

Master's programme in Information Networks

Stakeholders and value creation in software engineering

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Abstract

Modern day software teams work in a rapidly changing business environment where organisations often must deal with quickly evolving requirements that can become obsolete even before project completion. Software teams need to look beyond the functionality of a software system, in order to support organisational success. The goal of the study is to investigate, "How can software teams support stakeholder value creation?". The primary method of investigation was a pragmatic systematic literature review. This involved an qualitative selection and analysis of relevant publications in the study fields of management, marketing, software engineering and requirements engineering to understand relevant stakeholders for software teams and the current practices that software teams employ to align with stakeholder expectations. Based on our multidisciplinary literature review we defined a classification of stakeholders that could be applied to variety of software teams. The classification of stakeholders for software teams includes software team members, users, customers, internals, regulation and general public. Because stakeholders' types and characteristics may vary depending on the business context, all software teams should identify their own stakeholders and extend the suggested classification if needed. Stakeholder value is multidimensional and subjective in nature it is very difficult to measure in practice. Stakeholder value creation is an ongoing process that attempts to improve stakeholder value, but that relationship is hard to prove. The key practices we suggest software teams to support stakeholder value creation include face-to-face communication with stakeholders, iterative prioritization, and continuous design and development. These practices for software teams treat value creation as an ongoing process, emphasizing active stakeholder involvement and designing the system for ever-changing requirements. Software teams can support stakeholder value creation only if they have capabilities of understanding stakeholders' processes.

Keywords stakeholders, stakeholder value, value creation, software engineering, stakeholder classification, software engineering practices

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Tiivistelmä

Ohjelmistotiimit toimivat nykyisin nopeasti muuttuvassa liiketoimintaympäristössä, jossa organisaatioiden on usein käsiteltävä nopeasti kehittyviä vaatimuksia. Nämä voivat vanhentua jopa ennen projektin valmistumista. Tukeakseen organisaationsa menestystä, ohjelmistotiimien tehtäviin tulisi kuulua muutakin kuin ohjelmistojärjestelmien toiminnallisten ominaisuuksien kehittäminen ja ylläpito. Tutkimuksen tavoitteena on tutkia, "Kuinka ohjelmistotiimit voivat tukea sidosryhmäarvonluontia?". Tutkimuksen päämenetelmänä käytettiin pragmaattista systemaattista kirjallisuuskatsausta. Menetelmään kuului aikaisempien julkaisujen laadullisen etsintä, valinta ja analysoinnin johtamisen, markkinoinnin, ohjelmistokehityksen ja vaatimustenmäärittelyn tutkimusaloilta. Monitieteellisen tutkimuksen tavoitteena on ymmärtää ohjelmistotiimien kannalta olennaiset sidosryhmät ja nykyiset käytännöt, joita ohjelmistotiimit käyttävät näiden sidosryhmien tarpeiden täyttämiseksi. Kirjallisuuskatsauksen tulosten perusteella loimme sidosryhmien luokittelun ohjelmistotiimeille, jota voidaan soveltaa useille eri tiimeille. Määrittelemäämme luokitteluun kuuluvat ohjelmistotiimin jäsenet, käyttäjät, asiakkaat, sisäiset sidosryhmät, lainsäädäntö ja laaja yleisö. Koska sidosryhmät ja niiden erityispiirteet voivat vaihdella liiketoimintaympäristön mukaan, kaikkien ohjelmistotiimien tulisi tunnistaa omat sidosryhmänsä ja tarvittaessa laajentaa ehdotettua luokittelua. Sidosryhmäarvo on luonteeltaan moniulotteista ja subjektiivista, mikä tekee sen mittaamisesta käytännössä erittäin vaikeaa. Sidosryhmäarvonluonti on jatkuva prosessi, joka pyrkii parantamaan sidosryhmäarvoa, mutta tämän riippuvuussuhteen todistaminen on erittäin vaikeaa. Ehdotamme ohjelmistotiimien keskeisiksi käytännöiksi, joilla tuetaan sidosryhmäarvonluontia, kasvokkain tapahtuvan viestinnän sidosryhmien kanssa, jatkuvan tärkeysjärjestyksen asettamisen ja jatkuvan suunnittelun ja kehityksen. Arvonluonti on jatkuva prosessi jota nämä käytännöt tukevat korostaen aktiivista sidosryhmien osallistamista ja ohjelmistojärjestelmän suunnittelua jatkuvasti muuttuviin vaatimuksiin. Ohjelmistotiimit voivat tukea sidosryhmien arvonluontia vain, jos niillä on kyky ymmärtää sidosryhmien prosesseja.

Avainsanat sidosryhmät, sidosryhmäarvo, arvonluonti, ohjelmistokehitys, sidosryhmien luokittelu, ohjelmistokehityksen käytännöt

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Abbreviations

SLR	Systematic Literature Review
RE	Requirements Engineering
SE	Software Engineering
NGO	Non-Governmental Organisation
SaaS	Software as a Service
SM	Stakeholder management
ST	Stakeholder theory
TDD	Test-Driven Development

1 Introduction

1.1 Background and motivation

Modern day software teams work in a rapidly changing business environment where organisations often must deal with quickly evolving requirements that can become obsolete even before project completion [4]. At the same time software teams need to balance the needs for multiple different stakeholder groups. In order to support organisational success the software teams should look beyond the functionality of a software system to aim to match stakeholder needs. The more central the software systems are to the firms business, the more responsibility of the organisational success relies on software teams.

We have identified a lack of research on stakeholder classification and stakeholder value creation for software teams. These topics have been studied almost solely on firm perspective, overlooking the responsibility software teams can have on organisational success. There is also lack of consensus on stakeholder theory. According to Friedman and Miles [13] a "convergent stakeholder theory" is one of the most exciting problems in stakeholder theory, but there has not been done enough work has been done on the organisation-stakeholder relation itself in order to combine the different strands of stakeholder theory into a single meaningful framework. According to Friedman and Miles [13] there is also a lack of work done in distinguishing different types of stakeholders and there is a need for understanding stakeholder relations from both stakeholder and organisational perspectives. Tapaninaho and Kujala [32] argue that a more versatile understanding of value and value creation, as well as a broader comprehension of stakeholders and their needs, should be incorporated into future research. Additionally, this would help businesses to function more sustainably [32]. According to Garriga [16] there are only a few studies that have researched value creation from the stakeholder perspective. Garriga states [16] that there are still unanswered questions, such as how a firm should treat stakeholders to create value or what is the definition of 'value' from the perspective of stakeholders in the value creation process.

Freeman [10] sees understanding the relationships between organisation and the stakeholders integral to the business. For companies where the business relies heavily on software, the software teams responsibility over organisational success is integral. The software team's job is to create products to help the users achieve solutions to their problems while helping the firm achieve its financial goals. Kauppinen et al. [20] state that focusing on product features is not enough for companies who want to offer true value to customers. In this thesis will be investigating the definitions for stakeholder groups and stakeholder value form for example management literature and marketing literature in addition to software engineering (SE) and requirements engineering (RE) literature.

1.2 Research problem and questions

The research problem is "How can software teams support stakeholder value creation?". The research questions are the following:

1. What are stakeholders for software teams?
2. What are stakeholder value and stakeholder value creation?
3. What SE practices support stakeholder value creation?

1.3 Scope of the thesis

This study is a literature review. The main focus of the literature review is on research questions RQ1 and RQ2 as highlighted in the table 1.

Table 1: Research questions and their weighted importance in this thesis

Research question	Weighted importance in literature review
RQ1	X
RQ2	X
RQ3	x

One of the goals of the thesis is to look at the software teams, not independently, but how they can contribute to wider organisational success. Therefore, we will be conducting the literature research from multiple disciplines. We will be including references from software and requirements engineering literature, management literature and marketing literature.

We acknowledge that not all software teams are the same. Some software teams might not operate in an environment where they would have a lot of impact on the stakeholders. Therefore, we will be focusing on software teams that operate in software product companies and are capable of using agile methods. We think that these are the organisations where the software teams have a lot more impact on stakeholders, and for those teams the results of this study more meaningful and applicable.

When investigating stakeholders for software teams in section 3.1 we were considering all stakeholders. However, in section 3.2 where we studied stakeholder value and stakeholder value creation, while not completely excluding certain stakeholder groups, we did focus on mainly user and customer value and value creation.

1.4 Structure of the thesis

In this thesis, we will first go through the process research methods of this thesis in section 2. In this section we explain the research methods of literature research, the search and selection of relevant publications and how we performed the analysis on the relevant publications.

Then, we will go through the results of the literature review in the section 3. There we will systematically present the analysis of relevant publications in respect to our research questions, each research question having its corresponding section. First examine how the existing literature defines stakeholders in section 3.1 summarising what are the stakeholders for software team in section 3.1.10. Then we inspect what is stakeholder value and value creation and how does existing literature define them in section 3.2. Finally, we will look into practices that software teams should perform in section 3.3 and consider how they relate to stakeholders and supporting value creation.

After the results of the literature review we will summarise the results and discuss them in section 4. Finally, we will perform a conclusion of the thesis and provide suggestions for future study in section 5.

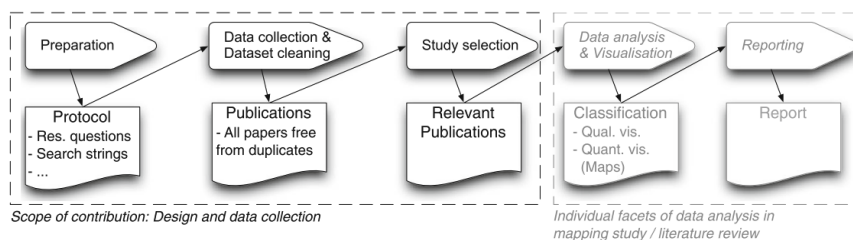
2 Research methods of literature research

2.1 Research process

In this thesis, we have adopted a pragmatic expertise based approach to systematic literature review (SLR), guided by the methodologies described by Kuhrmann et al. [21]. We chose this research method because it supports our goal to systematically and comprehensively examine stakeholders for software teams across various fields of study. This approach allows us to gather and analyse evidence from a wide range of disciplines and enables the synthesis of the different viewpoints on stakeholders and stakeholder value creation. By approaching the research questions from analysing existing theory and literature, we hopefully will arrive in results that are generalisable for variety of organisations and software teams.

The overview of the research process we are applying to this thesis is displayed in the Figure 1. This process serves as a framework to identify, analyse, and interpret evidence related to our defined research questions in a manner that is unbiased and, to a certain extent, repeatable.

Figure 1: Overview of the research process in Kuhrmann et al. [21]



The preparation phase in the research process, as outlined by Kuhrmann et al. [21], involves setting up the study design, which includes defining research questions, selecting relevant literature databases, developing search queries, and establishing inclusion and exclusion criteria. This phase in the SLR, ensures that the scope of the search is clearly defined and that preliminary studies can support search term development or testing, improving the study design overall.

The data collection phase, in the research process described by Kuhrmann et al. [21], involves executing the search strategy through selected databases using defined search terms. This phase aims to gather as many relevant publications as possible that meet the inclusion criteria defined in the preparation. Dataset cleaning is following the data collection. This involves removing duplicates, screening titles and abstracts to exclude irrelevant studies, and possibly reviewing full texts to ensure the studies meet all inclusion criteria. Dataset cleaning is important for maintaining the quality and relevance of the dataset for analysis.

The study selection phase in the research process described by Kuhrmann et al. [21], involves assessing the collected studies against the inclusion and exclusion criteria established during the preparation phase. This step ensures that only the most relevant studies are considered for the review. The process typically includes a detailed

examination of the studies' abstracts and, if necessary, full texts, to evaluate their relevance to the research questions. This phase may also involve a quality assessment of the studies to ensure they meet a minimum standard of evidence for inclusion in the analysis.

The goal of the analysis in the research process described by Kuhrmann et al. [21] is to build a comprehensive understanding of the subject area, leading to conclusions based on the gathered evidence. It involves a thorough examination of the selected studies to extract and synthesize evidence relevant to the research questions. This step requires a detailed assessment of the methodologies, findings, and contributions of each study. The aim is to interpret the data in a way that answers the research questions, identifies patterns or trends, and possibly uncovers gaps in the existing literature.

Additionally, we applied partial snowballing to define key references for the thesis. Wohlin [36] defines backward snowballing as a process where we use the reference list to find new papers. Wohlin [36] suggests that snowballing could be a primary search strategy, potentially an alternative to database searches, for identifying relevant literature. In this thesis we are applying snowballing as a secondary method for finding literature. Kuhrmann et al. [21], describes snowballing as a method to extend the included literature set by iteratively following references provided in the initially identified studies. Snowballing is particularly useful for capturing key contributions and contributors in a research area [21].

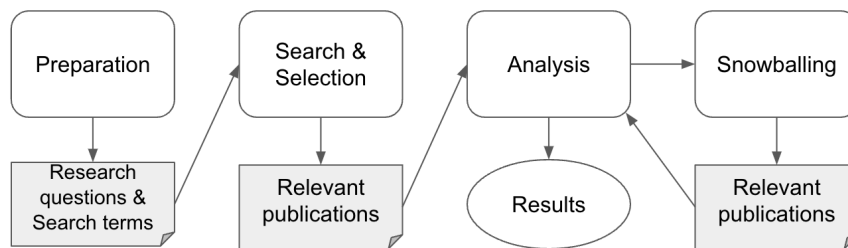
According to Kuhrmann et al. [21] SLR allows to share a structured overview of the publications in a specific research area and a common understanding of the state of reported evidence in research topics. SLR goes beyond mapping studies by not only identifying information but also analyzing and integrating the knowledge within the reviewed publications. We believe that SLR methodology is suitable for understanding the stakeholders for software teams and stakeholder value creation since there are plenty of existing studies on stakeholders including many theoretical frameworks. The stakeholder theory is from our point of view fragmented still containing a lot of commonalities among studies. Therefore, we believe that the synthesis of relevant studies could provide exiting insights on our research questions that would apply in many different teams and organisational contexts. Furthermore, in this study SLR enables us to analyse studies across many disciplines and perform cross-analyses on the knowledge between disciplines on the same topic. This multidisciplinary approach to SLR allows us to examine knowledge on software engineering as well as on the organisational environment where they are applied. We hope that this approach enables us to create meaningful results that can be applied to real world scenarios. Kuhrmann et al. [21] state that scientific community values systematic reviews in software engineering literature studies, since the method has been proven to provide structured and comprehensive insights.

The problem statement for systematic literature studies made by Kuhrmann et al. [21] is that conducting a literature study depends to a large extent on the expertise of the involved researchers and might not provide a completely repeatable research method. We acknowledge that these are challenge on the method we have chosen. We still believe that the potential of interesting results across disciplines outweighs the

risks involved to the methodology.

The research process we used in this thesis follows mostly the research process by Kuhrmann et al. [21] extended with partial snowballing defined by Wohlin [36]. Our application of these methods was practical emphasising lightweight and effective selection of relevant publications. The overview of the research process we used in this study is displayed in the Figure 2.

Figure 2: The research process of this study



The starting point of the literature review is the research questions. The research questions defined above are related to defining stakeholders for software teams. As described in the previous section 1.3 we are looking for references across the fields of management, marketing and software engineering.

From the research questions we define search terms. Defining search terms or query strings is also suggested by Kuhrmann et al. [21] for systematic literature studies. Kuhrmann et al. [21] state that the search terms should depend on the domain under investigation and therefore we are using specific search terms for each of the fields: management, marketing and software engineering.

The search itself is done using meta-search engines, like Scopus and Google Scholar, with the previously defined search terms. The difference in the process described by Kuhrmann et al. [21] is that we are not using database searches, because they involve a preparation phase that is too demanding for the scope of this thesis especially when we are conducting this research in multiple fields of literature.

The selection of the search results was done in order to control the vast amount of potentially relevant publications. We defined an inclusion criteria as suggested by Kuhrmann et al. [21]. A publication needed to apply to all the defined criteria. The inclusion criteria we defined was the following:

- Title, keyword list, and abstract make explicit that the paper is related to the topic
- The belongs to the domain of management, marketing or software engineering literature
- The paper is written in English

The found and included papers were documented and given a numeric value on their relevance to the topic of the thesis from 1-5. When performing the literature

review, the analysis was started from the paper rated as most relevant and not yet read. This was a way for us to perform a systematic literature review while managing the scope of the thesis. The relevant publications included to the study are listed in the section 2.2.

The analysis was performed to individual publications. During the analysis phase we investigated how the relevant publication answers the research question at hand. After that we summarised all the relevant papers by performing a synthesis. This was a qualitative phase that involved a thorough examination of the selected studies to extract and synthesize evidence relevant to the research questions. We explain this process in detail in section 2.3.

We applied partial backwards snowballing described by [36] and [21] to expand on key publications on the field of study. Kuhrmann et al. [21] and Wohlin [36] suggest that snowballing should be included to literature search and study selection process and precede the analysis phase. We applied backwards snowballing during the analysis instead, because it was much more practical and lightweight. In our study process, snowballing was applied for a relevant publication during analysis, if the relevant publication relied heavily upon other sources. After this the original sources were investigated and evaluated based on our inclusion criteria. The paper is documented to be a reference for another paper. If a paper has been referenced by multiple relevant articles it can be included to the relevant publications.

2.2 Search and selection of relevant publications

The search and selection of relevant publications was done as explained in the section 2.1. In this phase we prepared search terms that we used to query meta-search engines such as Google Scholar and Scopus. The relevant publications were chosen out of the top search results based on the inclusion criteria defined in the section 2.1. In the table 2 we have listed the search terms that we used for finding relevant literature targeting results in one discipline.

Table 2: Search terms used for finding relevant publications

Discipline	Search terms used
Management literature	stakeholder theory, stakeholders management, stakeholder theory management literature, stakeholder value, stakeholder value creation,
Marketing literature	stakeholder theory marketing literature, stakeholders marketing literature, stakeholder value marketing literature, stakeholder value proposition, stakeholders categorisation,
SE and RE literature	requirements engineering, stakeholder theory requirements engineering, stakeholders software development, value based software engineering, modern software development, software as a service requirements engineering, user value, user value creation

Additionally, we applied forwards snowballing for the selected publications as explained in the section 2.1. This process was done iteratively if a relevant publication heavily relied on another publication.

During the search and selection we aimed to identify the key references out of selected literature across fields of study for each research question. This selection was done with the selection criteria explained previously. The list of key references is not a complete list of references used to answer the research questions, but they represent the publications that were the most integral on the theory section of this literature review. The search and selection of relevant publications was performed to all research questions separately and therefore there are different key references for all research questions. The identified key references for all research questions are displayed in the tables 3, 4 and 5.

Table 3: Key references for RQ1

Discipline	Key references for RQ1
Management literature	<p>Clarkson (1995) "A Stakeholder Framework for Analyzing and Evaluating Corporate Social Performance". <i>Academy of Management Review</i> [6]</p> <p>Charreaux and Desbrières (2001) "Corporate Governance: Stakeholder Value Versus Shareholder Value". <i>Journal of Management and Governance</i> [5]</p> <p>Friedman and Miles (2002) "Developing stakeholder theory". <i>Journal of Management Studies</i> [13]</p> <p>Harrison et al. (2010) "Managing for stakeholders, stakeholder utility functions, and competitive advantage". <i>Strategic Management Journal</i> [17]</p> <p>Pedrini and Ferri (2019) "Stakeholder management: a systematic literature review". <i>Corporate Governance (Bingley)</i> [24]</p> <p>Beck and Storopoli (2021) "Cities through the lens of Stakeholder Theory: A literature review". <i>Cities</i> [2]</p>
Marketing literature	<p>Polonsky (1995) "A stakeholder theory approach to designing environmental marketing strategy". <i>Journal of Business and Industrial Marketing</i> [26]</p> <p>Podnar and Jancic (2006) "Towards a categorization of stakeholder groups: An empirical verification of a three-level model". <i>Journal of Marketing Communications</i> [25]</p> <p>Wheeler and Sillanpää (1997) "The stakeholder corporation: A blueprint for maximizing stakeholder value". Pitman Publishing [35]</p>
SE and RE literature	<p>Nuseibeh and Easterbrook (2000) "Requirements Engineering: A Roadmap" [23]</p> <p>Hoffman and Lehner (2001) "Requirements engineering as a success factor in software projects". <i>IEEE Software</i></p> <p>Cois et al. (2014) "Modern DevOps: Optimizing software development through effective system interactions". <i>Professional Communication Conference (IPCC), 2014 IEEE International</i> [7]</p> <p>Tariq et al. (2014) "Requirements Engineering Process for Software-as-a-Service (SaaS) Cloud Environment". <i>2014 International Conference on Emerging Technologies (ICET)</i> [33]</p> <p>Cao and Ramesh (2008) "Agile Requirements Engineering Practices: An Empirical Study". <i>IEEE Software</i> [4]</p> <p>Sharp et al. (1999) "Stakeholder Identification in the Requirements Engineering Process". <i>International Workshop on Database and Expert Systems Applications</i> [28]</p>

Table 4: Key references for RQ2

Discipline	Key references for RQ2
Management literature	Charreaux and Desbrières (2001) "Corporate Governance: Stakeholder Value Versus Shareholder Value". Journal of Management and Governance [5] Garriga (2014) "Beyond Stakeholder Utility Function: Stakeholder Capability in the Value Creation Process". Journal of Business Ethics [16] Tantalo and Priem (2016) "Value creation through stakeholder synergy". Strategic Management Journal [31]
Marketing literature	Smith and Colgate (2007) "Customer value creation: A practical framework". Journal of Marketing Theory and Practice [30] Frow and Payne (2011) "A stakeholder perspective of the value proposition concept". Journal of Marketing Theory and Practice [14]
SE and RE literature	Thew and Sutcliffe (2018) "Value-based requirements engineering: method and experience". Requirements Engineering. [34]

Table 5: Key references for RQ3

Discipline	Key references for RQ3
RE literature	Nuseibeh and Easterbrook (2000) "Requirements Engineering: A Roadmap" [23] Cao and Ramesh (2008) "Agile Requirements Engineering Practices: An Empirical Study". IEEE Software [4]
SE literature	Boehm and Huang (2003) "Value-based software engineering: a case study". Computer [3] Shore (2004) "Design - Continuous design". IEEE Software [29]

2.3 Analysis of relevant publications

The analysis of the relevant publications was done as explained in the section 2.1. In the analysis we investigated how the relevant publications provided answers for the research questions. We performed the analysis for all research questions separately and sequentially starting from RQ1 and progressing in order.

For RQ1 we investigated what are the stakeholders for software teams. For this we were looking for references that were studying or opinionated towards stakeholder definitions or stakeholder classifications. We analysed how different publications defined or perceived stakeholders and what possible stakeholder classifications there were listed. We aimed to find direct definitions for stakeholders in text. Additionally, we looked for what stakeholder classifications there was defined or what stakeholder groups were mentioned. We also analysed whether the publications prioritise some stakeholder groups over other and why.

For RQ2 we studied what does existing literature say about stakeholder value and stakeholder value creation. We were looking for direct definitions from relevant publications. By acknowledging the fact that direct definitions would be hard to find for stakeholder value and stakeholder value creation, we also decided to look for definitions in respect to individual stakeholder groups based on the results of the search and selection. For RQ2 we analysed what kind of properties relevant publications say that the stakeholder value has and what are the ways firms or entities can support stakeholder value creation. In the end we summarised all our findings by finding commonalities among the results of analysis between selected key references.

For RQ3 we analysed relevant publications in software engineering and requirements engineering and investigated what kind of practices software teams should perform in order to meet requirements and fulfill stakeholder needs. Then we summarised our findings by finding commonalities among the selected key references. Finally, we considered the resulted practices against the results of RQ2 and arrived to a conclusion for RQ3.

3 Results of the literature review

The goal of this thesis is to find SE practices that support stakeholder value creation. The key research questions relate to stakeholders and stakeholder value for software teams. In this theory section we are going to first investigate what are the stakeholders for software teams and what is stakeholder value and stakeholder value creation. We study how relevant publications in management literature, marketing literature, SE literature and RE literature contribute to our research questions and what are the commonalities and differences among them. We aim to synthesise our findings across all disciplines in the summary for all research questions

3.1 Stakeholders

In this section we study key references for RQ1. We look into how different fields of study define and classify stakeholders. We will be looking into sources in management, marketing and SE literature and study what kind of definitions and classifications exist withing the key references.

3.1.1 Brief history of stakeholder theory

The stakeholder concept can be traced back to 1963, where it was first mentioned by name in a Stanford Research Institute Memorandum [12]. Since then stakeholder theory has gained increasing amount of interest in strategy development literature. Its popularity has increased with the publication of Freeman's (1984) "Strategic Management: A Stakeholder Approach" [26]. Many of the key references in this thesis refer to Freeman (1984) [12] like [26], [2], [16]. According to [16] the publication of the book "Strategic Management: A Stakeholder Approach" in 1984, initialized wider interest in stakeholder theory. Since that thousands of papers and books have been published on stakeholder theory [16].

Freeman [10] describes the construct of stakeholder has Scandinavian origins. He highlights Juha Nasi's assessment that the original idea, that focuses on what holds stakeholder interests together, is deeply embedded in the Swedish term "intressent", which Finnish language adapts as "intressentti" or "sidosryhmä". These terms can be translated into English as "interest group", or even as a "linkage" or "bonding" or "binding" group. This notion of stakeholders being "bound together by the jointness of their interests" is particularly interesting, as it suggests a collective interdependence that is central to understanding stakeholder management. [10]

3.1.2 Stakeholder theory arises from management literature

Many sources state origins of stakeholder theory are in management literature (e.g. [13], [11], [10], [16]). Beck and Storopoli [2] define stakeholder theory to be based on any person (i.e. third party) who either affects or is affected by a firm's actions and policies, establishing a relationship that integrates ethics with business to generate value over the medium to long term. Freeman et al. [11] state that stakeholder theory

is about value creation and trade and how to manage the business effectively, meaning while creating as much value as possible. Garriga [16] similarly highlights that the primary focus of stakeholder theory is value creation. Moreover, Freeman [10] notes that as stakeholder theory began to be taken seriously among scholars writing primarily in the field of business ethics, it developed as a way to explore questions of justice within corporations.

According to Friedman and Miles [13] a "convergent stakeholder theory" is one of the most exciting problems in stakeholder theory, but there has not been done enough work has been done on the organisation/stakeholder relation itself in order to combine the different strands of stakeholder theory into a single meaningful framework. Friedman and Miles [13] state that this is due to lack of work that distinguishes different types of stakeholders. Garriga [16] describes some integral problems to stakeholder theory being stakeholder identification, stakeholder legitimacy, and evaluation of their claims.

Freeman [10] sees understanding the relationships between organisation and the stakeholders integral to the business and states that "business can be understood as a set of relationships among groups which have a stake in the activities that make up the business". According to Friedman and Miles [13] the premise of stakeholder theory has been focus on managerial decision-making. Generally, stakeholder theory has been approached from the point of view of business ethics, corporate governance and/or corporate social performance [13]. This however puts the organisation in the center of analysis and discourages the focus on stakeholders and the relationships between organisation and the stakeholders [13]. Friedman and Miles [13] promote the need for understanding stakeholder relations from both stakeholder and organisational perspectives.

3.1.3 Stakeholders in management literature

The origins of stakeholder theory lie in the strategic management literature as described in the previous section 3.1.2. In this section we look into how different publications in management literature define stakeholders. The Table 6 list contains definitions for stakeholders in management literature.

Table 6: Definitions for stakeholders in management literature

References	Definition of "stakeholders"
Clarkson (1995) [6]	Stakeholders are persons or groups that have, or claim, ownership, rights, or interests in a corporation and its activities, past, present, or future.
Charreaux and Desbrières (2001) [5]	Larger group of actors than just the shareholders.
Harrison et al. (2010) [17]	Stakeholders are groups and individuals who can affect or are affected by the strategic outcomes of a firm
Dentoni et al. (2016) [9]	Stakeholders are conceptualised not just as entities that can affect or are affected by a firm's actions, but as integral parts of a continuous process of interaction, learning, and adaptation.
Pedrini and Ferri (2019) [24]	Stakeholders are defined within stakeholder management (SM) as a part of a continuous and systematic process through which a firm establishes positive and constructive relationships with its stakeholders to integrate their expectations into business strategy and activity
Beck and Storopoli (2021) [2]	Stakeholders are entities or groups that can affect or are affected by firm's actions and policies.

According to Clarkson [6] stakeholders are persons or groups that have, or claim, ownership, rights, or interests in a corporation and its activities, past, present, or future. Such claimed rights or interests are the result of transactions with, or actions taken by, the corporation, and may be legal or moral, individual or collective.

Charreaux and Desbrières [5] define stakeholders as a larger group of actors than just the shareholders. They argue that focusing just on shareholders is not sufficient for companies, since firms' decision-making relies on all stakeholders. Beck and Storopoli [2] expand on the idea and they define stakeholders to be entities or groups that can affect or are affected by firm's actions and policies.

Harrison et al. [17] define stakeholders as groups and individuals who can affect or are affected by the strategic outcomes of a firm. They acknowledge the wide-ranging impact of a firm's actions on various entities and the influence these entities can have on the firm. The emphasis is on understanding and managing the relationships between a firm and its stakeholders to achieve competitive advantages, suggesting that firms that effectively manage their stakeholder relationships can unlock additional value creation and sustain competitive advantages. [17]

Dentoni et al. [9] focus on the development of dynamic capabilities for stakeholder orientation within the context of cross-sector partnerships (CSPs). They emphasise the

importance of creating dynamic capabilities to effectively engage with and learn from stakeholders. Stakeholders are conceptualised not just as entities that can affect or are affected by a firm's actions, but as integral parts of a process where ongoing interaction, learning, and adaptation are key to addressing complex social and environmental challenges.

Pedrini and Ferri [24] expanded on the older definition of stakeholders in management literature which is "those groups without whose support the organisation would cease to exist." They define stakeholders within the context of stakeholder management (SM) as part of a continuous and systematic process through which a firm establishes positive and constructive relationships with its stakeholders to integrate their expectations into business strategy and activity. This definition aligns with the broader stakeholder theory, emphasizing the necessity for firms to balance stakeholder expectations as a condition for their long-term success and survival. The definition reflects an understanding of stakeholders not just as entities to be managed for the firm's benefit but as integral contributors whose expectations and needs are to be integrated into the firm's strategic considerations. This approach signifies a shift from a purely profit-maximizing perspective towards a more inclusive, relationship-focused strategy that considers a wide range of stakeholders, including but not limited to shareholders, employees, and clients, in the firm's decision-making processes. [24]

The perspectives of Pedrini and Ferri [24] and Harrison et al. [17] aligns with the stakeholder theory's emphasis on the importance of considering the needs and demands of a broad group of stakeholders, beyond traditional shareholder interests, in strategic management practices. Dentoni et al. (2016) [9] on the other hand provides a definition that aims to enhance firms' responsiveness and adaptability to stakeholder needs and concerns.

These views and definition in management literature indicate that stakeholders are groups and entities affected by the firms strategic actions. Furthermore, firms should engage actively with stakeholders in order to create strong relationships that would be mutually beneficial. The studies did not indicate there being negative effects from strong stakeholder relationships, but from lack of them.

3.1.4 Stakeholders classification in management literature

In this section we look into how different publications in management literature classify stakeholders to stakeholder groups. According to Clarkson [6] stakeholders with similar interests, claims, or rights can be classified as belonging to the same group. The Table 7 contains classifications for stakeholders in management literature.

Table 7: Classification of stakeholder groups in management literature

Classification	Stakeholder group (times mentioned)	Sources
Primary	Shareholders (4), Customers (4), Employees (4), Suppliers (4), Managers (3), Trade unions, Government and their agencies, Lenders, Other financial creditors, Some NGOs,	Clarkson [6], Friedman and Miles [13], Charreaux and Desbrières [5], Harrison et al. [17]
Secondary	Media, Some NGOs, The general public, Companies connected through common trade associations/initiatives, Aggrieved or criminal members of public (2)	Friedman and Miles [13], Clarkson [6]

Many relevant publications in management literature stated that there are stakeholders for the company but there was a lack of providing concrete categorisations. Concrete attempts to categorise stakeholders were defined in studies of Friedman and Miles [13], Harrison et al. [17] and Charreaux and Desbrières [5]. In all of them there was a focus on primary stakeholders. Notably Friedman and Miles [13] attempted to name a more complete list of secondary stakeholder groups. Clarkson [6] named some stakeholder groups but mainly focused on the methods, how organisations should define primary and secondary groups. Many sources that didn't name any stakeholder groups viewed that stakeholders are defined by the relationships or actions between firm and a stakeholder group (e.g. [17], [24], [9]). A natural way to interpret this is that the stakeholder groups with the strongest relationships would be seen as more important than others. This supports the assessment that stakeholder groups are classified to primary and secondary according to management literature.

Primary stakeholder groups identified by many sources in management literature (e.g. [13], [5], [17]) are shareholders, customers, managers, employees and suppliers as displayed in the Table 7. Different sources did have different ways to name these groups. Charreaux and Desbrières [5] define their principal categories of stakeholders to be customers, suppliers, and employees excluding managers, managers, financial creditors, and shareholders. Harrison et al. [17] described stakeholders to be owners (including stockholders, partners, members), customers, organisational members

(including employees, managers) suppliers and others (depending on situation). Clarkson [6] simply state that primary stakeholders can be investors, employees, customers and suppliers.

Clarkson [6] divides stakeholder groups to two primary and secondary as do many other sources in management literature. Primary stakeholders These are groups or individuals that are vital to the survival and success of a corporation. They have a direct stake in the organisation and its activities because the organisation has a legal or contractual obligation to them. Secondary stakeholders on the other hand influence or are influenced by the corporation but are not engaged in transactions with the corporation and are not essential for its survival. Secondary stakeholders do not have a direct stake in the organisation but can still affect or be affected by its actions. [6]

Freeman [12] commented that while organisation is not dependent on secondary stakeholders, such groups can cause significant damage the organisation. For some organisations criminals must be counted as aa stakeholder group.

Clarkson [6] in addition to primary and secondary also differentiates between voluntary and involuntary stakeholders, pointing out that the latter have no choice in their engagement with the organisation nor the ability to disengage, highlighting the complex dynamics at play in stakeholder relationships.

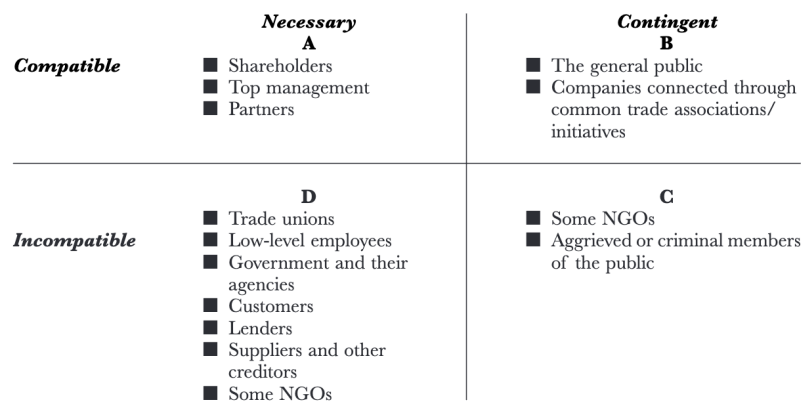
Friedman and Miles [13] expanded on the definition of primary stakeholder groups based on their contract types. They propose a model of distinguishing different stakeholders through contract types. They define contracts as "relationships entered into with some degree of freedom and in accord with at least some interests of the parties" [13]. Based on this framework, they raised additional primary stakeholder groups. These groups were specified being trade unions, government and their agencies, enders, other financial creditors and some NGOs. Notably they were also the only source that was willing to name also secondary stakeholder groups.

Friedman and Miles [13] stand out from the other relevant publications in management literature by offering a concrete way to identify primary and secondary stakeholder groups trough different contract types. According to Friedman and Miles [13] "Ideal contracts may be associated with the assumptions behind perfect competition in neoclassical economics: perfect information about alternatives and about the value of all contracts to all parties, an infinite number of parties to contract with and perfect mobility, so that exit from contracts is costless. Here we are not concerned with ideal contracts. We assume a world of imperfect information, imperfect mobility and small numbers. Contracts can exist where one of the parties may well wish to terminate or alter it, but does not do so". Friedman and Miles [13] identified four different types of structural configurations of the contracts between firm and stakeholders.

- A Necessary compatible: characterizes relations between shareholders and corporations, between top managers and corporations and among partners.
- B Contingent compatible: covers relations where there is no formal contract and no direct relationship between the parties. Circumstances are such that compatible interests may be furthered if further relations were to be formed or implicit contracts recognized

- C Contingent incompatible: organisation/stakeholder relations do not involve a contractual relationship. There might be a general social contract, but it does not always operate.
- D necessary incompatible configuration organisations are encouraged to answer the claims and criticisms of stakeholders, in spite of incompatible interests.

Figure 3: Stakeholder configurations and associated stakeholder types by Friedman and Miles [13]



According to Charreaux and Desbrières [5] employees are assets difficult to duplicate or to transfer because of their specificity, their place within the social systems, internal or external to the firm, and of the ambiguousness of how individual employees contribute to the firm’s total performance.

Interestingly we were unable to find relevant literature from management publications that would create separation from customers to users. For software products, software users are one of the most prominent stakeholder groups, but they are not always customers since by definition customers perform a purchase. (e.g. [13], [5], [17]). Users might also be customers but many digital products offered by firms nowadays are also provided free of charge for consumers.

3.1.5 Stakeholders in marketing literature

Stakeholder theory arises from management literature. It also became an useful framework for marketing literature to utilise and extend upon. Although management literature has extensive research on stakeholders, there is little agreement in the management literature about which constituent groups an organisation should consider as stakeholders [26]. Marketers identified that the existing theories were not enough and stakeholder theory implies that a broader range of groups should be considered by the firms [26]. Polonsky [26] states that stakeholder theory has implicitly been a core component of marketing theory, since the development of modern marketing philosophy, even though this has not been always explicit. Podnar and Jancic [25]

agree that stakeholder theory (ST) offers a framework that is especially suitable for environmental marketing.

All the relevant publications in marketing literature referred in this research used the definitions for stakeholders from management literature (e.g. [25], [26], [27], [14]). This indicates that management literature and marketing literature both utilise similar definitions for stakeholders. Those definitions are also included to the previous section 3.1.3. Many of the relevant publications in marketing literature are focusing on stakeholder group identification and classification instead (e.g. [14], [25]).

Marketing literature has increased emphasis on external stakeholders [26]. The reason for this could be because many of the marketing activities focus on outside perception of the firm. Still taking all stakeholders into account when doing strategic marketing decisions is not trivial [26]. Polonsky [26] defined a process for marketers of integrating stakeholders into all activities including the strategic marketing process as follows:

- (1) Identify the relevant stakeholder groups in relation to the issue being addressed.
- (2) Determine the stake and importance of each stakeholder group.
- (3) Determine how effectively the “needs” or “expectations” of each group is presently being met.
- (4) Modify corporate policies and priorities to take into consideration stakeholder interests (Freeman [12] cited by Polonsky [26]).

Polonsky [26] highlights the integral role of stakeholder theory (ST) in relationship marketing, emphasizing the long-term nature of relationships, shared responsibilities and benefits, mutual trust, and coordinated planning. This viewpoint aligns with the idea that consumers and organisations share common goals, fostering long-term connections that grant both parties vested interests in each other’s success.

Polonsky [26] draws a difference in how industrial and consumer marketing sees relationships with consumers. Industrial marketers are not just more engaged but are fundamentally more integrated into the customer problem-solving process than their consumer marketing counterparts. This highlights how industrial marketing transcends traditional transactional relationships to form more solution-oriented partnerships. This fosters a collaborative environment where value is co-created, addressing customer needs more effectively through sustained and interactive relationships. Polonsky’s insights reveal the strategic depth in cultivating long-term industrial relationships, emphasizing their role in driving mutual success and customer satisfaction. [26]

3.1.6 Stakeholders classification in marketing literature

In this section we look into how different publications in marketing literature define and classify stakeholders to stakeholder groups. The Table 7 contains classifications for stakeholders in management literature.

Table 8: Classification of stakeholder groups in marketing literature

Classification	Stakeholder group (times mentioned)	Sources
Primary	Shareholders (3), Customers (3), Suppliers (3), Employees (3), Managers, Consumers, Partners, Investors, Local communities, Regulation, Competitors, Nature, Future generations,	Wheeler and Sillanpää [35], Polonsky [26], Podnar and Jancic [25]
Secondary	Media (3), Government (2), Competitors (2), Academic commentators/scientific community (2), Financial institutions (2), Social and environmental pressure groups (2), Trade associations (2), Courts/legal system, Financial public, Trade organisations, Trade unions, Animal welfare organisations, General public, Local communities, Interest groups, Opinion leaders, Schools and universities, Civic institutions, Political parties, Families of employees, Nature, Unemployed, Cultural organisations, Non-competitive companies, Foundations, Sport organisations, Religious organisations,	Wheeler and Sillanpää [35], Polonsky [26], Podnar and Jancic [25]

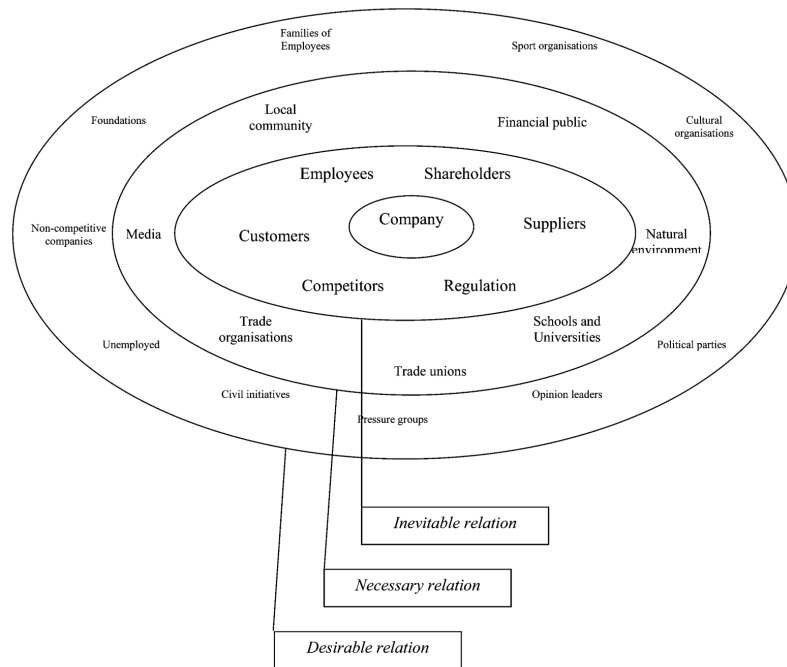
In the table 8 we provide an synthesized presentation of stakeholder groups in marketing literature based on relevant publications (e.g. [26], [35], [25]). We took into account the importance that the groups were given in the original publication. Wheeler and Sillanpää [35] offer a detailed classification of primary and secondary stakeholders. This offered a good baseline for classification. Polonsky [26] provided expanded nicely on the classification by Wheeler and Sillanpää [35]. Podnar and Jancic [25] provided a detailed way to determine the importance of stakeholder groups that expanded and contradicted upon the classification made with other relevant publications.

Many sources in marketing literature emphasise the significant distinction between primary and secondary stakeholders (e.g. [25], [26], [35]). Polonsky [26] divides primary and secondary. Primary stakeholders have formal, official, or contractual relationships with the organisation and exert a direct and necessary influence. Secondary stakeholders, while not directly engaged in the economic activities of the organisation but are able to exert influence or are affected by the organisation. According to Podnar and Jancic [25] primary stakeholders are "those individuals or groups whose continuous support is needed if the company wants to avoid serious (reputation) damage". Interestingly all relevant publications mentioned media as a secondary stakeholder group.

There were some notable differences in how different sources classified the same stakeholder groups. for example Podnar and Jancic [25] defined competitors being and very important and inevitable relation for the company, if was perceived as a secondary stakeholder group in other sources (e.g. [26],[35]). Wheeler and Sillanpää defined nature being a primary non-social stakeholder, but it was not seen as an important stakeholder by other sources. Also local communities was a dividing factor between relevant publications.

Podnar and Jancic [25] highlight the importance of recognizing a wide array of stakeholder groups in an organisation's communication strategy They explained in detail how stakeholder groups can be divided into three levels of exchange and communication with company stakeholders. Those levels are inevitable, necessary and desirable. The stakeholder groups based on their levels of exchange and communication with the company are visualised on an onion shape. Podnar and Jancic [25] state that stakeholders are not all equally important and hence a company categorises them differently.

Figure 4: Three main levels of exchange and communication with company stakeholders by Podnar and Jancic [25]



Wide range of different groupings of stakeholder groups and names. Wheeler and Sillanpää [35] interestingly group together employees and managers, suppliers and partners and media and academic commentators. They perceive these groups having similar interests from marketing perspective. Other sources in marketing (e.g. [25], [26]) did not bundle these groups together

Wheeler and Sillanpää [35] classified stakeholders according to two dimensions: primary – secondary and social – non-social. Accordingly, they suggest four groups of stakeholders:

- Primary social stakeholders (shareholders, investors, employees and managers, customers, local communities, suppliers and partners).
- Secondary social stakeholders (government, social pressure groups, trade bodies, civic institutions, media and academic commentators, competitors).
- Primary non-social stakeholders (natural environment, future generations, non-human species).
- Secondary non-social stakeholders (environmental pressure groups, animal welfare organisations)

Polonsky [26] emphasises that each firm should determine the stake and importance of each stakeholder group. Research done by Podnar and Jancic [25] also indicate that some stakeholder groups are perceived as more important than other. In the research done they randomly asked Slovenian marketing agency employers to grade list of 24

different stakeholders groups into importance with a numeric value of 1 to 5. This resulted in significant variations in respondents' assessments of the importance of different stakeholders. Five stakeholder groups: employees, consumers, competitors, media, and suppliers, were identified as particularly crucial by respondents, with average scores exceeding 3.6. Following closely were professional organisations, financial public, opinion leaders, state officials (regulation), schools and universities, economic associations, and others, with average scores falling between 3.0 and 3.5. The lowest ratings were given to sports and religious organisations scoring below 2.0 on average.

Podnar and Jancic [25] state that their research has some important implications for the practice of corporate communications and public relations.

1. "For lack of resources, corporate communications and public relations (PR) should primarily focus on those stakeholders that have a direct effect on the success of a firm. With them, the exchange is inevitable. Therefore, companies should develop direct and indirect public relations programs to establish and develop long-term relationships with stakeholders. The key to success is in constant monitoring of what is going on with these stakeholders and communicating with them on a regular basis to ensure a stream of information in both directions."
2. "The second group of stakeholders must also be carefully monitored. The company should watch their activities, especially in those areas that can have negative or positive influences on the company and its interests. Communications still need careful strategic consideration. However, in contrast to the first group, there is no need for constant communication. Ad hoc communication programs should be developed and implemented."
3. "The third group of stakeholders has no direct impact on the success of a company. However, carefully selected communication activities and corporate social responsibility programs directed towards this group should be used to gain a competitive advantage and reputation. In addition, they can be used with the aim of influencing or channeling messages more effectively to stakeholders from the first and the second group when necessary."

In this section we provided an overview on how marketing literature classifies stakeholders. While relevant publications were able to provide solid classifications, there exists critique on is it possible to determine objectively a classification for stakeholder. Podnar and Jancic [25] conclude that each company has a unique network of stakeholders, with different distributions of power, and that common rules cannot apply.

3.1.7 Requirement engineering is a discipline inside SE that focuses in stakeholders

Often when discussing stakeholders in SE literature we are talking about requirements engineering, that is a discipline within SE. In this section we are looking into relevant

publications within RE and SE. In this thesis we consider Requirements Engineering to be a discipline inside Software Engineering and their requirements refer to requirements for a software system.

The definition of RE varies depending on a source. Zave [37] defines requirements engineering as follows: "Requirements engineering is the branch of software engineering concerned with the real-world goals for, functions of, and constraints on software systems. It is also concerned with the relationship of these factors to precise specifications of software behavior, and to their evolution over time and across software families." Cao and Ramesh [4] define requirements engineering to be equivalent of requirements analysis. According to Nuseibeh and Easterbrook [23], the measure of success of a software system is the degree to which it meets its purpose and requirements engineering is the process of finding that purpose.

Requirements engineering addresses what needs to be build instead of how it is built. The requirements of building software should not arise from within the software development team but instead of from the stakeholders. When we are trying to figure out the stakeholders of software teams it can be useful to look at the relationship that these stakeholders have to the software product and its requirements.

Hofmann and Lehner [18] state that "deficient requirements are the single biggest cause of software project failure". Additionally, more than 75 percent of companies are not doing sufficient amount of requirements engineering activities [18].

In this thesis we will take a closer look to RE activities in the section 3.3.3.

3.1.8 Stakeholders in software engineering

In this section we are looking into stakeholder definitions within SE literature.

Table 9: Definitions for stakeholders in SE literature

References	Definition of "stakeholders"
Sharp (1999) [28]	Stakeholders are people who have a stake or interest in the project. Meaning, anyone whose jobs will be altered, who supplies or gains information from it, or whose power or influence within the organisation will increase or decrease.
Nuseibeh and Easterbrook (2000) [23]	Stakeholders are individuals or organisations who stand to gain or lose from the success or failure of a system.
Hofmann and Lehner (2001) [18]	Stakeholders are individuals and organisations that are actively involved in a software project or whose interests the project affects.

Sharp et al. [28] provide a rare example of a relevant publication in SE that goes into extent of defining, what is a stakeholder. They state that stakeholder arises from strategic management refer to stakeholder definition by Freeman [12]. Stakeholders

are people who have a stake or interest in the project. Meaning, anyone whose jobs will be altered, who supplies or gains information from it, or whose power or influence within the organisation will increase or decrease. They arrived to this definition from previous definitions of stakeholders in SE that were: 1) The people and organisations affected by the application, 2) System stakeholders are people or organisations who will be affected by the system and who have a direct or indirect influence on the system requirements, 3) Stakeholders are people who have a stake or interest in the project.

Also for other sources in SE the stakeholders meant the stakeholders of the system. Nuseibeh and Easterbrook [23] stated defined stakeholders are individuals or organisations who stand to gain or lose from the success or failure of a system. They also identified stakeholders of software system to be "customers or clients (who pay for the system), developers (who design, construct and maintain the system), and users (who interact with the system to get their work done)." Hofmann and Lehner [18] define stakeholders to be individuals and organisations that are actively involved in a software project or whose interests the project affects."

Some sources in SE that offered an categorisation for stakeholders, did not provide an definition for stakeholders to begin with or an process to identify them (e.g. [4]).

The notion of stakeholders is tightly coupled with RE processes. The activities of RE include identifying stakeholders and their needs among other things [23].

According to Nuseibeh and Easterbrook [23] the needs of stakeholders "may vary and conflict" based on their individual perspectives, work environment and goals. The needs of stakeholders might not be clearly defined or could be challenging to express. Achieving the goals of stakeholders might be constrained by a variety of factors outside their control. [23]

Cao and Ramesh [4] emphasise the changing requirements of software systems in a rapidly evolving business environment. They make the distinction between the static needs of stakeholders and the dynamic understanding of those needs, which can evolve with increased feedback cycles. They emphasise that in addition to the evolving knowledge of stakeholder needs, swift changes in an organisation's business environment—such as competitive threats, changes in stakeholder preferences, advancements in development technology, and pressures to reduce time to market—can influence stakeholder needs and, consequently, the requirements of a software system, potentially rendering some existing requirements obsolete. [4]

Managing stakeholders of a software system in a global organisation can become an increasingly complex process. According to Ali and Lai [1] "the impact of cultural diversity, communication and coordination, language barriers, differences in time zones, and knowledge management on GSD (Global Software Development) make the conventional processes of requirements elicitation, analysis, specification, validation, and management less useful for use in globally distributed environments."

3.1.9 Stakeholders classification in software engineering

As discussed in the previous section 3.1.8, stakeholders in SE refer into the stakeholders of a software system. In this section we look into how different publications in SE literature classify stakeholders to stakeholder groups. The Table 10 contains

classifications for stakeholders in SE literature.

Table 10: Classification of stakeholder groups in SE literature

Classification	Stakeholder group (times mentioned)	Sources
Internal	Developers (3), Project managers (3), Quality assurance staff (3), Top management (2), Product managers, Software developers, Senior architects, Analysts, Engineers, Designers,	Nuseibeh and Easterbrook [23], Cao and Ramesh [4], Hofmann and Lehner [18], Cois et al. [7]
External	Customers (4), Users (3), SaaS Providers, Other stakeholders	Nuseibeh and Easterbrook [23], Cao and Ramesh [4], Hofmann and Lehner [18], Cois et al. [7] Tariq et al. [33]

There was no clear motivation to classify to primary and secondary in the SE sources (e.g. [23], [4], [18]). We divided the stakeholder groups mentioned based on their relationship with the software project. Classification to internal and external is justified by the distinct roles, responsibilities, and influences these groups have on a software project, as outlined by various sources in the software engineering (SE) literature. Additionally, since in SE stakeholders are defined as stakeholders of the software system (e.g. [18], [28], [23]) it makes sense to classify them according to their relationship with the software system. Internal stakeholders, including developers, project managers, quality assurance staff, and others, are directly involved in the creation, maintenance, and management of the software system. Their insider perspective is crucial for the technical development, operational management, and strategic direction of the project. External stakeholders, such as customers, users, and SaaS providers, affect or are affected by the software system from outside the organisation. They provide essential feedback, requirements, and constraints that shape the software's functionality, usability, and market viability.

Nuseibeh and Easterbrook [23] define the stakeholders to be "customers or clients (who pay for the system), developers (who design, construct and maintain the system), and users (who interact with the system to get their work done). This offers an good baseline of essential stakeholders for software systems. Cao and Ramesh [4] agree

with Nuseibeh and Easterbrook [23] and go further in specifying different roles and professions within an organisation to be the stakeholders fe. top management product managers, quality assurance personnel, software developers and senior architects.

According to Hofmann and Lehner [18] stakeholders of any computer system can include customers, users, project managers, analysts, developers, senior management, and quality assurance staff." According to them a typical software project team consists of a project manager, analysts, developers, and quality assurance personnel. Often it also includes users or their representatives.

In SE, the construct of a "developer" embodies a broad spectrum of roles, each with its distinct responsibilities and contributions to the project at hand. This ensemble includes, but is not limited to, software developers, senior architects, engineers, and sometimes even designers. This diverse set of different roles in software development highlights the complexity of software development and different skills needed. From the systems perspective these all can be defined as developers as done by Nuseibeh and Easterbrook [23]. On the other side of spectrum there are Cao and Ramesh [4] that define internal stakeholders being top management, product managers, quality assurance personnel, software developers, senior architects, project managers and developers.

Cois et al. [7] specify stakeholders to be engineers, designers, quality assurance staff, project managers and customers. They highlight that these are project team stakeholders. State that there can be more stakeholders, depending on project team structure. Effective and efficient communication between these stakeholders is key to software project success Cois et al. highlight communication relationships between certain stakeholders are essential components of a successful software project. They highlight the communications between engineers, between engineers and managers, and between teams and clients.

For our classification, we expanded existing categorisations with adding SaaS providers including Cloud Providers as external stakeholders based on studies of recent trends in SE. Tariq et al. [33] address three main stakeholders of a SaaS product. The requirement categories include Architecture Requirements, Operations/ Behavioral Requirements, Management Requirements, Technical/ Implementation Requirements, Quality of Services (QoS), Security and Privacy Requirements and Compliance Requirements. The SaaS Users of SaaS providers are often software developers. Li et al. [22] suggest that software teams developing SaaS products should collaborate with SaaS customers in order to divide the functional requirements into the smallest possible units of functional requirements to maximize software reuse even across different organisations.

3.1.10 Summary of stakeholders for software teams

In this subsection we aim to answer to RQ1 "What are stakeholders for software teams". Previously there has been stakeholder categorisations for organisations in management and marketing literature and for software systems (not software teams) in SE literature. We want to provide a categorisation that would cover all stakeholders in a meaningful and comprehensible way and to provide tools for software teams to

understand what stakeholders are they affecting. First we will summarise the literature review of stakeholders across types of literature. We will do a cross-analysis of the definitions of stakeholders and stakeholder value across different fields of study and how the definitions relate to the definition of stakeholders for software teams.

In the literature review section we have taken a look into management, marketing and software engineering literature for a definition of stakeholders. In contrast to management and marketing literature where stakeholders are seen as "groups and individuals who can affect or are affected by the strategic outcomes of a firm", the relevant publications in SE literature define stakeholders as "groups and individuals who affect or are affected by the software system".

Stakeholder theory is the basis of stakeholder definition across disciplines, arising from management literature, and more specifically, from organisational management and business ethics. This foundational framework acknowledges the relationships between business entities and how firms actions affect them. Business ethics, corporate social responsibility, and principles derived from social contract theory are integral components of stakeholder theory, highlighting its role in guiding ethical decision-making within organisations.

In marketing literature, there is an emphasis on the identification and categorisation of especially external stakeholders. The adoption of stakeholder theory has proven to be valuable for marketing, as it underscores the importance of concentrating on both external stakeholders and groups not directly engaged in business operations, yet capable of influencing a firm's impact, public image, and overall competitiveness. The definition of stakeholders in marketing literature draws upon concepts from management literature and stakeholder theory, thereby providing a comprehensive framework for understanding and addressing the diverse entities that can impact a business's success.

There are more identified stakeholders in marketing literature than in management literature. There is also more variety in naming the stakeholder groups. For example marketing literature defines customers and consumers separately.

In management literature and especially in different branches of management literature, the views on stakeholders are more varying than in for example marketing literature. This is because in management literature there is more disagreement on what are the stakeholders or in other words "who should we consider" when making managerial decisions.

Marketing literature does seem to prioritise stakeholders. According to the research of Podnar and Jancic [25] some stakeholder groups are more important than others. There is also similar results in management literature. Polonsky [26] emphasises that each firm should "determine the stake and importance of each stakeholder group".

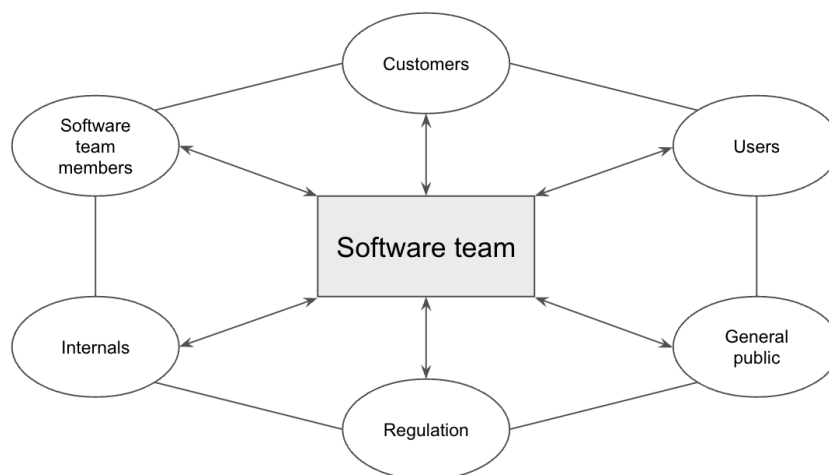
In order to determine what are the stakeholder groups for software teams, we should look for the stakeholders that are defined important also according to stakeholder theory, management literature and marketing literature. One of the purposes of a software team is to work together with the other departments in the firm to meet the organisational goals. The stakeholder groups that are important for example for management and marketing should be important for software teams as well.

Many sources across disciplines emphasise the importance of identifying the

stakeholders that are individual for the firm (e.g. [25], [17]). This is a high indication that the stakeholders are not the same for every company or every context. The weighted importance of those stakeholders are also different for different firms. On contrast for example Nuseibeh and Easterbrook [23] provided an objective classification for stakeholders of a software system being simply: customer, developers, users. These stakeholder groups can in fact be found in any software system built inside companies independently of the context or the field.

By analysing the stakeholder definitions and classifications in management, marketing and SE literature, we composed a stakeholder classification displayed in the Figure 5 for software teams addressing the viewpoints for the wider organisation and aiming to maximize software system success, organisational success and stakeholder value. This categorisation aims to address meaningfully all relevant stakeholder groups a modern and value driven software team should take into account when developing a software system.

Figure 5: Stakeholder classification for software teams



Inspiration for the satellite configuration for stakeholders for software teams comes from a relevant publication in marketing literature. Polonsky [26] created a satellite representation for "Interaction of stakeholders with firm and adjacent stakeholders" displaying the relationships of the firm and stakeholders and between the stakeholder groups. Important in this representation is that there are no initial division into primary and secondary stakeholders, but the importance of each corresponding stakeholder relationship should be determined in the context of the software team.

First three stakeholder groups are also often the most important groups that can be found in every software project done in a company regardless of the context. These groups are:

1. Team members, those who take part or will take part in software team and develop the system (in a product managerial, engineering or designer role),
2. Users, those who use software,

3. Customers, meaning those who pay for the software.

This classification is in line with Nuseibeh and Easterbrooks [23] categorisation of stakeholders for software teams customer, developers, users. The differentiation is that we define developers to be "any individual contributor within the team" or "any software team member" now or in the future. These are also the stakeholders whose efficient and effective communication is integral for the success of modern software projects [7].

The most important primary stakeholders for the organisation in management literature are shareholders, customers, employees, suppliers and managers. In marketing literature the most important primary stakeholders shareholders, customers, suppliers and employees. Managing and marketing literature agreed that media and the general public would be important secondary stakeholder groups. Government has been as a primary stakeholder in management literature since it sets boundaries. By synthesising these findings in respect to the role of software teams, we determined these groups to be stakeholders for software teams:

1. Internals, are the individuals and groups that belong to the organisation but not to the software team fe. shareholders, management, marketing, sales
2. Regulation, the legal institutions that set boundaries and restrictions for software teams
3. Genral public, wide and varying group of different kinds of institutions, communities and associations

These groups do not just have needs for the software team, but they provide restrictions and guidelines. Internals are the individuals and groups that belong to the organisation but not to the software team (fe. shareholders, management, marketing, sales). Internals might set varyinyg requirements to the software team and often expect active communication. For example management require team to follow a certain timeline and marketing would need information about future development. Regulation represents the legal institutions that set boundaries and restrictions for software teams that must be honoured. From the point of view for software teams, general public can be considered covering many of the more specific stakeholder groups such as different institutions, communities and associations that were mentioned as standalone stakeholder groups in marketing literature.

In the literature review and especially in marketing literature, we identified tens of different stakeholder groups that are not directly articulated in our categorisation. This is because we wanted to emphasise simplicity and provide a model that supports the work that all software teams do. If needed the model can be expanded and clarified to suit the needs of a specific software team.

Modern agile software teams are autonomous and in charge of their software system success. Software teams are performing task prioritisations according to requirements based on stakeholder teams. The software system can be integral part of the organisational success. When the stakeholder needs are colliding, choosing

the right way forward is not an easy task, but something the software teams in the end must address. In the following section this thesis touches upon ways the software teams can enable stakeholder value creation.

3.2 Stakeholder value

In this section we aim to investigate how existing literature defines stakeholder value and proposes activities value creation. Additionally, we will be diving deeper into value and value creation for "customers" and "users" as they are two of the essential and external stakeholder groups for software teams. Those groups are also the more studied groups from value creation perspective.

In this thesis we are discussing stakeholder value and stakeholder value creation. The difference in how we have interpreted the difference from the relevant publications (e.g. [17], [16]) is the following. Stakeholder value is the outcome at a point in time, while stakeholder value creation is the ongoing process by the firm aimed to increase that value.

3.2.1 Stakeholder value in management literature

According to Garriga [16], in the field of strategic management, "value" has been defined in several ways, such as "the amount that buyers are willing to pay for what a firm provides them" or "properties of products or services that provide utility". Garriga [16] states that stakeholder theory approaches value creation from a perspective that is different from other strategic management theories. In stakeholder theory, "value" is not solely based on economic transaction. In table 11 we display an overview into how relevant publications in management literature view stakeholder value.

Table 11: Views on stakeholder value in management literature

References	Views on "stakeholder value"
Charreaux and Desbrières (2001) [5]	Stakeholder value is a measure that encompasses the rent created by the firm in relation to different stakeholders. Stakeholder value is created through transactions involving various stakeholders.
Harrison et al. (2010) [17]	Stakeholder value should be understood in terms of welfare. Stakeholder Value Creation is conceptualised as a managing-for-stakeholders approach. This approach emphasises the importance of gaining a deep understanding of stakeholder utility functions.
Garriga (2014) [16]	Stakeholder value, is not solely based on economic transactions but on enhancing stakeholders' capabilities to achieve their goals and improve their welfare through engaging with the firm. Stakeholder value creation involves firms making exchange offers that are informed by an understanding of stakeholders' capabilities.

Charreaux and Desbrières [5] argue that the traditional focus on shareholder value as a measure of the financial returns shareholders receive from a company, is too narrow and does not fully capture the broader impacts and value creation mechanisms within a firm.

Charreaux and Desbrières [5] defines stakeholder value as a measure that encompasses the rent created by the firm in relation to different stakeholders, not just shareholders. They view that value is created through transactions involving various stakeholders, including employees, managers, suppliers, and customers, each contributing to and sharing in the created value. "rent" in the context refers to the extra benefits or profits that stakeholders gain from being involved with a company, beyond what they would minimally accept or expect. rent is not just financial but can also represent other forms of value, such as increased job satisfaction for employees, improved product quality for customers, or enhanced collaboration with suppliers.

Furthermore, Charreaux and Desbrières [5] explain practical challenges of measuring stakeholder value and acknowledge the complexities involved in quantifying the contributions and returns of different stakeholder groups. They propose a methodological framework for assessing stakeholder value but also recognize the need for further research to refine these measures and incorporate them into corporate governance practices effectively.

According to Harrison et al. [17], stakeholder value should be understood in terms of welfare. This is because stakeholders would choose those opportunities that increase their welfare in the value-creation process. Furthermore, firms should identify opportunities and manage stakeholder relationships based on how their actions

affect or are affected by stakeholders' welfare. Harrison et al. [17] outline that a firm managing for stakeholders focuses on understanding how the welfare of its stakeholders is affected by the firm's actions and seeks to act in a manner that respects and enhances this welfare. Welfare, in this context, refers to the well-being of individuals or groups, conceptualised through utility functions that specify stakeholders' preferences for various outcomes resulting from the firm's actions.

Harrison et al. [17] incorporated the traditional concept of the utility function into stakeholder theory. They defined the term "stakeholder utility function" as a way to understand stakeholder welfare and value. In this context, stakeholder utility function is conceptualised as a representation of stakeholders' preferences, indicating how they value different outcomes or attributes associated with a firm's actions. It essentially maps stakeholders' welfare (or utility) onto a set of possible outcomes, allowing for a systematic understanding of what stakeholders consider beneficial or detrimental. These utility functions consider both tangible and intangible outcomes, indicating that value to stakeholders encompasses more than just economic benefits; it includes how they perceive the fairness of distributions, the processes leading to these outcomes, and the quality of interactions with the firm. Firms can affect these stakeholder utility functions and therefore created stakeholder value by their actions both directly and indirectly.

Harrison et al. [17] state that their described managing-for-stakeholders approach results in increase growth, efficiency, and higher levels of innovation. According to this approach, stakeholder value creation relates to the firm's ability to understand and respond to the specific needs and preferences of its stakeholders, reflecting a nuanced and dynamic approach to managing relationships and resources in a way that benefits both the firm and its stakeholders.

Concretely, Harrison et al. [17] state that firms can enable stakeholder value creation for example by allocation of resources by a firm to satisfy the needs and demands of its legitimate stakeholders beyond what is necessary to retain their participation in the firm's activities.

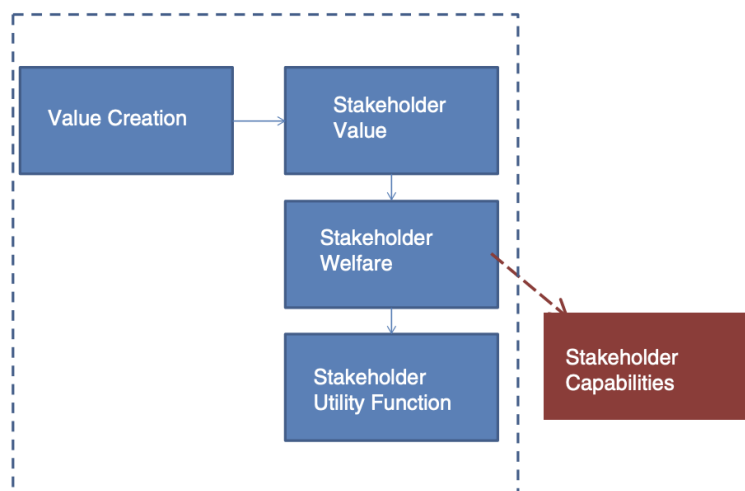
According to Harrison et al. [17], by fostering trusting relationships based on principles of distributional, procedural, and interactional justice, firms are more likely to gain detailed insights into stakeholders' utility functions, enabling them to create value more effectively by aligning their strategies and operations with stakeholders' true needs and preferences. This process, in turn, reinforces stakeholders' engagement and support, furthering a cycle of value creation and competitive advantage.

According to Garriga [16], in management literature the term 'value' is commonly based on the idea of utility. Garriga states that "The utility function essentially states that consumers spend their income (resources, money, attention) to maximize the satisfaction or utility from the outcomes". Garriga criticizes the utility function model for not adequately representing stakeholder welfare and proposes a shift towards understanding stakeholder capabilities as the foundation for value creation. Garriga argues that utility functions is a problematic framework in representing welfare. One of the problems is that it is impossible to assess all the possible utility functions for a stakeholder or match observed utility into a numerical value. Additionally, the emphasis on stakeholder capabilities represent notions of freedom in comparison to

utility functions. Stakeholder capabilities represent the opportunities that stakeholders have to perform utility functions and "achieve" utilities [16].

Garriga [16] proposes a capability approach to understand stakeholder welfare and stakeholder value in terms of stakeholder capabilities rather than stakeholder utility functions. This proposal is presented graphically in Figure 6.

Figure 6: Stakeholder capabilities proposal by Garriga [16]



Garriga [16] describes that in the framework of stakeholder capabilities, concept of welfare or well-being should be understood in terms of people's capability to function, that is "to undertake the actions and activities that they want to engage in, or to be the person they want to be". Stakeholder value, in this context, is related to enhancing stakeholders' capabilities to achieve their goals and improve their welfare through engaging with the firm. This involves a broader and more inclusive approach to value creation that considers the empowerment and development of stakeholders' capabilities as central to the process. Garriga emphasises stakeholder opportunities' to take actions as an integral part in the value creation process between a stakeholder and the firm. Garriga defines that stakeholder welfare should be understood "in terms of people's capability to function", because stakeholders aim to choose the proposals from firms that increase their welfare. [16]

Garriga [16] states that by understanding the stakeholder capabilities, the firm can introduce ways for improving stakeholder welfare using new exchange offers that incentives stakeholders either to work with the firm or to create value. Fostering an environment where stakeholders' abilities to achieve their objectives and improve their welfare through engagement with the firm are integral part of Garrigas view on stakeholder value creation. Garriga emphasises the importance of identifying and measuring these capabilities to understand how firms can create value for different stakeholder groups, ultimately contributing to a more comprehensive and ethically grounded understanding of stakeholder value and value creation.

3.2.2 Stakeholder value in marketing literature

Both sources in marketing (Frow and Payne [14], Smith and Colgate [30]) analysed in this section focus mainly on customer value and value creation. We discuss customer value more deeply in the section 3.2.3. In this section we aim to look into the views of marketing literature in the wider framework of stakeholder value and value creation.

In the table 12 we provide an overview on how relevant publications in marketing literature view stakeholder value and value creation.

Table 12: Views on stakeholder value in marketing literature

References	Views on "stakeholder value"
Smith and Colgate (2007) [30]	They concentrate on customer value and value creation. Customer value has many dimensions, culminating on what they "get" (benefits) relative to what they have to "give up" (costs or sacrifices). Stakeholder value creation involves the process and activities by which firms create value for customers
Frow and Payne (2011) [14]	They concentrate on customer facing value propositions and their role in value co-creation processes in the framework of Service-Dominant logic. Service-Dominant logic in marketing literature suggests value, is not delivered by one party to another, but instead, value is co-created in use with both parties playing a role.

Smith and Colgate [30] concentrate on a single stakeholder group, customers when defining value and value creation. Customer value is what they "get" (benefits) relative to what they have to "give up" (costs or sacrifices). They outline four major types of value: functional/instrumental, experiential/hedonic, symbolic/expressive, and cost/sacrifice value. More on these types of value in section 3.2.3. Additionally, they identify five major sources of value: information, products, interactions, environment, and ownership/possession transfer.

Smith and Colgate [30] define value creation as the process and activities by which firms create value for customers. Organisations can develop strategies to enhance product concepts, recognize new opportunities, and create a more comprehensive and appealing value proposition for customers. [30]

Frow and Payne [14] do not offer direct definitions of customer value and value creation, they implicitly address these concepts through the lens of value propositions and their role in value co-creation processes. They study deeply the concept of value propositions within the broader framework of Service-Dominant logic, primarily focusing on how value propositions can facilitate value co-creation among multiple stakeholders in a marketing system.

According to Frow and Payne [14], 'value proposition' is seen widely in marketing

literature as the first step in value delivery. In contrast, Service-Dominant logic in marketing literature suggests value, is not delivered by one party to another, but instead, value is co-created in use with both parties playing a role. In other words, value arises from the interactions and co-creation activities between customers and firms, rather than being embedded in goods or services themselves. Value propositions on the other hand set expectations of value-in-use. The study suggests that these expectations do affect the experienced value by the customer. [14]

Frow and Payne [14] conclude that value propositions have a key role to play in co-creating value between various stakeholders, "acting as a value alignment mechanism within a marketing system". They state that by developing and aligning value propositions across different stakeholder domains, firms can facilitate more effective value co-creation processes. They also conclude that Service-Dominant logic helps enterprises address value propositions in a more holistic and integrated manner [14].

3.2.3 Customer value

We define Customers as a stakeholder group that consists of the consumers or firms that pay for the software product. In the context of software engineering. According to Smith and Colgate [30] the value customers receive relate on what they get relative to what they have to give up.

As discussed in the section 3.2.2, marketing literature focus on customer value and value creation. Frow and Payne [14] customer value arises from the interactions and co-creation activities between customers and firms, rather than being embedded in goods or services themselves. Smith and Colgate [30] define stakeholder value and value creation within the context of customer value creation, being a critical task for marketers, especially when developing new products and services or starting new businesses.

Smith and Colgate [30] assess that customer value could be understood as value for the customer (customer perceived value or customer received value) and value for the firm (value of the customer, now more commonly referred to as customer lifetime value). They prefer describing customer value from the customer's perspective as what they "get" (benefits) relative to what they have to "give up" (costs or sacrifices). A more descriptive conceptualisation is: "a customer's perceived preference for, and evaluation of, those product attributes, attribute performances, and consequences arising from use that facilitates (or blocks) achieving the customer's goals and purposes in use situations". Smith and Colgate [30] outline four major types of value as follows:

- **Functional/instrumental value** is concerned with the extent to which a product (good or service) has desired characteristics, is useful, or performs a desired function.
- **Experiential/hedonic value** is concerned with the extent to which a product creates appropriate experiences, feelings, and emotions for the customer.

- **Symbolic/expressive value** is concerned with the extent to which customers attach or associate psychological meaning to a product.
- **Cost/sacrifice value** is concerned with transaction benefits versus costs and other sacrifices that may be involved in the purchase, ownership, and use of a product.

Smith and Colgate [30] highlight that it is not clear whether customer value is a summative (benefits minus sacrifices) or ratio (benefits divided by sacrifices). Furthermore, it may not be possible to accurately measure how a customer assesses the value of a product (the value proposition) at a particular point in time.

Smith and Colgate [30] argue that creating this value is essential for achieving differential positioning in the market, leading to customer satisfaction, loyalty, and ultimately, organisational success.

Studies in management literature also suggest that customer value arises from customers' activities. Tantalo and Priem [31] suggest that customers experience value during consumption activities, and therefore a durable good purchase can result in many future value-producing experiences. According to [31] the lack of attention to customers' needs may lead customers to search for alternative value propositions that are more able to maximize their satisfaction. This weakens customers' commitment to the firm.

Kauppinen et al. [20] argue customer value emerges in customers' processes and it is not embedded in products and value is not created in the companies' development and production processes [20]. The customer value derives from a trade-off between what the customer receives (e.g. quality, benefits, worth, utilities) and what they give up to acquire and use a product [20]. Gardial et al. [15] state that customers judge products differently in different contexts and may perceive value differently during purchase and during subsequent use.

3.2.4 User value

We define users as a stakeholder group that consists of end users of the service. In the context of software products, the users are the people that are using the software product. What differs users from customers is that they might have or not have performed purchase, when customers are by our definition paying for the service.

Relevant publications that we found in management and marketing literature do not address users explicitly. They focus on customers or consumers, but overlook the people that are actively interacting. The views discussed in the previous section 3.2.3 considering customers and consumers might implicitly apply to users of digital services as well.

The research by Thew and Sutcliffe [34] outlines a method for Value-based Requirements Engineering focused on addressing socio-political issues like emotions, values, and feelings in the Requirements Engineering (RE) process. It introduces a taxonomy of stakeholders' values, motivations, and emotions, alongside process guidance for eliciting and analyzing these aspects to inform the RE process and design

implications. Thew and Sutcliffe [34] in this context define user "values" as personal attitudes or long-term beliefs that may influence stakeholders' functional and non-functional requirements. These values are seen as attitudes that shape stakeholders' preferences and requirements for a system. Values are differentiated from motivations and emotions, with motivations being described as psychological constructs related to personality traits, viewed as stakeholders' long-term goals in RE. Emotions are cues to stakeholders' reactions, arising from value/motivation conflicts, essentially acting as signals for deeper, possibly unarticulated stakeholder concerns that need to be addressed in the RE process.

User value creation in the context of Thew and Sutcliffe [34] involves a methodical approach to identifying and analyzing stakeholders' values, motivations, and emotions to inform and guide the requirements engineering process. Insights from the analysis of values, motivations, and emotions should be applied to design and development decisions to ensure that the resulting system aligns with stakeholders' values and addresses their motivations and emotional concerns, thereby creating value for users by making the system more likely to be accepted and effectively used.

3.2.5 Summary of stakeholder value and value creation

In this section we summarise, how the relevant publications view stakeholder value and value creation, focusing on the distinct perspectives provided by management and marketing literature, with a special emphasis on customers and users as key stakeholder groups. In the figure 7 we summarise what are stakeholder value and stakeholder value creation.

Figure 7: Stakeholder value and stakeholder value creation

Stakeholder value	Outcome or benefit that stakeholders derive from their engagement with a firm. This value can be multidimensional in nature and emerges from stakeholders' own processes.
Stakeholder value creation	Ongoing process aimed at enhancing the value provided to stakeholders. This process involves understanding stakeholders' needs and preferences and engaging in activities that increase their welfare or capabilities.

Stakeholder Value is conceptualised as the outcome or benefit that stakeholders derive from their engagement with a firm at a specific point in time. This value can be multidimensional in nature [30]. Different frameworks in relevant publications view stakeholder value as something that emerges from the stakeholders processes conceptualising it in terms of utility functions, welfare, or capabilities (e.g. [16], [17]). The literature review suggests that stakeholder value extends beyond mere financial transactions to include various forms of utility and benefits stakeholders gain from their relationships with firms. The literature also suggest that the value can be negative taking into account what stakeholders need to give up.

Stakeholder Value Creation, on the other hand, is viewed as an ongoing process aimed at enhancing the value provided to stakeholders. This process involves understanding stakeholders' needs and preferences and engaging in activities that increase their derived value ([17],[30]). The concept of value creation is tied closely to the idea of co-creation [14], especially in the context of customers, where value is seen as emerging from the interactions between firms and stakeholders rather than being embedded in products or services.

Stakeholder theory offers a broader perspective on value, emphasizing the importance of understanding and enhancing stakeholders' capabilities and welfare, not just their economic benefits. Both management and marketing literatures point to understanding stakeholder processes as foundational elements of stakeholder value creation. The theoretical frameworks we evaluated were stakeholder utility functions, stakeholder welfare and stakeholder capabilities. While traditional views on value creation focus on monetary benefits, Harrison et al., [17] focus on stakeholders' utility functions emphasizing stakeholders' agency in value creation process and Garriga [16] expands on the idea of agency by transitioning the focus on stakeholders' capabilities. Garriga [16] argues that the concept of welfare or well-being should be understood in terms of people's capability to function, that is Stakeholder value, in this context, is related to enhancing stakeholders' capabilities to achieve their goals and improve their welfare through engaging with the firm.

In relevant publications from marketing literature the focus has been is in customer value creation instead of providing a general framework in addressing all stakeholders (e.g. [30]). Customer value has many dimensions, culminating on what they "get" (benefits) relative to what they have to "give up" (costs or sacrifices) [30]. Stakeholder value creation in this context involves the process and activities by which firms create value for customers [30]. The value is co-created between firm and stakeholders instead of delivered from one party to another [14]. The marketing literature, in particular, emphasises the co-creation of value, suggesting that value arises from the interactions between firms and stakeholders. This perspective challenges traditional views of value delivery and highlights the importance of collaborative processes in creating meaningful and sustainable value for all parties involved.

Customers and users are identified as critical external stakeholder groups for software teams. The literature review emphasise focusing on the needs and preferences of those groups as a means of creating value. Specifically, customer value is linked to the trade-offs between benefits received and costs incurred, while user value is associated with how software products meet users' personal attitudes, beliefs, and requirements.

The literature review highlights that measuring stakeholder value and effectively incorporating it into SE teams practices present methodological challenges. The literature review highlights the need for further research to refine these measures and better integrate stakeholder value considerations into decision-making processes.

3.3 SE practices that support stakeholder value creation

In this section we are looking into how relevant publications in SE and RE suggest practices to support stakeholder value creation. These activities are performed by software teams to ensure that the software project will meet the explicit and hidden needs of its stakeholders.

Modern day software teams work in a rapidly changing business environment where organisations often must deal with quickly evolving requirements that can become obsolete even before project completion [4]. Cois et al. [7] highlight the importance of effective and efficient communication is essential for successful software project. Cois et al. [7] characterize modern software engineering as a complex, fast-moving, and cooperative activity. Additionally, they note that current agile development methodologies aims to enable engineering teams to adapt to rapid and considerable shifts, preserving the project's progression. These methodologies are built on the acknowledgment that changing requirements, constraints, and customer expectations will persistently influence all facets of a project during its lifecycle.

3.3.1 Continuous design in SE

Shore [29] proposes continuous design as a way to meet changing requirements. The idea is that instead of doing a lot of upfront design, software teams should focus on the current requirements while maintaining good design principles. Shore [29] states that it is a completely viable approach to design a software system while developing. The design goals in continuous design suggested by Shore [29] are the following:

- **DRY (Don't Repeat Yourself):** There's little duplication.
- **Explicit:** Code clearly states its purpose, usually without needing comments.
- **Simple:** Specific approaches are preferred over generic ones. Design patterns support features, not extensibility.
- **Cohesive:** Related code and concepts are grouped together.
- **Decoupled:** Unrelated code and concepts can be changed independently.
- **Isolated:** Third-party code is isolated behind a single interface.
- **Present-day:** The design doesn't try to predict future features.
- **No hooks:** Interfaces, factory methods, events, and other extensibility "hooks" are left out unless they meet a current need.

These software design goals serve as guidelines on how to design and implement a software system that is designed for change. Especially the goal "don't try to predict future features" can be extremely relevant for software teams that are working in a fast-paced environment trying to address changing stakeholder needs.

3.3.2 Value-based SE

Boehm and Huang [3] defined the value-based software engineering agenda, seeks to integrate value considerations into current and emerging software engineering principles and practices, while developing an overall framework in which they compatibly reinforce each other.

According to Boehm and Huang [3], The value-based software engineering agenda includes the following elements:

- **Requirements engineering.** Developing principles and practices for identifying a system's success-critical stakeholders, eliciting their value propositions with respect to the system, and reconciling these value propositions into a mutually satisfactory set of objectives for the system.
- **Architecting.** Reconciling system objectives with achievable architectural solutions.
- **Design and development.** Developing techniques to ensure that the software's design and development inherit the system's objectives and value considerations.
- **Verification and validation.** Ensuring that a software solution satisfies its value objectives, and organising V&V tasks to operate as an investment activity.
- **Planning and control.** Extending traditional cost, schedule, and product planning and control techniques to include the value delivered to stakeholders.
- **Risk management.** Developing principles and practices for identifying, analyzing, prioritizing, and mitigating risk.
- **Quality management.** Prioritizing desired quality factors with respect to stakeholders' value propositions.
- **People management.** Stakeholder team building and expectations management, managing the project's accommodation of all stakeholders' value propositions throughout the life cycle, and integrating ethical considerations into daily project practice.
- **Principles and practices.** These include COTS-based systems, rapid development, agile methods, high-dependability systems, systems of systems, and ethics.

One possible study that can be performed is how to apply the earned-value system described by Boehm and Huang [3]. The earned-value feedback process first determines if the budgeted cost of work performed (BCWP) is greater than or equal to the budgeted cost of work scheduled (BCWS). It next determines if BCWP is greater than or equal to cost. If both hold true, development proceeds; if either proves false, the project team determines corrective actions. [3]

According to Boehm and Huang [3], a lot of software project failures were caused by value-oriented shortfalls such as lack of user input, incomplete requirements, changing requirements, lack of resources, unrealistic expectations, unclear objectives, and unrealistic time frames.

3.3.3 Requirements engineering activities

Requirements engineering activities according to Nuseibeh and Easterbrook [23] are eliciting requirements, modelling and analysing requirements, communicating requirements, agreeing requirements, and evolving requirements. Nuseibeh and Easterbrook [23] describe the activities as follows:

- **Eliciting requirements:** attempts to capture different user needs for example with data gathering techniques.
- **Modelling and analysing requirements:** can be used to assess how well does a design of a system satisfy the elicited user needs. Modelling also attempts to answer the question of what can be done.
- **Communicating requirements:** is used for example to communicate what are the user needs and how does the system intend to satisfy them.
- **Agreeing requirements:** attempts to match up conflicting user needs so that the system can maximize customer value and all the stakeholders are satisfied.
- **Evolving requirements** attempts to manage to change environment and user needs even after the system is built.

Many RE activities benefit immensely or even sometimes require collaboration with the stakeholders. Stakeholder needs can be conflicting, vague and hidden, and discovering those might require active collaboration between person conducting RE activities and the stakeholder of the software system. [23].

RE is not essential only to determine user needs but also to communicate the needs for both internal and external stakeholders [23].

3.3.4 Agile requirements engineering practices

According to Cao and Ramesh [4] "the rapidly changing business environment in which most organisations operate is challenging traditional RE approaches." They state that the requirements of modern software systems are evolving quickly and sometimes becoming obsolete even before project completion. [4]

Cao and Ramesh [4] state that the constant feedback from the various stakeholders results in emerging requirements throughout the development process. Their study reveals that agile RE differs from traditional RE in that it takes an iterative discovery approach over requirements. [4]

Cao and Ramesh [4] in their research identified 7 agile RE practices that have been successfully adopted in modern organisations:

1. **Face-to-Face Communication Over Written Specifications:** Emphasizes the transfer of ideas through direct interaction rather than extensive documentation. This approach aids in quickly addressing changes and understanding stakeholder needs, enhancing adaptability and reducing documentation overhead.
2. **Iterative Requirements Engineering:** Involves developing requirements in a continuous, iterative manner throughout the project lifecycle, allowing for adjustments as understanding improves or conditions change. This practice supports stakeholder value by ensuring that the product evolves to meet real needs effectively.
3. **Extreme Prioritization:** Prioritizes features based on business value as defined by the customer, ensuring that the most critical and valuable aspects of the product are developed first. This approach directly ties development efforts to stakeholder value, ensuring resources are allocated to areas of highest impact.
4. **Managing Requirements Change Through Constant Planning:** Facilitates the accommodation of requirement changes during development, allowing for a more flexible approach that can adapt to stakeholder feedback and emerging needs, thereby enhancing the delivered value.
5. **Prototyping:** Utilizes prototypes to validate and refine requirements, providing a tangible means for stakeholders to interact with proposed solutions early in the development process. This can help clarify needs, refine expectations, and ensure alignment with stakeholder value.
6. **Test-Driven Development (TDD):** Incorporates the creation of tests before functional code, treating these tests as part of the requirements and design activities. TDD ensures that the development is aligned with specified requirements, enhancing reliability and stakeholder satisfaction.
7. **Use Review Meetings and Acceptance Tests:** Employ frequent review meetings and acceptance tests for requirements validation, providing regular opportunities for stakeholder feedback and ensuring that the product meets the defined needs and expectations.

These practices aim to support stakeholder value creation by ensuring that the software development process is adaptive, responsive, and closely aligned with the stakeholders' evolving needs and priorities. However, Cao and Ramesh [4] state that the implementation of these practices also presents challenges, such as managing changes in project scope, ensuring the completeness and clarity of requirements, and dealing with the potential for increased development costs due to continuous adaptation. The organisations in the study that Cao and Ramesh [4] conducted generally have high of medium adoption level on most of these practices. There are also differences in organisations in that they all have not adopted the same practices or they do not perform the practices similarly.

Cao and Ramesh [4] state that extreme prioritization is one of the agile RE practices. The difference in prioritization between agile RE and traditional RE is that agile RE involves prioritizing requirements in each development cycle, as opposed to being prioritised once in traditional RE [4]. Prioritization in agile RE often occurs during the planning meetings at the beginning of each cycle. [4]. Inayat et al. [19] state that requirements prioritisation is the most adopted of the agile RE practices.

According to Daneva et al. [8] The greatest challenge of requirements prioritisation is that only focusing on business value can become problematic. Moreover, allowing the customer to prioritise the requirements is not right because there are other things to consider in software systems such as scalable software architecture. In large outsourced agile projects following business value, was defined as the most important requirements prioritisation criteria, but it might not correlate with software project success [8].

3.3.5 Summary of SE practices that support stakeholder value creation

The modern day software teams work in a rapidly changing business environment where organisations often must deal with quickly evolving requirements that can become obsolete even before project completion [4]. In this kind of environment software teams need to create practices to address that change.

Analyzing the relevant publications, it becomes clear that stakeholder value creation can be significantly supported through a combination of agile practices, continuous design principles, and value-based considerations. We conducted a synthesis of the relevant publications to identify practices that ensure software projects meet both the explicit and hidden needs of stakeholders. These practices are not isolated but are interrelated, demonstrating how blending elements from different frameworks can provide a holistic approach to SE and RE.

1. **Face-to-Face Communication With Stakeholders:** Building on the principles of agile methodologies and the importance of understanding stakeholder needs as outlined by Nuseibeh and Easterbrook [23], this practice involves continuous interaction with stakeholders through all stages of the development process that goes beyond attempting to measure stakeholder value. Agile practices emphasise face-to-face communication over written specifications and the use of review meetings and acceptance tests for regular feedback [4]. This tries to ensure that emerging requirements are captured, and stakeholder expectations are continuously addressed aligning with eliciting requirements activity [23], facilitating another practice "iterative requirements engineering" [4] and the adaptation to changing stakeholder needs.
2. **Iterative Prioritization:** This practice aligns well with "extreme prioritization" practice suggested by Cao and Ramesh [4] also aligns well with value-based SE suggested by Boehm and Huang [3] and "Present-day" continuous design principle by Shore [29]. By continuously prioritizing features and requirements based on current understanding of stakeholder needs and integrating stakeholder

feedback into each iteration of the development cycle, software teams aim to allocate their development capabilities efficiently. By working on the requirements with the highest priority, this practice not only addresses the dynamic nature of stakeholder needs but also mitigates risks associated with changing requirements and incomplete, misunderstood or unclear objectives.

3. **Continuous Design and Development:** Inspired by Shore's continuous design [29] approach and the value-based SE principle [3] of ensuring that software design and development inherit the system's objectives and value considerations, this practice advocates for a flexible, present-oriented design process. Principles such as "Don't Repeat Yourself" (DRY), simplicity, and "don't try to predict future features" ensure that the software is built to accommodate change by highlighting non-functional requirements such as maintainability. This approach supports the creation of software system that is closely aligned with current stakeholder needs and capable of evolving with those needs.

In conclusion, the synthesis of agile practices, continuous design principles, and value-based considerations into these three core practices: face-to-face communication with stakeholders, iterative prioritization, and continuous design and development. Based on the subjective and multidimensional nature of stakeholder value and changing nature of stakeholder needs, these practices focus on requirement elicitation, prioritization while preparing for change. We suggest that by adopting these practices, software teams can support stakeholder value creation. These practices emphasise that software projects are responsive, adaptable, and aligned with the evolving needs and values of stakeholders, thereby increasing the likelihood of project success and stakeholder satisfaction.

4 Discussion

4.1 Stakeholders for software teams

The stakeholder definition arises from management literature [12] and the definition is utilised by relevant publications in management, marketing and SE literature. However, the literature is fragmented on the implications of stakeholder theory.

All disciplines have different emphasis when considering stakeholder classifications. Management literature focuses in essential stakeholders for an organisation and possible risk factors (e.g. [6], [13], [17]) Marketing literature emphasises external stakeholder identification (e.g. [35], [26], [25]) and SE literature focuses on users and other stakeholders of a software system (e.g. [23], [4]). None of these disciplines directly consider what are the stakeholders for a software team.

We identified a satellite model that aims to conceptualise the stakeholder groups that are relevant from the point of view of software teams. These groups are software team members, users, customers, internals, regulation and general public. All of these groups address different types of requirements, needs and restrictions for the software team and all of them are relevant to consider in developing a software system. The model we provided is simple and all-encompassing for all software teams to use. The model can be expanded and clarified to suit more specific needs.

By considering all of these stakeholders, hopefully software teams are encouraged to engage in ethical decision-making, prioritizing stakeholder needs in a manner that aligns with the organisation's strategic objectives as well as societal responsibilities. Especially including the general public as a stakeholder should make software teams consider stakeholders outside their users and financial benefitors.

The more integral part a software system the software team is managing, the more impact the software team and the way they manage the software project has on stakeholder value and therefore the organisational success. For example in a small software product startup with only one software team, that teams impact to the stakeholders is immense. In a large corporation a team developing internal tools, the impact to the organisational success might not be as significant.

We believe that the suggested classification is a useful tool for software teams to consider all of their stakeholders, but it is not enough. All software teams should go deeper in evaluating what are their stakeholders like and weather this model needs to be expanded further. For example a software system might have very different kinds of users whose characteristics and needs are so different that it makes more sense to consider them as separate groups. It might be impossible to objectively say how many groups software teams need to consider, because the context of the system might vary immensely.

4.2 Stakeholder value and value creation

The literature underscores stakeholder value as an outcome derived from stakeholders' engagement with a firm, extending beyond financial transactions to include improvements in welfare, capabilities, and various forms of utility (e.g. [16], [17]). This

concept of value is not static but evolves through the process of value creation, which is heavily influenced by stakeholders' needs and preferences.

Stakeholder theory broadens the scope of value to include stakeholders' overall welfare and capabilities, underscoring the need for a deep understanding of stakeholder needs for effective value creation [17]. The relevant publications advocate for a more inclusive approach that considers stakeholders' utility, welfare, or capabilities, challenging traditional views of value creation focusing on monetary value (e.g. [17], [16]). The literature suggests that particularly in the context of customers, value creation should be seen as a co-creative process between firms and stakeholders, emphasizing interactions over transactions [14].

Management and marketing literature both contribute to understanding stakeholder value creation, advocating for a focus on co-creation and the importance of stakeholder engagement in the value creation process (e.g. [16], [14]). Specifically, marketing literature tends to concentrate on customer value creation, portraying it as a balance between the benefits received and the costs or sacrifices made by the customer [30]. From the viewpoint of value creation, customers and users emerge as essential stakeholders. For these groups value creation is seen as trade-offs between the benefits received and costs incurred, and how well software products align with their personal attitudes, beliefs, and requirements.

The literature review states that measuring stakeholder value and integrating such considerations into software engineering practices is challenging. If the stakeholder value is created in the stakeholders' processes, it can be hard for organisations to understand the created value and how the firm affects it, making improving stakeholder value creation a difficult task. Dentoni et al. [9] suggest organisations to employ "dynamic capabilities" consisting of the four dimensions of sensing, interacting with, learning from, and changing based on stakeholders. They suggest that organisations should improve their capabilities of understanding stakeholders' processes and changing their operations based on new evidence.

4.3 SE practices to support stakeholder value creation

In this thesis we want to focus on the SE practices that have potential to support the stakeholder value creation for the stakeholders of software teams. In response to the challenges posed by rapidly changing business environments and evolving project requirements, a synthesis of relevant publications imply that key practices supporting stakeholder value creation include: Face-to-Face Communication With Stakeholders, Iterative Prioritization, and Continuous Design and Development.

Face-to-Face Communication With Stakeholders is a practice suggested by Cao and Ramesh [4], and it highlights importance of understanding stakeholder needs [23]. It aims to capture emerging requirements [4] and facilitates iterative RE. Agile methodologies emphasise continuous interaction with stakeholders, prioritizing direct communication and regular feedback through review meetings and acceptance tests.

Iterative Prioritization is a practice that aligns well with "extreme prioritization" practice suggested by Cao and Ramesh [4] also aligns well with value-based SE suggested by and Boehm and Huang [3] and "Present-day" continuous design principle

by Shore [29]. This practice that focuses on prioritizing features and integrating stakeholder feedback addressing dynamic needs and reducing risks associated with changing requirements. This practice could enable software teams to be more efficient in supporting stakeholder value creation, by directing the teams to focus on the most important working items. In order for prioritisation to be effective, the team needs to have accurate understanding on the most pressing stakeholder needs. This can be done through the previous practice: "Face-to-Face Communication With Stakeholders".

Continuous Design and Development practice draws inspiration from continuous design approach [29]. This practice promotes a flexible, present-oriented design process that accommodates change and emphasises present-day problem-solving, simplicity and the avoidance of unnecessary complexity. This practice for software teams is a preparation for changing stakeholder needs.

These practices are not standalone but they support each other. This approach we suggest to SE and RE that centers on creating stakeholder value emphasizing responsiveness, adaptability, and alignment with stakeholders' evolving needs. We believe that adopting these practices is possible for most software teams, enhancing the likelihood of project success and stakeholder satisfaction.

We believe that these are the most important practices a software team can do to support stakeholder value creation. The benefit of having these three practices is that they are simple to understand, and they internalise a lot of good practices suggested by relevant publications. We suggest that these practices can support stakeholder value creation, but within this literature study we cannot prove that. The relationship between varying actions of a software team and stakeholder value creation is hard to observe and measure.

Another challenge of these practices is that they might be hard to employ in an organisation that does not have culture of supporting stakeholder value creation. Additionally, while the practices aim to support stakeholder value creation they require organisation that supports the adoption, require a skillful team and still might not be a bulletproof framework for success and favour some stakeholder groups over others.

4.4 Limitations of the study

This study has been a literature review across multiple disciplines on how software teams can support stakeholder value creation. The strength of this study has been its wide scope, but it is also its weakness. We applied systematic literature review in a pragmatic way using meta-search engines and could not possibly review all the relevant publications on the topic. This might affect the accuracy of all results negatively.

The results required an analysis and a synthesis phase of the relevant publications. Conducting a SLR can be to a degree objective, but always rely on the researchers' expertise. This affects the scientific reproducibility of the study. While the team was careful in the analysis of the relevant publications, mistakes might have happened in the interpretations.

The stakeholder categorisation we provided is complete, but it is not the only possible synthesis on the relevant publications. There was a lot of room for interpretation since none of the sources suggested a complete stakeholder categorisation for

software teams. Other researches might have emphasised different stakeholder groups resulting in different categorisations. Similarly, as the stakeholder categorisation, the suggested practices for software teams are reflective on the expertise of the researchers.

Stakeholder value creation was proven to be a wide and complicated topic. There are challenges in measuring stakeholder value and prove direct and indirect relationships between firms actions and created "value". Due to the complexity of the topic and the low amount of key references included, the results for the RQ2 were high level theory and not very concrete.

5 Conclusions

In this thesis we investigated the research problem "How can software teams support stakeholder value creation?" by answering the research questions: "What are stakeholders for software teams?", "What are stakeholder value and stakeholder value creation?" and "What SE practices support stakeholder value creation?". We conducted a wide literature study where we looked into what do management, marketing and SE literature say about stakeholders and stakeholder value creation. Finally, we suggested three practices for software teams to support stakeholder value creation.

Software teams should identify their stakeholders themselves. Our suggested classification of stakeholders for software teams include software team members, users, customers, internals, regulation and general public. This simple classification is meant to broaden software teams' understanding on whom they need to consider in their daily work and who they are accountable for. This general classification could be applied to a variety of software teams but does not necessarily prove to be beneficial for all. The stakeholders' types and characteristics might vary depending on the context where software teams operate. Many sources across disciplines emphasise the importance of identifying the stakeholders.

Software teams can support stakeholder value creation only if they have capabilities of understanding stakeholders processes. Stakeholder value is conceptualised as the outcome or benefit that emerges in stakeholders' processes and derive from their engagement with a firm. Stakeholder value creation, is the process aimed at enhancing stakeholders' welfare and capabilities. Stakeholder value is subjective and multidimensional in nature also taking into account what stakeholders need to give up. Value creation is not a single action but an ongoing process. It is hard to draw direct relationships between firms actions and the change in perceived value. While stakeholder value creation has been identified as an essential for firms, measuring stakeholder value creation is very difficult to do in practice.

The key practices software teams should do to support stakeholder value creation include active stakeholder involvement and preparing for changing requirements. The key practices we suggest software teams to do include face-to-face communication with stakeholders, iterative prioritization, and continuous design and development. Modern software engineering environment is fast-paced with changing needs. These practices emphasise value creation as an ongoing process. We believe that integrating these practices to the daily work help teams to understand stakeholder needs and gives teams capabilities to apply changes fast to the software system, minimising the feedback loop duration.

While the results of the study attempt to provide tools for a wide range of software teams it is still a theoretical framework never tested in practice. For future study we suggest an empirical study on the applicability of the categorisation of stakeholders and activities to support stakeholder value creation for software teams. We suggest researching this with software teams with a high level of autonomy working in smaller organisations, where the results of their actions and decisions would be more significant.

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