Needs Analysis of Android-Based Science E-Book Development in PGMI Study Programme UIN Mataram

Kurniawan Arizona[1,*], Ramdhani Sucilestari[2], Baiq Mutiara Alika Nirmala[2]

[1]Study Programme Tadris Physics FTK UIN Mataram
Gajah Mada Street No. 100 Mataram, West Nusa Tenggara, Indonesia
[2] PGMI Study Programme FTK UIN Mataram
Jl. Gajah Mada No. 100 Mataram, West Nusa Tenggara, Indonesia

*E-mail correspondence:arizona@uinmataram.ac.id

Article Info:

Abstract

This study aims to analyze the need to develop Android-based science e-books for PGMI FTK UIN Mataram students. By applying a quantitative approach through questionnaires, this research seeks to identify the needs and characteristics of students in learning science. The analysis results showed that 80% of the 45 respondents considered science materials, especially physics content, difficult to understand. Most respondents (80%) wanted teaching materials in digital format due to its practicality, effectiveness, and efficiency. The powerful support (97.8%) for the development of interactive e-books reflects the urgency of this innovation in improving the quality of learning. The expected e-book is an interactive learning platform with rich multimedia features while remaining simple and easy to use. E-book development must consider student characteristics, such as cognitive and affective development stages, interest in visual materials, and the need for concrete media. In addition, e-book content must be aligned with the competency standards and essential competencies in the applicable curriculum. This research provides a strong foundation for the development of innovative and effective Android-based science e-books to support learning in PGMI Prodi FTK UIN Mataram.

INTRODUCTION

Education is the main foundation for developing the character and knowledge of the younger generation. In the context of Islamic education, especially in Madrasah Ibtidaiyah (MI) and Primary School (SD), learning Science (IPA) has a vital role in introducing basic science concepts to students. However, the challenges faced in the science learning process often relate to the limitations of interactive and interesting learning resources. Along with the development of information technology, mobile devices such as smartphones are increasingly widespread. This opens up opportunities to develop more innovative and effective teaching materials. Android-based E-Books are one potential solution that can be implemented to support science learning in MI / SD. E-books offer ease of access and can also be equipped with multimedia, interactivity, and features that enhance student understanding.

Madrasah Ibtidaiyah Teacher Education (PGMI) Study Programme at the Faculty of Tarbiyah and Keguruan (FTK) UIN Mataram is committed to improving the quality of education through learning innovation. Therefore, it is crucial to analyze the need to develop a science e-Book that is by the curriculum and characteristics of PGMI students at FTK UIN Mataram. This research is expected

to obtain comprehensive information about user needs, including expected features and challenges that may be faced in developing the e-book. By conducting a needs analysis, this research aims to design a science e-book that is effective and interesting for students so that it can improve their motivation and learning outcomes. In addition, the results of this study are also expected to be a reference for developing other teaching materials in the PGMI Study Programme of FTK UIN Mataram.

E-books have become an essential alternative in education, offering easy and flexible access for students. Using e-books in the teaching and learning process can increase students' interest in reading and provide a more interactive and exciting learning resource than traditional printed books. Science education at the MI / SD level aims to introduce basic science concepts that are important for developing student knowledge[1]. The science curriculum should be able to foster students' curiosity and critical thinking skills, which can be supported through the use of innovative learning media. Android-based E-Books allow the integration of various multimedia, such as images, audio, and video, which can help explain science concepts more clearly. This is particularly relevant for MI/SD students who require a visual approach to learning.[2], [3].

User needs analysis is a crucial step in e-Book development. Understanding students' and teachers' preferences and needs will help design e-books that are more effective and appropriate to the curriculum. This research also suggests involving stakeholders, including teachers and students, in the design process. Although e-books offer many benefits, challenges such as limited technology access and teacher training must be considered. The successful implementation of e-books in schools largely depends on the readiness of infrastructure and the ability of teachers to utilize the technology.

This research offers a novelty in developing science e-book teaching materials at the MI / SD level with an Android-based approach. Unlike previous studies, this research analyses user needs and identifies the interactive features most needed by students and teachers and the challenges faced in their implementation. Another novelty lies in integrating multimedia in the e-book designed to enhance the learning experience, as well as using direct feedback from stakeholders as a basis for design. Focusing on the local context at UIN Mataram, this research aims to provide a more relevant and effective solution to support the science learning process and contribute to developing technology-based education in Indonesia.

METHODS

This study applied a quantitative approach as the primary method to analyze the need to develop Android-based MI/SD 2 Science e-books. The process began by designing a comprehensive questionnaire to collect data from students in the PGMI program at UIN Mataram. The questionnaire contained questions regarding the importance of various e-book features, user experience with existing teaching materials, and the frequency of technology use in science learning. The study population included university students with random sampling to ensure representativeness. The collected data was analyzed using descriptive statistics to describe the characteristics of the respondents and identify the most pressing needs. The analysis results show the most desired features and contents in e-books, such as multimedia and interactivity, which are highly expected to improve learning effectiveness. The findings are interpreted to provide concrete recommendations for e-book development and presented as a report that visualizes the data through graphs and tables. With this quantitative approach, this research seeks to provide a solid basis for developing teaching materials that follow the real needs in the field. In summary, the stages or flowchart of the study that has been implemented are presented in Figure 1.
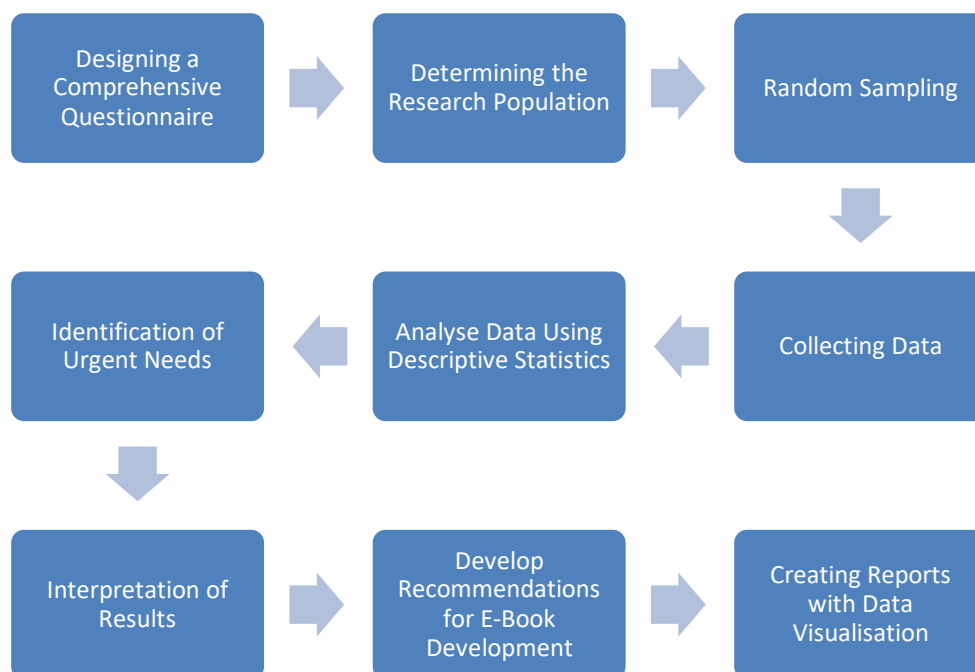
Figure 1. Research Flowchart

RESULTS AND DISCUSSION

The initial stage is to identify learning needs in the PGMI study program student environment, especially in science subjects. At this stage, the competency standards and basic competencies (KD) in the applicable curriculum are analyzed. The goal is to ensure that the E-Book developed is in line with the curriculum's demands and can meet students' learning needs. Curriculum analysis by reviewing the basic science competencies in MI / SD to determine relevant and essential topics to be included in the E-Book. In addition, user needs by involving student teachers from the PGMI Study Programme in the analysis process to understand specific needs in teaching science, including the learning methods they want and the types of media that are effectively used in classroom learning.

Based on the results of a questionnaire distributed to PGMI FTK UIN Mataram students, 80% of the 45 respondents stated that physics content science material was considered difficult, as shown in the following diagram.

Figure 2. Student Responses to the Difficulty of Science-Physics Content

In addition, 80% of respondents hope that the teaching materials used are digital, such as the following infographics.

Menurut Anda, bahan ajar IPA jenis apa yang Anda sukai dan harapkan untuk dipelajari?
45 responses

Student Responses to the Types of Teaching Materials that Support Learning

This is supported by the ownership of PGMI Study Program students, the majority of whom have devices in the form of laptops or smartphones to support accessing digital teaching materials.
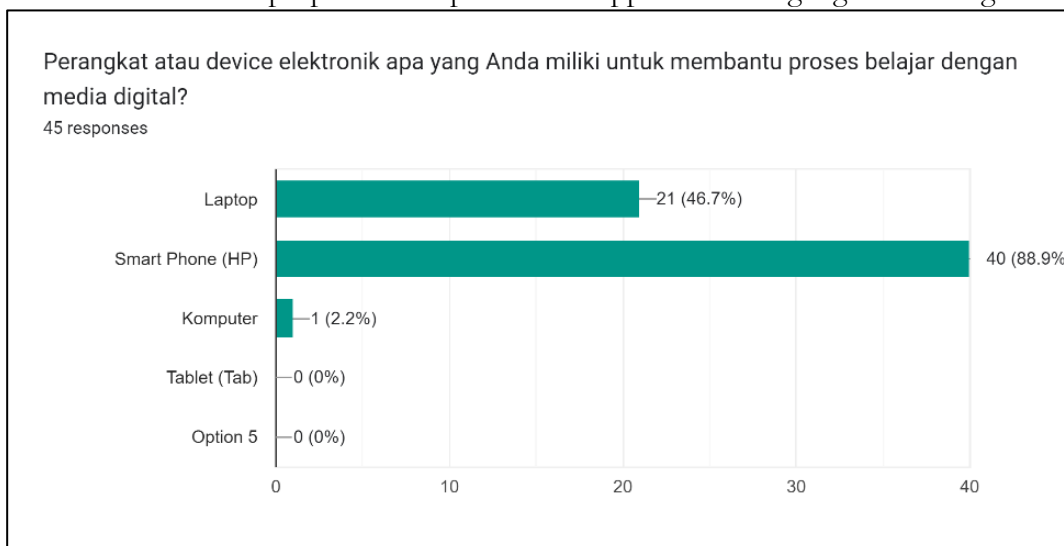

Figure 4. Student Responses to Devices that Support Learning

The reason the majority of respondents choose digital-based teaching materials is that they are more practical to use and more effective and efficient.
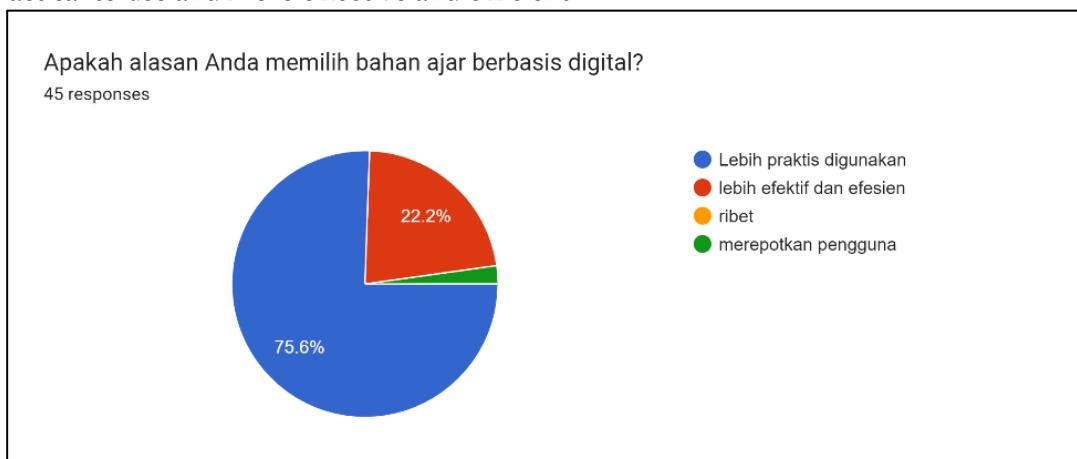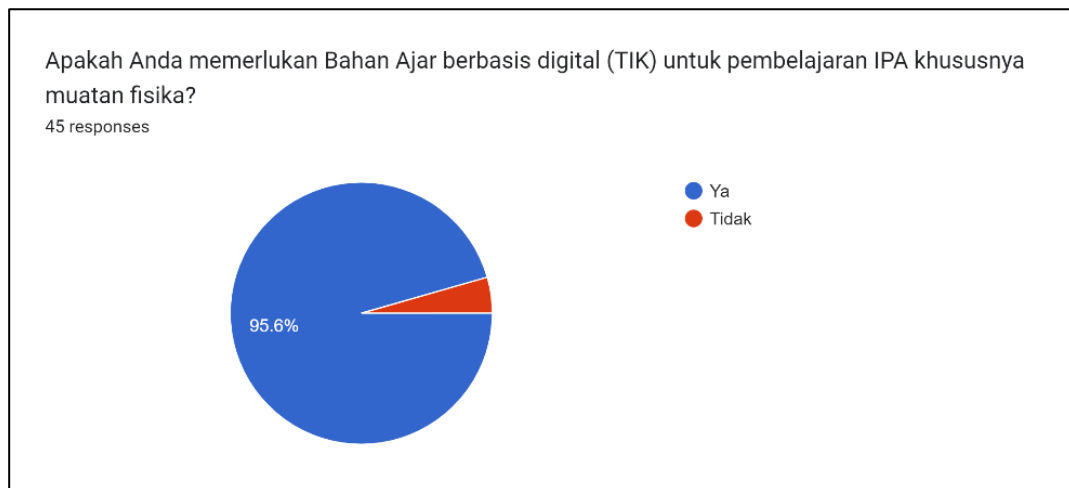

Figure 5. Student Responses to Reasons for Choosing Digital-Based Teaching Materials

In learning science (especially physics material), almost all respondents need digital-based teaching materials.

Picture 6. Student Responses to the Needs of Digital-Based Teaching Materials

97.8% of all respondents expected to develop and implement digital teaching materials in the format of electronic books (e-books).
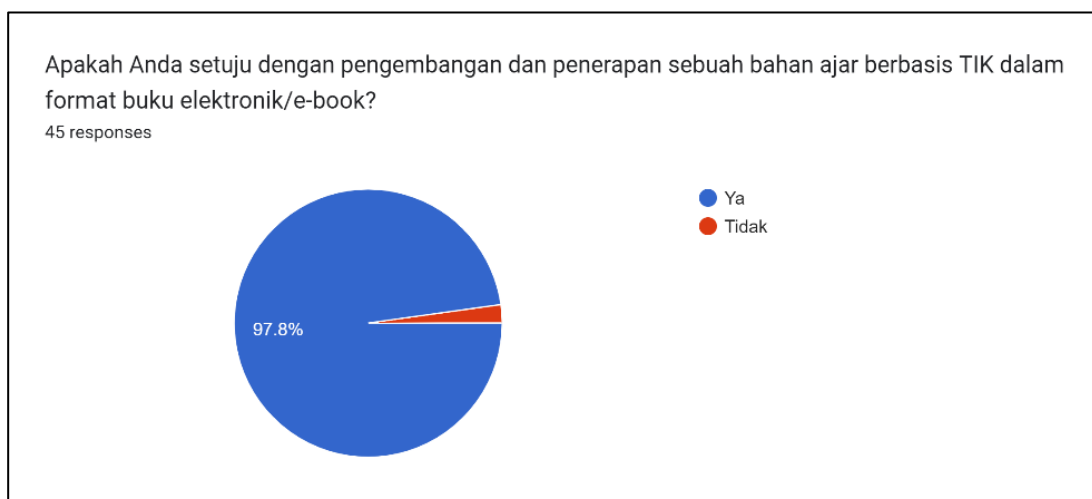

Figure 7. Student Responses to the Need for Science E-Books

There are two reasons all respondents needed the development of e-books, namely 1) the e-book interface is more attractive and feature-rich than ordinary textbooks, and 2) it facilitates and helps students learn lecture material.

Figure 8. Students' Responses to the Reasons for Using Science E-Books

The e-book model respondents require is an interactive multimedia-based e-book that can develop student competence. In addition, respondents also expect e-books that are simple and easy to use.

The results of this study indicate a significant need for the development of Android-based science e-books in the environment of PGMI FTK UIN Mataram students. The needs analysis was conducted by reviewing the competency standards and basic competencies in the curriculum and involving students as potential e-book users. The finding that 80% of respondents consider science materials, especially physics, difficult to understand is in line with previous research that reveals the challenges in learning abstract concepts in science, especially in physics content.[4], [5], [6].

The preference of the majority of respondents (80%) for digital teaching materials reflects the growing trend in education. These results reveal that students are more interested and motivated when using interactive digital teaching materials. In line with the results of several studies) which states that students who use interactive digital teaching materials show higher levels of motivation, student engagement, and learning achievement than those who use conventional teaching materials.[3], [7], [8], [9] The very strong support (97.8%) for the development of interactive e-books confirms the urgency of this innovation in improving the quality of learning, as highlighted in studies by several researchers that reveal the urgency of interactive e-book development as an important innovation to improve the quality of learning in the digital era.[10], [11], [12], [13]. Their findings strongly support an interactive science e-book development project for PGMI students to improve students' engagement, understanding, and learning outcomes.

The characteristics of students as e-book users, such as stage of cognitive and affective development, interest in visual materials, and need for concrete media, should be a significant consideration in the development. This is supported by findings emphasizing the importance of tailoring teaching materials to students' learning styles and preferences for optimal results.[14], [15]. In addition, this study revealed respondents' expectations for e-books rich in multimedia features while remaining simple and easy to use. Research by Santiago et al. (2021) also highlighted the importance of balancing interactivity and ease of use in digital teaching materials.[16]. Developing e-books that fulfill these criteria can significantly enhance students' learning experience.[17], [18].

However, several challenges need to be considered in e-book development, as identified by previous research. These include ensuring compatibility with various Android devices, designing an intuitive interface, and addressing potential technical issues. Overcoming these challenges will be critical to successfully implementing e-books[19].

Overall, the results of this study provide valuable insights into the needs and preferences of PGMI students in science learning. By combining these findings with best practices identified in the literature, the development of effective and engaging Android-based science e-books is possible. Such e-books have the potential to significantly improve university students' understanding of challenging science concepts and prepare them to be better teachers in the future.

CONCLUSIONS

Based on the analysis of the needs and characteristics of PGMI FTK UIN Mataram students, an urgent need was identified for developing digital teaching materials, especially in the format of interactive e-books for science subjects. The findings show that 80% of students consider science material difficult, and the majority (80%) want teaching materials in digital form because of their practicality, effectiveness, and efficiency. The very strong support (97.8% of respondents) for e-book development reflects the urgency of this innovation in improving the quality of learning.

The expected e-book is a digital book and an interactive learning platform rich in multimedia features, yet simple and easy to use. The characteristics of students as users, including their cognitive and affective developmental stages, interest in visual materials, and the need for concrete media should be critical considerations in the development. In addition, it is essential to ensure that the e-book content is aligned with the competency standards and basic competencies in the applicable curriculum.

ACKNOWLEDGEMENTS

REFERENCES

[1] J. Zhao, G.-J. Hwang, S.-C. Chang, Q. Yang, and A. Nokkaew, "Effects of gamified interactive e-books on students' flipped learning performance, motivation, and meta-cognition tendency in a mathematics course," *Educ. Technol. Res. Dev.*, vol. 69, no. 6, pp. 3255–3280, 2021, doi: 10.1007/s11423-021-10053-0.

[2] X. Zhang, A. Tlili, K. Shubeck, X. Hu, R. Huang, and L. Zhu, "Teachers' adoption of an open and interactive e-book for teaching K-12 students Artificial Intelligence: a mixed methods inquiry," *Smart Learn. Environ.*, vol. 8, no. 1, 2021, doi: 10.1186/s40561-021-00176-5.

[3] F. Solikhin and A. Wijanarko, "The Development of Android-Based Learning Media (Chemdroid) on The Topic Thermochemistry to Improve The Students' Achievement," *JKPK (Jurnal Kim. dan Pendidik. Kim.*, vol. 6, no. 2, p. 138, 2021, doi: 10.20961/jkpk.v6i2.46849.

[4] N. S. Podolefsky and N. D. Finkelstein, "Analogical scaffolding and the learning of abstract ideas in physics: An example from electromagnetic waves," *Phys. Rev. Spec. Top. - Phys. Educ. Res.*, vol. 3, no. 1, pp. 1–12, 2007, doi: 10.1103/PhysRevSTPER.3.010109.

[5] O. Uhden, R. Karam, M. Pietrocola, and G. Pospiech, "Modelling Mathematical Reasoning in Physics Education," *Sci. Educ.*, vol. 21, no. 4, pp. 485–506, 2012, doi: 10.1007/s11191-011-9396-6.

[6] R. Sucilestari and K. Arizona, "The Impact of Inquiry-Based Learning on Students' Critical Thinking Skills," vol. 408, no. Iconist 2019, pp. 172–175, 2020, doi: 10.2991/assehr.k.200220.031.

[7] I. G. Astawan, I. M. Suarjana, B. R. Werang, S. I. Asaloei, M. Sianturi, and E. C. Elele, "Stem-Based Scientific Learning and Its Impact on Students' Critical and Creative Thinking Skills: an Empirical Study," *J. Pendidik. IPA Indones.*, vol. 12, no. 3, pp. 482–492, 2023, doi: 10.15294/jpii.v12i3.46882.

[8] W. P. L. Tarigan, H. Sipahutar, and F. Harahap, "The impact of an interactive digital learning module on students' academic performance and memory retention," *Comput. Child.*, vol. 2, no. 2, p. em004, 2023, doi: 10.29333/cac/13654.

[9] K. Arizona, "Elevating Students' Competence Based Ict in the Era of Industrial Revolution 4.0," *J. Teach. Learn. Phys.*, vol. 5, no. 2, pp. 48–59, 2020, doi: 10.15575/jotalp.v5i2.7987.

[10] R. Ramli, R. Risky, and W. Kusmaryani, "Post-pandemic impact: E-learning crack-up and English learning quality," *Englisia J. Lang. Educ. Humanit.*, vol. 11, no. 1, pp. 236–251, 2023, doi: 10.22373/ej.v11i1.17948.

[11] Asrowi, A. Hadaya, and M. Hanif, "The impact of using the interactive e-book on students' learning outcomes," *Int. J. Instr.*, vol. 12, no. 2, pp. 709–722, 2019, doi:

10.29333/iji.2019.12245a.

[12] I. Khofifah, Meirza Nanda Faradita, and Fajar Setiawan, "Development of interactive e-book for science learning in fifth grade elementary school students," *J. Pendidik. Dasar Nusant.*, vol. 9, no. 1, pp. 10–21, 2023, doi: 10.29407/jpdn.v9i1.19770.

[13] K. Arizona, "Peningkatan Kompetensi Teknologi Informasi Berbasis Produk bagi Calon Guru melalui Kegiatan Study Group Prodi Tadris Fisika FTK UIN Mataram," *J. Pengabdi. Masy. Sains Indones.*, vol. 2, no. 2, 2020, doi: 10.29303/jpmsi.v2i2.84.

[14] J. Hu, Y. Peng, X. Chen, and H. Yu, "Differentiating the learning styles of college students in different disciplines in a college English blended learning setting," *PLoS One*, vol. 16, no. 5 May, pp. 1–26, 2021, doi: 10.1371/journal.pone.0251545.

[15] L. Testers, A. Gegenfurtner, and S. Brand-Gruwel, "Taking Affective Learning in Digital Education One Step Further: Trainees' Affective Characteristics Predicting Multicontextual Pre-training Transfer Intention," *Front. Psychol.*, vol. 11, no. September, pp. 1–14, 2020, doi: 10.3389/fpsyg.2020.02189.

[16] S. Criollo-C, A. Guerrero-Arias, Á. Jaramillo-Alcázar, and S. Luján-Mora, "Mobile learning technologies for education: Benefits and pending issues," *Appl. Sci.*, vol. 11, no. 9, 2021, doi: 10.3390/app11094111.

[17] A. Agus, L. Hakim, A. Mahsyar, and Fatmawati, "Education Policy on Operational Assistance Management at the Local Level: A Challenge and Recommendations," *Int. J. Sci. Soc.*, vol. 6, no. 2, pp. 121–133, 2024, doi: 10.54783/ijsoc.v6i2.1116.

[18] C. H. Huang, "Exploring the continuous usage intention of online learning platforms from the perspective of social capital," *Inf.*, vol. 12, no. 4, 2021, doi: 10.3390/info12040141.

[19] M. Di Gregorio, D. Di Nucci, F. Palomba, and G. Vitiello, "The Making of Accessible Android Applications: An Empirical Study on the State of the Practice," *Proc. - 2020 IEEE Int. Conf. Softw. Maint. Evol. ICSME 2020*, no. i, pp. 857–861, 2020, doi: 10.1109/ICSME46990.2020.00112.