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Stakeholder Analysis for enhancing ethics in software development: A scoping review

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Abstract. Stakeholder analysis has become a crucial means for achieving software development ethical goals. This scoping review study aims to provide an overview of the extent to which stakeholder analysis has been applied to enhance ethics in software development. The study explores research studies that have been published by IEEE, ACM, Science Direct, AIS and Journal of Business Ethics. PRISMA-ScR was employed to achieve the objective of the study. Only six research studies published from 1999 to 2015 met the selection criteria for data extraction and analysis. The results show that the focus of stakeholder analysis is on moral impulse, risk identification, stakeholder interactions, stakeholder classification and impact level. Furthermore, stakeholder analysis for enhancing ethics in software development is prevalent to empower the voiceless stakeholders, risk management and stakeholder mapping and quantification for measuring stakeholder impact on projects. The analysis of the results reveals several research gaps such as unavailable empirical studies beyond 2015, concentration only on requirements engineering and lack of studies on stakeholder analysis on emergent technologies. The implications of this study point to the need for more guidance and expanded use of stakeholder analysis across the complete software process to benefit software teams and ongoing research to harness the potential of this theory on enhancing ethics in the emergent technologies.

Keywords: Stakeholder Analysis, Enhancing ethics, ethics goals, Software Development, Scoping Review

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1. INTRODUCTION

Projects in the computing field are complex in nature, and their success is, amongst other factors, driven by suitable stakeholder integration [1]. Moreover, the absence of stakeholder integration is often cited as a major contributor to the failure of various IT projects [2], [3], including software initiatives [4]. Ethics as an aspect of interest in software development requires stakeholders integration [5]. However, navigating ethics for stakeholders has become even more complex because of the rapid technological advancements. These advances require the application of several ethical principles suitable for the type of software under development and the collaboration among the diverse stakeholders affected by software development [6]. Despite this complexity, ethics has become an integral component of software development [7] and incorporating the viewpoints of all affected stakeholders to achieve ethical goals has become increasingly pertinent in both practice and research [6]. This is crucial, as creating software products and services that behave ethically becomes a challenge if affected stakeholders are not identified early to help determine the applicable ethical guidelines and viewpoints necessary to shape the moral outcomes of such software [8]. The achievement of ethical goals in software development requires the involvement of stakeholders, just like all technology-oriented projects, as these stakeholders possess a significant influence that can hinder or propel the software project's success.

The extant literature reports various ethical challenges emanating from software, especially in the newer disruptive technologies, because relevant stakeholders were not identified. Consequently, leading to stakeholders' contribution or needs on software ethics not being factored into the final software product or service [9]. Therefore, relevant strategies should be applied to identify and make provisions for stakeholder involvement in enhancing the ethical development of software products and services. Stakeholder theory is one of the organisational theories useful in research and practices for studying stakeholders and understanding their interests and influence on organisational matters [10], [11]. Ethics is a matter of interest for stakeholders in software development because their omission has unappreciable consequences. For example, the inability to consider stakeholders ethics in software technologies has led to system failures, poor service delivery and financial losses amongst others [12].

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Research studies such as [1], [13], [14] raise a concern about the extent to which stakeholder theory is applied to study stakeholders to cater for their ethical needs. These studies indicate that applying this theory is usually confined to limited stakeholders deemed to have a direct link to organisational goals and projects, and that the theory is not maximised to study ethics. In addition, whilst [11], [15], [16], [17] argue that this theory is suitable for ethics, the earlier study by Pouloudi [13] showed that the application of stakeholder theory on the ethics of software development is limited in research. It is so, even though this theory is touted to have the capability to support ethics through its fundamental and normative constructs. Although there are attempts to research this topic, limitations still exist. For example, [14] and [18] show that the heightened consideration of mainstream stakeholders while ignoring indirect stakeholders results in a missed opportunity for integrating the ethical needs of all affected stakeholders. In strengthening this argument, [6] and [19] support stakeholder integration that allows a wider identification of stakeholders and factors their needs to allow for the selection of appropriate ethical guidelines in developing software that will behave in an ethically responsible manner.

The adoption of the stakeholder approach to achieve software development ethical goals can be useful because failure to consider stakeholders has proven to have a negative impact [8], [13], [20]. Based on the benefits of this theory and its suitability to ethics, as suggested by Kandaswamy et al. [21] and the fact that it has not been adequately researched in software development technologies [6], [13], studies on the achievement of ethical software development could gain from its use. Therefore, a gap exists for a study to provide an overview on the use of stakeholder analysis for enhancing ethics in software development. To the best of our knowledge, no review study exists to provide results that address the objective of the current study. The novelty of the study is based on the gap of the limited empirical studies on stakeholder analysis specifically for enhancing ethics in stakeholder analysis and its objective is to provide the practice and future research with synthesised knowledge on stakeholder analysis for enhancing ethics in software development. The research question to be answered in this paper is: To what extent has stakeholder analysis been considered for enhancing ethical software development?

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The remaining part of the paper is structured to present related works section 2, an outline of the methodology to answer the study's research question in section 3, and lastly, the findings and discussions of the study are provided in section 4.

2. RELATED WORKS

To provide a theoretical grounding of the this research work, we start this section with a review of the concepts important to the study. The section concludes with a review of related studies on stakeholder analysis to determine the benefits of this theory in the computing field including in software development. A stakeholder is considered to be anybody who has an influence or can be affected by any endeavour to achieve organisational goals [1], [22], [23]. Therefore, to support ethical software development, stakeholders with the propensity to influence the ethicality of the software process and its outcomes, and those who may be affected, must be identified.

Stakeholder analysis is an instrumental aspect of stakeholder theory, which specifically assists project management in developing a suitable picture, providing a view of organisational stakeholders so that suitable organisational decisions and actions can be taken to achieve goals [10]. Furthermore, [24] define stakeholder analysis as an organisational process used to identify project stakeholders and organise them according to their perspectives, importance, influence and classifications. Stakeholder analysis has proven to be a capable mechanism for carrying the needs and interests of stakeholders into the planning process and the organisation's performance [25]. The analysis of stakeholders is significant to allow for the comprehensive inclusion of stakeholder requirements to prevent omissions that may lead to organisational project failures [26]. The stakeholder analysis approach and associated tools are prevalent within organisations across different fields because of their richness in bringing out insights about parties of interest, their intentions and influence, and resources to influence decisions [10], [27]. Consequently, leading to improved management of stakeholders [28]. Therefore, applying stakeholder analysis can assist in ensuring the ethical interests of stakeholders in software development are attended to and that the software process outcomes are ethical.

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The application of stakeholder analysis requires open-mindedness and use of approaches that will ensure that the inclusion extends beyond the conventional stakeholders as organisations evolve and organisational goals are adapted in alignment with newer technologies. These evolutions have become more prevalent in emergent software technologies, such as those in the implementation of Artificial Intelligence (AI) and Internet of Things (IOT). These technologies collect different kinds of data through sensors installed in networks of things, process the data using AI algorithms and share it across different platforms [29]. The design and use of these technologies raises various questions affecting diverse stakeholders, necessitating ethical considerations on privacy, security, transparency and mitigation of algorithmic bias amongst others [30], [31]. The adoption of ethics-aware approach that strongly support the integration of stakeholders and their ethical needs is paramount in the development of these technologies [30].

Making the concentration of the analysis of stakeholders on a particular grouping considered of higher interest in achieving organisational goals leads to the alienation of other significant stakeholders who are crucial to assisting the organisation in achieving its goals [8]. The misidentified or unidentified stakeholders who influence software development may expose the project to risks [20]. For example, in software development, the developers and users may be perceived as stakeholders of high interest, whilst ignoring the plethora of other stakeholders whose influence is significant for achieving the software goals. Their omission along with their ethical needs may lead to possible project failures. It is for these reasons that [13] suggested a transition from a developer- or user-centric focus to a more organisation-wide approach to including stakeholders. However, [22] states that this approach needs to be used with caution and recommend a systematic approach to avoid considering everybody as a stakeholder. To provide an organised approach, software development methodologies in both the traditional and contemporary domains support systematic approach to the wider inclusion (over and above the developer and user stakeholders) [32]. This is achieved through a clear specification of the different activities in the software process and the stakeholder roles required for achieving the outcomes of the software process [33], [34].

To support the above stated approach, the study by Collins et al. [5] provides a practical demonstration of how the popularly used software models, such as waterfall, V-model, Spiral model and the Agile family models, can include ethics at a specific stage of the process and final review process at the end of the model. Therefore, all relevant stakeholders must be identified and analysed for the influence they may have on the ethics or how they may be affected by the ethics of software development. Ethics in software development has the potential to affect those who are directly involved in the development of software and those who are not actively participating in the software process [8]. Therefore, to ensure all stakeholders and their ethical needs are known organisations should adopt stakeholder analysis. Orr and Davis [35] state that the ethics of software development should be the business of the parties involved. In addition, [22] concedes that all individuals, groups and organisations whose actions influence in any form the development of a system because of their roles are stakeholders.

Stakeholder analysis can be applied for three purposes: descriptive, instrumental, and normative. The descriptive and instrumental application of stakeholder analysis is common in the study of organisational and management practices toward achieving a business strategy [13]. Specifically, the descriptive approach is used to describe the business environment as an organisation of cooperative and competing interests, whilst the instrumental approach establishes a framework for examining how stakeholder management can assist organisations in achieving their goals [13]. Therefore, the instrumental approach can be used to derive a framework for ensuring software ethics are part of organisational goals and the descriptive approach to outline the cooperation of the different software role players for achieving ethical software development. The normative approach assumes that it is ethical to consider stakeholders [13] and places moral obligations on the stakeholders in pursuance of business goals [11]. Furthermore, the basic application of the normative approach in the practice of ethics is to provide practical means for tackling ethical challenges by following certain principles [36]. Therefore, based on the normative approach, stakeholder analysis can be used to achieve ethical purposes in software development [13].

The notable results of stakeholder analysis are reported in various areas of practice, including in management, its area of origin (e.g [11], [37]). The benefits of using this theory

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include enabling the integration of stakeholder inputs (e.g. needs, expectations, impact, etc.) into strategic planning, interpretation of stakeholder environment, stakeholder classification for better understanding of their needs, improved communication, relationship management and informed project decision-making to improve project success [11]. It has also extended into engineering fields (e.g. [26]) and information and communication technologies (e.g., [38], [1] and [13]) with outcomes that include supporting stakeholder involvement, improved project performance in complex environments and requirements engineering for influencing project success and value creation. Therefore, the adaptability of this theory across diverse fields suggests its suitability to even complex fields like software development.

The integration of ethics in software development projects requires the identification of stakeholders and their needs. The use of stakeholder integration for engaging ethics in the development and use of information technology yields positive results [14], [25]. Notably so, because the normative aspect of stakeholder theory is fundamental for its positive impact on investigating the ethical implications in the development of information systems and technologies [6], [13], [14]. In terms of software development, stakeholder analysis has gained success in projects, mainly for the identification of stakeholders and their roles, level of involvement, and risks [39]. It is also applied to improve product development [40], release planning [4] and requirements engineering [41]. Furthermore, it provides a domain-independent, effective and pragmatic approach for identifying relevant stakeholders in a system [42]. It functions well when the focus is on interactions between stakeholders rather than relationships between the system and the stakeholders. A view supported by [43] because software development activities are achieved through interactions defined by roles, teams and resources. Although the study by [43] aimed to close the lack of appropriate stakeholder inclusion, its conceptualisation was limited to requirements engineering instead of the entire software life cycle. In another study, exploring stakeholders in the context of agile software development, [44] developed a stakeholder identification model to assist managers in organisations practising agile principles to determine relevant stakeholders and their influence. The study culminated in the stakeholder identification strategies mapping to six stakeholder groups, providing an opportunity to cater for the wide inclusion of stakeholders.

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To give an account of stakeholder analysis and ethics in the literature, [13] investigated the engagement of the stakeholder concept concerning the development of information systems. The study reveals that even though stakeholder analysis is well-suited for the ethical dimension of information systems development, more research is required to provide insights on this aspect. A subsequent review study by [25] observed a progression from a narrow to a wider perspective of stakeholders in organisations' information systems-related challenges. The study further found that stakeholder analysis profoundly explains projects' organisational, strategic, ethical and cultural dynamics. In addition, this theory is attractive to studies on e-government, e-commerce and information systems, amongst others. Although the theory is considered suitable for studying ethics, the same review by [25] was based on limited studies on ethics. The lack of empirical studies on stakeholder analysis was also found to be a concern by [27]. In an attempt to research software stakeholders and ethics, [14] conducted a review study to determine the stakeholders affected by software-intensive systems, ethical values, and how the stakeholders' ethical requirements and values can be addressed in the design and development of software systems. The study's findings suggest approaches to categorising stakeholders in terms of who is affected by the system, how they are affected and how they interact with the system. In addition, it further shows that reviewed studies focus on values for the stakeholders and the translation of those values into software requirements.

Figure 1. Application of stakeholder analysis in software development

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Based on the above review of related studies, the studies show that in the wide spectrum of software development, stakeholder analysis has been used for risk identification, product development, requirements engineering, release planning and ethics initiatives. We have organised this summary and presented it in Figure 1. However, limitations still exist regarding reviews on studies focused on stakeholder analysis for enhancing ethical software development. This current study proceeds to identify and analyse literature to report on the extent to which stakeholder analysis has been used to enhance ethics in software development.

3. METHODS

In the introduction section we have showed the need for the study to synthesise knowledge on the use of stakeholder analysis in enhancing ethics in software development. [45] assert that quality reviews are suitable to provide a synthesis of available knowledge for the practice. Hence, this paper employs a systematic scoping literature review to analyse previous research studies on stakeholder analysis for enhancing ethical software development. The scoping literature review was selected for its suitability in exploring the extent to which literature provides evidence on a subject [46]. This will help to determine successes and knowledge gaps in the use of stakeholder analysis for enhancing ethics in software development.

Like other review research studies, the methodology adopted in this study addresses the formulation of the research question, search and screening of literature articles used in the study, and the extraction of the relevant data from the selected articles for further analysis, as guided by [46]. The protocol of the study was developed by one of the authors and validated by the other to minimise bias in the execution of the study. The research question to be answered is formulated in the introduction section as: *To what extent has stakeholder analysis been considered for enhancing ethical software development?* The study selection process of suitable materials is shown in the PRISMA-ScR flow diagram in Figure 2 and is detailed in subsections 3.1 to 3.3.

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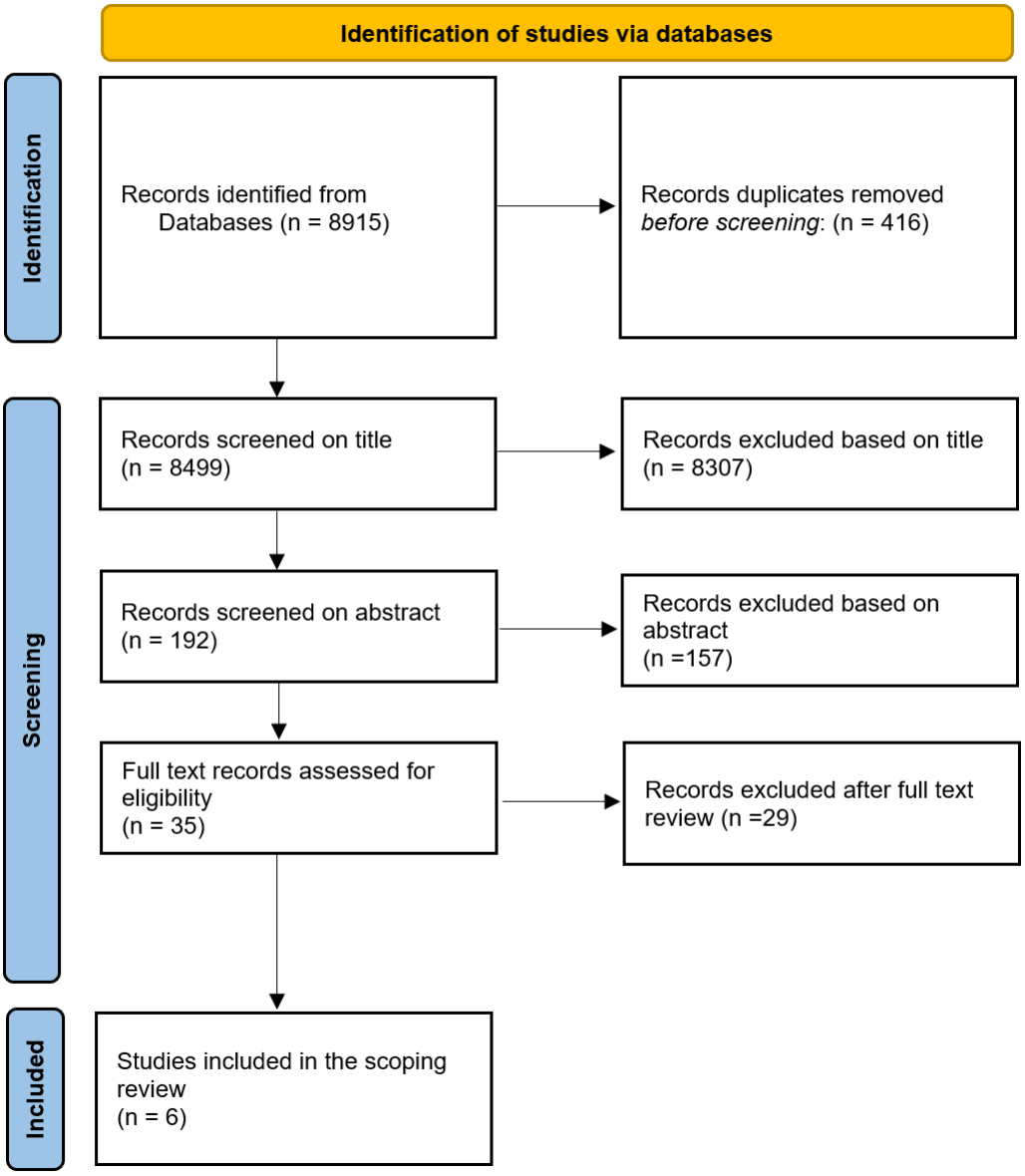

Figure 2. Adopted PRISMA-ScR Flow diagram

3.1 Literature identification

The search for literature was conducted in May 2025 using the combination of search strings "stakeholder" AND "ethics" AND ("software development" OR "software engineering") AND ("involvement" OR "integration" OR "communication") AND "analysis". These combinations of keywords were first explored on Google Scholar, then flexibly applied to the selected repositories (IEEE, ACM, Science Direct, Emerald and AIS) to conduct a final search. In addition, a popular journal of Business Ethics (JBE) was searched, as it commonly contains original and peer-reviewed research material on the

application of ethics in various domains. The searches yielded a total of 8,915 articles as per Table 1.

Table 1. Databases and search results

	IEEE	ACM	Science Direct	Emerald	AIS	JBE	Total
Articles retrieved	2939	489	1353	705	1975	1454	8,915

3.2 Articles screening

The screening of the articles included the removal of duplicates, review of titles, abstracts and complete reading of the retrieved articles to determine their suitability to the research work. The screening was conducted by one researcher following the developed protocol. It was then verified by the other researcher. Although the agreed means of resolving disagreements was discussions, no screening inconsistences emerged between the two researchers. Furthermore, only articles that are written in English, peer-reviewed and provide results qualified to be included in the sample. Other materials, such as reviews (systematic and ordinary), books and theses, were excluded. The study excluded articles that were not written in English, not peer reviewed and not published. To ensure the relevance of the articles, only articles concerned with the application of stakeholder approaches to enhancing ethics in software development were included. Only a sample of six articles meeting the set criteria was available for data extraction and analysis after the final assessment of the retrieved articles. These materials included four journals and two conference papers, with publication dates ranging between 1999 and 2015. The limited sample shows that fewer studies exist to be included in this research study. The selected articles are presented in Table 2.

Table 2. Articles selected for this study

ID	Year	Author(s)	Title	GS Citations
A	1999	Yuthas & Dillard	Ethical Development of Advanced Technology: A Postmodern Stakeholder Perspective	64
B	2005	Gotterbarn, D., & Rogerson, S.	Responsible analysis for software development: creating the software development impact statement	84

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ID	Year	Author(s)	Title	GS Citations
C	1999	Sharp, H., Finkelstein, A., & Galal, G.	Stakeholder identification in the requirements engineering process	543
D	2007	Woolridge, R. W., Mcmanus, D. J., & Hale, J. E	Risk Assessment: An Outcome-Based Approach	47
E	2010	Power, K.	Stakeholder identification in agile software product development organizations: A model for understanding who and what really counts	51
F	2015	Rahman, M., Moonira, M. M., & Zuhora, F. T.	A systematic methodology and guidelines for software project manager to identify key stakeholders	9

3.3 Data extraction for analysis

The study aimed to answer the study's research question stated in the introductory section, which sought to determine what research has achieved in terms of stakeholder analysis for improving ethical software development. Following the protocol, we extracted and tabulated the elements of stakeholder analysis from the analysed articles to include methods/techniques, focus, software process supported, and ethics support advanced for software development as presented in Table 3. These elements assisted in the synthesis and drawing up conclusions on the use of stakeholder analysis for enhancing ethics in the software development landscape.

Table 3. Application of stakeholder analysis for ethics in software development

ID	Stakeholder Analysis Technique	Elements of the technique	Focus	Software process supported				Ethics support
				Plan Driven	Agile	Both	Not stated	
A	Stakeholder-oriented systems development	Postmodern ethics principles are based on	Moral impulses of individuals that lead to				Yes	Goes beyond traditional stakeholders to include all

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ID	Stakeholder Analysis Technique	Elements of the technique	Focus	Software process supported				Ethics support
				Plan Driven	Agile	Both	Not stated	
		individual moral impulse Step-by-step process for achieving stakeholder solidarity Early ethical interest and needs identification Engagement on ethical issues	shared solidarity					relevant stakeholders. Applies postmodern ethics principles to the ethical development of technologies Emphasises individual moral impulse over self-interests and institutional structures and rules
B	Software development impact statement	Process-oriented with 4 stages Considers the project context for stakeholder analysis Consideration of intra- and extra-project stakeholders qualitative risk identification	Stakeholder risk identification			Yes		Helps identify social, professional and ethical risks for a project. Applies comprehensive stakeholder identification
C	Baseline stakeholder identification	Baseline stakeholder to identify the web of stakeholders Step-by-step stakeholder identification	Stakeholder interactions	Yes				Inclusion of relevant stakeholders for a specific system by applying a baseline stakeholder analysis.

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ID	Stakeholder Analysis Technique	Elements of the technique	Focus	Software process supported				Ethics support
				Plan Driven	Agile	Both	Not stated	
		Domain-independent Ethical decision-making						
D	Outcome-based stakeholder risk assessment	Step-by-step, Identify stakeholders' impact on the project. Identify the project's impact on stakeholders, risk impact assessment, Project outcomes based	Project outcomes impacting stakeholders				Yes	Comprehensive inclusion of stakeholders for managing project risks arising from stakeholders
E	Stakeholder mapping	Traditional primary stakeholder mapping, Software process context and principles Uses agile roles	Stakeholder interactions		Yes			Inclusion of stakeholders (stakeholder mapping and influence quantification)
F	Methodology for identifying key stakeholders	Step-by-step orientation Analyze stakeholders based on classification and impact	Stakeholder impact and classification levels				Yes	Inclusion of stakeholders (stakeholder classification and impact)

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ID	Stakeholder Analysis Technique	Elements of the technique	Focus	Software process supported				Ethics support
				Plan Driven	Agile	Both	Not stated	
		on the project Use metrics to measure stakeholder impact						

4 RESULTS AND DISCUSSION

4.1 Factors considered in applying stakeholder analysis for enhancing ethics in software development

It has become important to use stakeholder analysis to achieve ethical goals in software development. The application of stakeholder analysis from the analysed studies considered several supporting factors laid out in *Table 3*. These include the technique/method and its elements, focus, applicable software process and how ethics are supported. Firstly, the elements of the technique in all the studies are organised in a step-by-step approach to provide a logical flow. In addition, the studies show that the integration of stakeholder analysis techniques in a software process is beneficial. For example, some of the studies, i.e. [20], [42], [44] demonstrated how stakeholder analysis can be applied practically in a software process. Specifically, the study by [42] integrated stakeholder analysis in a plan-driven software development whilst the study by [44] aligned with the agile approach. However, the studies by [23], [42] and [23] focused on requirements engineering instead of the entire software process. The use of stakeholder analysis in these studies allowed for identification of roles and responsibilities prescribed by the software process and showed where in both the traditional and agile development software process the stakeholder analysis supports ethics.

Furthermore, the analysed studies' s focuses on stakeholder analysis include moral impulse [47], qualitative risk identification [20], stakeholder interactions [44], project outcomes [23] and stakeholder classification level and impact level [24] as summarised and depicted on Figure 3. Therefore, applying stakeholder analysis assists not only

identifying stakeholders and their impact, but also in focusing on a specific aspect of stakeholder interest in relation to software development ethics.

Figure 3. Focuses of stakeholder analysis

4.2 Ethical purposes for which stakeholder analysis is applied in software development

The analysis of the studies identified in this study shows that the areas in software development in which stakeholder analysis has been used to enhance ethics are to provide a voice for solidarity, risk management, stakeholder mapping and influence quantification. These applications summarised and presented in *Figure 4*.

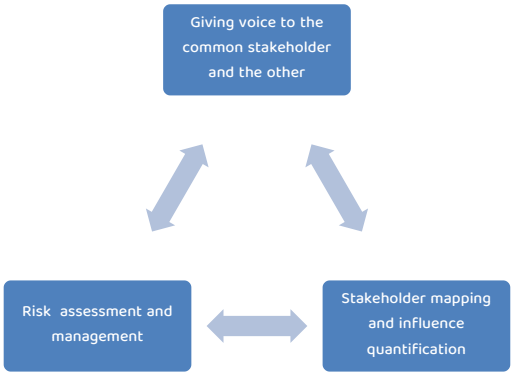

Figure 4. Application of stakeholder analysis for ethics in software development

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1) Giving voice to the common stakeholder and the other

Stakeholder theory is considered a powerful means of not only ensuring that stakeholders are accounted for but also are allowed to have a voice in the organisational goals. This approach is more suitable to advocate for ethical software development because its normative orientation provides strategies for an ethical approach. Furthermore, the traditional approach to ethics, as observed by [20], is that other stakeholders and the ethical responsibilities accrued to them by the so-called mainstream stakeholders (i.e. the developers and project managers) receive insufficient attention. This limitation justifies the need for expanded means of accommodating the voices of the sidelined. Furthermore, [47] indicate that the shortcoming of the traditional stakeholder approach is that its performance is limited to only acknowledging the presence of the stakeholders and is sometimes used to sweet-talk them into accepting software systems, so project managers can report the system as successful. As an improvement, the same authors suggest that the application of stakeholder analysis should also ensure that moral concerns, which might otherwise be ignored or silenced, find expression within the software development activities through the invocation of individual moral impulse over institutional rules and structures to achieve shared solidarity, empathy and understanding.

For example, in terms of giving voice to all relevant stakeholders, [47] proposed a framework applying the principles of affirmative postmodern ethics to make provision for considering stakeholders that might emerge after the development of the system and find themselves being affected by the system. The framework enables stakeholder-oriented systems development by identifying stakeholders and providing them with a platform for unifying their voices, expressing themselves not only in infusing ethics into software development activities but also in evaluating the outcomes of the software process. The Outcome-Based Risk Assessment Model (OBSRAM) by [23] also allows for extended stakeholder identification and assessment of the stakeholder impact of the project's success. This constitutes a major shift from only considering those close to the project to those functioning at a distance from the project and those who have yet to come.

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2) Risk assessment and management

Stakeholders can bring risks into the software project activities, especially through the roles assigned to them. Therefore, any risk management plan should ensure sufficient coverage of stakeholders with the possibility of their participation to negatively affect the software project [23]. Not paying attention to ethics in software development may pose a risk to the software project. Therefore, any risk management initiative should feature the aspect of ethics applicable to software development.

The reviewed studies provide several strategies for identifying and dealing with the risks associated with software projects. Project risks are usually identified from those that are quantifiable for ease of management and reporting. However, ethics are a qualitative aspect, and if anybody were to deal with ethical risks, it would make sense to also look at them from a qualitative perspective. To circumvent software project risks, [20] developed SoDIS (Software Development Impact Statement), a step-by-step process to expedite the extended view of risks to reduce or eliminate the impact of undetected risks in software development. The process applies qualitative best practices, allowing for a comprehensive risk analysis to identify social, professional and ethical risks for a software project in line with the tasks associated with the stakeholders. Similarly, the OBSRAM framework by [23] also helps to identify and plan for software project risk mitigation, step-by-step, from identifying stakeholders from the early stages of requirements engineering through to determining the project's impact on stakeholders and risk assessment.

To ensure maximum benefit, the two frameworks ensure alignment with the activities of the software project and can be applied in different project settings. In addition, the SoDIS framework identifies project tasks across the entire software process and determines how the completion of the project's collective tasks can affect the identified stakeholders inside and outside the project. The advantage of this process is that it extends the concept of software risk in three ways (it recognises project stakeholders beyond those considered in typical risk analysis and adds qualitative elements). Additionally, it goes beyond the limitations of traditional measures of project success (schedule, budget and function). Therefore, in successfully with ethical risks, the risk

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management strategies should also consider the ethical needs of the identified stakeholders.

3) Stakeholder mapping and influence quantification

The stakeholder analysis in the studies was not limited to the identification of stakeholders of a software project. As observed from the analysed literature, mapping of stakeholders to their responsibilities, risks, and the software project outcomes is useful in determining the power or influence of the stakeholder. The studies offer varying research results regarding the mapping of stakeholders and the quantification of their influence. The mapping helps to determine if the stakeholders are internal or external to the project or the organisation. For example, [23] and [20] in their mapping, identify internal and external stakeholders to the organisation, as well as intra-project stakeholders and extra-project stakeholder groups, respectively. The differentiation in terms of proximity helps to gauge stakeholder impact and understand the extent of their participation. Another useful element in the mapping of stakeholders, as applied by [44] is the guiding principle and context of the software process used in the project. The mapping of stakeholders becomes significant to contextualise the stakeholder and their needs.

To be able to measure the influence of the stakeholder, it is important to have a means of quantifying the influence. This is useful to understand and compare the influences of the stakeholders, and if possible, prioritise their needs and likely impact on the project or the impact of the project on them. To quantify the stakeholder influence, the study by [23] suggests the use of metrics for measuring the degree of impact, significance, and the desired impact of the specified outcome on a given stakeholder. [24]shows that to evaluate the impact of the stakeholders, stakeholders should be allocated to the classification level matrix, which can be compared with the stakeholder impact level matrix to allow the project management to prioritise aspects of the software project. Therefore, stakeholder mapping and influence quantification are important to inform decision-making to propel and reconfigure activities to achieve the goals in software development.

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5 CONCLUSION, RECOMMENDATIONS AND LIMITATIONS

The analysed data from the selected articles shows that the application of techniques for the identification and categorisation of stakeholders according to their roles is a powerful aspect of stakeholder analysis. Key to the techniques is that, besides the identification of stakeholders, their roles, and interests, the allocation of responsibilities in a normative stakeholder approach is vital. Furthermore, the selected articles provide an extended analysis of stakeholders to include a wide range of stakeholders because of their roles and influence, and the possible risk that can be introduced by their omission. The empirical study by [22] testaments to the fact that stakeholders can extend beyond the initially considered list.

The common approach to stakeholder analysis in enhancing software development ethics that emerged from the articles requires alignment with the software process. However, majority of the articles limited the stakeholder analysis to requirements engineering process instead of the entire software process. Therefore, organisations should, over and above the roles derived from software development methodology, from which software project stakeholders are drawn, apply dedicated stakeholder analysis techniques aligned to the entire software process to ensure that stakeholders ethical needs are accounted for throughout.

The analysed studies shows that the prevalent use of stakeholder analysis to support ethics in software development is in giving voice to the voiceless or the other, risk management and stakeholder mapping and quantification for measuring stakeholder impact on projects. This justifies stakeholder analysis as an ethical tool as it provides organisations a platform for stakeholder engagement in terms of their interests and power to influence organisational goals including ethics. Furthermore, the focus of stakeholder analysis by these studies concentrated on moral impulse, risk assessment and management, stakeholder interactions, project outcomes, stakeholder classification and impact levels. In terms of the flow of the organisation of the analysis approach, the prevalent approach is the step-by-step which can be integrated into a software process.

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The paper has achieved its objective by synthesising the existing knowledge to show the extent to which stakeholder analysis was applied to enhance ethics in software development. However, it is important to highlight that there are limited empirical studies as evidenced from the six analysed articles, to sufficiently inform stakeholder ethics practice in software development. Moreover, the lack of studies beyond 2015 illustrates research gaps considering that software ethics have become a thorny issue and stakeholders' interests are a growing phenomenon in software development as confirmed by [6], [14]. This is despite the call by researchers such as [22] to use stakeholder theory for enhancing ethics in the development of advanced technologies. In addition, the analysed studies do not account for stakeholder analysis in the development of IoT, AI and other emergent technologies. Knowing and understanding stakeholders, integration of ethics in newer technologies will assist in harnessing stakeholder power of influence and adequately managing risks that they are likely to negatively affect the software project's success from stakeholder needs exclusion perspective.

The limited up-to-date knowledge on this subject has the potential of leaving practitioners without updated knowledge to inform the practice. Further investigations are necessary to explore the different aspects of ethics in software projects using stakeholder analysis. A specific focus on analysing ethics of stakeholder interactions could provide more insights to the field. In addition, future studies can be undertaken to apply stakeholder analysis on emergent technologies such AI, IoT, etc., to enhance ethics, focus specifically on empirical studies, and use of normative approaches to support ethics in software development.

A further limitation of the study is that its findings are confined to the articles are retrieved from the sources specified in the methodology section. It will benefit the discourse for other researchers to consider alternative sources to explore possibilities of diverse findings. Because of the nature of this study, which is scoping review, certain insights could not be generated. Other forms of systematic reviews can be conducted on the subject by considering empirical studies to generate insights beyond the scoping review.

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