model to analyze this case. Alkire and co-authors discuss the processes by which to go about analyzing feedback benefits. Linda and co-authors had two main qualitative studies: study 1 included interviews with managers working in the service sector and study 2 had groups with front-line service employees. Through these studies the authors were able to break down 8 key themes surrounding the general theme of positive feedback and company outcome. The researchers were also able to confirm that positive customer feedback is significantly better than front-line employee in regards to the betterment of the company. Using SCOT, Alkire and co-authors were able to analyze the different groups of people within the

environment and deduct which group is key for the best outcome."For the managers, the real value of the customer feedback lies in that it provides guidance for improvement: "feedback is useless unless you're doing something with it"" (Alkire et al., 2014, pg. 12). If we look at this from the perspective of the framework, feedback is useless without purpose. And in this case, its purpose is to benefit the software it is about.

By adopting a transformative service research (TSR) perspective, Linda and co-authors identified various categories of positive feedback and their impacts on service entities' well-being. The focus on the Positive Feedback Model model and its various impacts emphasize the importance of fostering a culture of appreciation and gratitude within service organizations to enhance employee and customer well-being. Our SCOT framework hones in on the fact that customers are key to developing good products and the feedback form through which we get this information is important to set. The well-being of people is constantly emphasized and that is what makes feedback shine. Positive feedback, furthermore, returned back to those who develop technology, is also important. Since they create the technology we use, it is important that they receive the best possible feedback they can in order to implement changes. This highlights the idea of technological determinism, which is a part of the SCOT method that "promotes the idea that it is humans that design and retain control over technology" (Hallström, 2022, pg. 17). The artifact in this paper is defined as the Positive Feedback Model, which represents possible positive feedback categories, its various impacts and the outcomes on the parties involved. The social groups affected are the customers and employees of service organizations. This brings about the SCOT idea of interpretive flexibility, showing that this is the preferred approach to this specific social group (Linder, 2022). The PFM Model is built to contribute to the growing TSR movement that is specific to these service organizations. "The paper concludes with a summary

of the main contributions and limitations of the study, and presents directions for future research (Alkire et al., 2014, pg. 3)." If we redefine the solution as a proper summary of the uses of the PFM model, we can definitely say there is closure for the social groups defined, and note that SCOT shows that this model is useful for the specific group of employee-customer relations.

Case Study: Electronic Feedback or Handwritten Feedback: What do Undergraduate Students Prefer and Why

In 2014, this research paper by Michelle Ann Bakerson and co-authors was published, aiming to explore undergraduate students' preferences regarding feedback delivery methods and the underlying reasons behind their preferences. The researchers delved into the realm of educational psychology and instructional design, seeking to inform educators and institutions about effective feedback practices (Bakerson et al., 2012) . The primary objective of the authors was to investigate whether undergraduate students preferred electronic feedback or handwritten feedback on their assignments and assessments. Additionally, the researchers uncovered the rationale behind students' preferences, considering factors such as convenience, readability, and perceived effectiveness.

Bakerson and co-authors conducted a mixed-methods study, combining surveys and focus group discussions to gather data from undergraduate students across multiple disciplines. The survey assessed students' preferences for electronic versus handwritten feedback, while focus group discussions provided qualitative insights into the reasons behind their preferences. The research was conducted at a large university with diverse student demographics. Bakerson and co-authors revealed a clear preference among undergraduate students for electronic feedback over handwritten feedback. The convenience of accessing electronic feedback, the ease of

reading digital comments, and the perception of electronic feedback as more detailed and informative were cited as primary reasons for this preference (Bakerson et al., 2012). Additionally, students expressed a preference for electronic feedback due to its environmental friendliness and the ability to store and organize feedback digitally for future reference.

The research on electronic versus handwritten feedback provided valuable insights into undergraduate students' feedback preferences and the factors influencing those preferences. By highlighting the advantages of electronic feedback and addressing common concerns related to readability and effectiveness, Bakerson and co-authors findings informed educators about the benefits of incorporating digital feedback mechanisms into their teaching practices. These findings underscored the importance of adapting feedback delivery methods to align with students' preferences and enhance their learning experiences. The researchers generated significant interest among educators and instructional designers, prompting discussions about the role of technology in feedback delivery. Bakerson and co-author findings have informed pedagogical practices in higher education institutions, leading to increased adoption of electronic feedback platforms and tools). Additionally, Bakerson's study sparked further research into optimizing feedback delivery methods to meet the diverse needs of students in the digital age (Bakerson et al., 2012. Overall, this research has contributed to ongoing advancements in educational psychology and instructional design, ultimately enhancing the quality of feedback provided to undergraduate students.

Michelle Bakerson and co-authors' research on undergraduate students' preferences regarding feedback delivery methods provides valuable insights into the advantages of electronic feedback over handwritten feedback. Convenience, readability, and perceived effectiveness are

cited as primary reasons for students' preference for electronic feedback. "The vast majority of SOE undergraduate participants preferred feedback that is sent to them electronically because this form of feedback was said to be easy to access, … Feedback sent to them electronically is faster than handwritten feedback … Typed feedback is more readable than most handwritten" (Bakerson et al., 2022, pg. 20). The findings emphasize the importance of adapting feedback delivery methods to align with students' preferences and enhance their learning experiences. In terms of a software company, electronic feedback is extremely important. The data can easily be translated to other platforms in limited time. It can be restructured easily and analyzed with even more ease. The benefits of electronic feedback are extremely strong in this industry even within the space of feedback itself. Connecting this piece to SCOT, we see that feedback delivery is analyzed without the perspective of students. Bakerson and co-authors' paper is based upon the idea of understanding the needs of people. The artifact in this case would be both handwritten and electronic feedback, but for the purposes of this analysis, electronic feedback is the artifact to focus on. With this as the focus, building a diagram it is noticeable that the main social groups are the undergraduate students and the researchers of this paper. Going along the idea of interpretive flexibility, Bakerson and her co-authors have evidence that points towards electronic feedback being significantly more effective than handwritten. Since the students are satisfied with electronic feedback, they give significantly more points towards that than handwritten, showing a closure mechanism with the societal group. There is also closure for the research group as they reached a conclusion that supported their hypothesis and goal. This framework shows that specifically within the space of undergraduate students, electronic feedback is the best option even with looking through the lens of SCOT.

Case Study: A Research Paper on the Effects of Customer Feedback on Business

In 2022, a research paper by Rai and Shah was published aiming to explore the impact of customer feedback on businesses across various e-commerce companies. The authors sought to investigate how customer feedback influences business performance, customer satisfaction, and organizational strategies. The primary objective of Rai and Shah was to examine the effects of customer feedback on different aspects of business operations, including product development, service quality improvement, and customer relationship management. Additionally, Rai and Shah aimed to identify the mechanisms through which customer feedback translates into obvious business outcomes and competitive advantages. The authors conducted a comprehensive literature review, synthesizing existing research on customer feedback management and its implications for businesses. Drawing from diverse sources, including academic journals, industry reports, and case studies, Rai and Shah analyzed the key themes and findings related to customer feedback effectiveness. "According to a Medallia survey, a whopping 96.2% of customers would leave a brand if there was a mismatch between customer service expectations and customer experience" (Rai & Shah, 2022, pg. 673). The researchers showed several significant effects of customer feedback on business operations and outcomes.

Firstly, customer feedback was found to be instrumental in enhancing customer satisfaction and service quality by providing insights into customer preferences, expectations, and pain points. Secondly, businesses that actively solicited and acted upon customer feedback demonstrated greater organizational learning capabilities, leading to continuous improvement and innovation. Thirdly, customer feedback played a crucial role in facilitating better decision-making processes, enabling businesses to allocate resources effectively and prioritize

initiates based on customer needs and priorities (Rai & Shah, 2022). Finally, businesses that effectively managed customer feedback gained a competitive advantage by fostering stronger customer relationships, improving brand reputation, and differentiating themselves from competitors.

Rai and Shah provided valuable insights into the significant impact of customer feedback on business success. By highlighting the various ways in which businesses can leverage customer feedback to drive innovation, improve service quality, and foster customer loyalty, the study underscored the importance of incorporating customer feedback into strategic decision-making processes. The researchers emphasized the need for businesses to adopt proactive approaches to collecting, analyzing, and acting on customer feedback to stay competitive in today's dynamic marketplace (Rai and Shah, 2022). The information in this paper provides widespread interest for many people including but not limited to business leaders, marketers, and researchers, sparking discussions about the strategic importance of customer feedback in business management. Rai and Shah's findings have influenced business practices across industries, leading to increased investment in customer feedback mechanisms and the adoption of advanced analytics tools to extract actionable insights from customer data. Additionally, the study has contributed to the development of best practices for integrating customer feedback into business operations, ultimately enhancing customer satisfaction, loyalty, and long-term profitability (Rai and Shah, 2022).

Using the SCOT framework to analyze, the artifact of this piece is the methodology for gathering feedback in a office space. The social groups pointing to the artifact in this case are the customers and companies within an e-commerce space. Looking at one of the basic principles of

SCOT, interpretive flexibility, it is important to understand that there is no "best" solution to getting feedback (Linder, 2022). The companies noticed that customers would not behave how they expected whenever there was no feedback method. The best solution in this case is one that benefits "happy customers [who] are the foundation of any successful business because they lead to repeat purchases, brand loyalty, and positive word of mouth" (Rai & Shah, 2022, pg. 675). Referring to the closure part of SCOT, "Customers who are pleased with their purchases are more likely to tell five or six other people about their purchases" (Rai & Shah, 2022, pg. 675). Since these social groups see the problem as solved, which in this case it means that the company is performing how the customers expect, they "will begin to talk about the problem being solved" (Linder, 2022). The researchers Rai and Shah also reached closure through the conclusion that was backed up with solid facts. This method concludes that consistent feedback and focus on customer satisfaction "can result in a factor 2.6 increase in revenue contribution." (Rai and Shah, 2022, pg. 675)

Conclusion

Proper customer feedback is received through the process of breaking down the benefits of technology through the lens of the customer. It is important to align company goals with customer expectations/experience so the company can thrive and the customers can gain proper benefits through use of the technology. We need to support this because, analyzing through the SCOT methodology, people are needed for technology, and not the other way around (Klett, 2018). We need our own desires to push the depths of technology, and that is where feedback comes in. These papers have all noted that, within different settings, and after applying interpretive flexibility, electronic forms of feedback are extremely important to gauge consumer

opinion. Through closure methods, it is shown that feedback forms are applied and show positive results from various social groups.

In today's competitive global markets, businesses work hard to set themselves apart. By offering a stronger line of products, companies can effectively capture the attention of customers. Once satisfaction is achieved, loyalty follows suit. These concepts are important for success, emphasizing the relationship between customers and businesses. Businesses are able to easily respond back to customers in a shorter amount of time. This translates directly to the importance of feedback mechanisms in the software development life cycle.

Using our methodology and framework on these case studies, we are able to come to the conclusion that, generally, electronic feedback is the best way to improve the state of a company, which in our case is a software development company.

We were able to sustain my argument that feedback is important to the growth of software development companies. From here, we can reach out to companies to promote this idea and improve connections to customers.

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