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# Managing Ethical Requirements Elicitation

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## Abstract

The process of Requirements Elicitation (RE) demands from a software development team the need to communicate and engage with a variety of stakeholders, for numerous purposes regarding many aspects of the project. The aim is to translate the needs of the “customer” into accurate and actionable requirements. In this initial step of the software life cycle process several ethical challenges are invoked, which, if left unresolved, may lead to unintended consequences.

Computer Ethics focuses on the questions of right and wrong that arise from the development and deployment of computers. Thus, it urges that the ethical and social impact of computers must be analysed. The purpose of normative ethics is to scrutinise standards about the rightness and wrongness of actions, the goal being the identification of the true human good. A rational appeal can be made to normative ethical principles to arrive at a judicious, ethically justifiable judgement.

In software engineering, the Software Process Improvement (SPI) Manifesto was developed by groups of experts in the field, aimed to improve the software produced, through improving the process, the attitudes of software engineers, and the organisational culture and practices. In this position and constructive design research paper, we argue that software developers, in accordance with the SPI Manifesto aim of improving the software produced, address the ethical challenges invoked in the Requirements Elicitation process.

The steps taken in this paper are: First we report on the findings of a broad literature review of related research, which refers to the current challenges in RE. Second, we source from ethical theory, generic Deontological and Teleological ethical principles that can serve as normative guidelines for addressing the challenges identified in the initial step. Third, we prescribe a set of ethical rights and duties that must be exercised and fulfilled by software developers for them to exhibit ethical behaviour. Each of these suggested actions are substantiated via an appeal to one, or several normative guidelines, identified in the second step. By identifying and recommending a set of defensible ethical obligations that must be fulfilled in the RE process, software developers can fulfil their ethical duties and thus reduce the number of unintended consequences that plague Requirements Elicitation. Ultimately RE must be underpinned with ethical consideration.

**Keywords:** Computer Ethics, Requirements Elicitation, Ethical Theory, SPI Manifesto

## 1 Introduction

Requirements gathering is a vital part of any project, but this exercise can easily become a challenging endeavour. Proper due consideration needs to be paid in requirements elicitation in a software project, which is viewed as one of the most salient and difficult tasks during the software process. Hofmann and

Lehner [1] state that shortcomings in the handling and treatment of requirements are one of the main causes of failure of software projects. Ferreira Martins et al. [2] argues that the negative effects of a misconducted software requirements elicitation are well known project delays, cancellations and deliveries of incomplete work.

The process of Requirements Elicitation (RE) demands from a software development team the need to communicate and engage with a variety of stakeholders, for numerous purposes regarding many aspects of the project. The aim is to translate the needs of the “customer” into accurate and actionable requirements.

### 1.1 Requirements Elicitation

Sommerville and Sawyer [3] define Requirements Engineering as “*the process of discovering, documenting and managing the requirements for a computer-based system*”. The goal of this set of logically related activities is to produce a set of system requirements which, best reflects what the customer actually wants. In requirements engineering, requirements elicitation is the practice of “*researching and discovering the requirements of a system from users, customers, and other stakeholders*” [4].

Stakeholders have input at various stages of the system lifecycle, typically input at the initial stage where requirements are elicited; input essential during requirements analysis and negotiation, and finally accept the system into deployment. Thus, Ryan [5] argues careful selection of appropriate stakeholders is therefore fundamental to the success of the project. It follows that to gather requirements, the first step is to identify the *right* stakeholders from whom those requirements are to be gathered. Identification and involvement of stakeholders in RE process, require that stakeholders can be identified and that they are willing to participate in the collaborative elicitation and prioritization process.

Stakeholders of globally available platforms, such as Facebook and Instagram, with millions of location-independent, heterogeneous and out of organizational reach end-users and people affected by the system, may either be unknown or cannot easily be identified for participating in RE activities. Current RE approaches try to deal with such stakeholders by online polls, questionnaires, or pilot studies. Siakas et al. [6] claim that social media and crowdsourcing are particularly useful in RE for involving stakeholders out of organisational reach working in a dynamic context where requirements evolve regularly. Crowdsourcing denotes the act of outsourcing tasks or business activities through an open call to a large group of external people in a self-selected network of undefined individuals or community (a crowd) that use different social media for collaboration [7].

Johnson [8] argues that requirements elicitation is the most salient stage of software development, and that a list of incomplete requirements is one of the most common reasons for IT project failure. There exists a plethora of methods or techniques that have been proposed to acquire information for the purposes of elicitation. Based upon a comprehensive systematic literature review, several RE techniques are identified [9], as presented in Figure 1.



Figure 1 – Techniques to acquire information for the purposes of requirements elicitation.

In terms of selecting a technique from the wealth of methods available, Davis, et al. [10] concludes that there is little consensus/agreement among experts on how best to elicit information or knowledge. Valusek and Fryback [11] state that acquisition, comprehension and volatility are three categories of problems that affect the correct definition of software requirements.

Requirements volatility is the emergence of new requirements and modification or removal of existing requirements [12]. The reason for requirements volatility is that requirements are not fully known or understood in the beginning of a project. However, new requirements and alterations to requirements can appear during any development phase. This happens because there may be contextual alterations in e.g. organisational goals and objectives, policies, structures, work roles and environmental changes that directly have an influence on the system requirements. Stakeholders needs may also mature due to increased knowledge brought on by the development activities. If such alterations are not taken into consideration, the original requirements will become incomplete and inconsistent with the new situation. In addition, requirements are usually determined by individuals who may have conflicting needs and goals. In a global context these individuals might come from different national, organisational and team cultures with different values and preferences. To lessen volatility risks an iterative process for requirements elicitation is proposed [12].

This paper focuses on problems concerning acquisition, i.e., information or knowledge elicitation.

## 1.2 Computer Ethics

In Requirements Elicitation, this initial step of the software life cycle process, several ethical challenges are invoked, which, if left unresolved, may lead to unintended consequences.

Kallman and Grillo [13] state that it is clearly dangerous to rely solely on law as a moral guideline because in certain circumstances bad laws exist. Inadequate laws may bind rules on society that fail to provide moral guidance. History has presented us instances of immoral laws, which have excused society from fulfilling certain obligations and duties or allowed a society to justify their unethical behaviour. Ethical judgments simply do not have the same deductivity and objectivity as scientific ones. However, moral judgments should be based upon rational moral principles and sound, carefully reasoned arguments. Normative claims are supported by: *“An appeal to defensible moral principles, which become manifest through rational discourse”* [14].

A normative claim can only be substantiated, and a rational discourse presented, through an appeal to such principles. In Section 2 the authors identify the current issues concerning the RE process. Thus, with regards to the ethical issues raised by Requirements Elicitation, in Section 3 of this paper we will present a list of defensible ethical principles, which are taken from ethical theory. Several heuristics are suggested in Section 4, which if followed may lead to ethical guidance concerning RE. These normative claims are substantiated via the citation of one or a few of the ethical principles from Section 3. Thus, each heuristic is based upon rational moral and philosophical principles and sound, carefully reasoned arguments.

## 1.3 SPI Manifesto

Three core values and ten principles constitute the Software Process Improvement (SPI) Manifesto, which serves as an expression to state-of-the-art knowledge on SPI. In planning a SPI project, the manifesto can be used to better facilitate the necessary corresponding change in the organisation [15] [16] [17] [18].

The argument put forward in this paper that we, as SPI professionals, need to fulfil ethical duties concerning the software process assessment to improve the quality and productivity of software development processes, ultimately to produce high-quality software using a productive and efficient team, which all correlates with the values outlined in the SPI manifesto. The SPI values: must involve people actively and affect their daily activities; is what you do to make business successful; and is inherently linked with change. These three values can be decomposed into a set of principles, which in turn serve as foundations for action. The notion of improving the software development process, of which Requirements Elicitation is a pivotal phase, is implicitly implied in the SPI Manifesto values and principles.

Making ethical choices is not a purely deductive exercise like mathematics. Many people may rely on intuition or personal preferences alone. However, computer ethics can provide a more logical and rational

approach, whether formal or informal guidelines or an academic theory are employed. Computer ethics provides rules and principles that, when applied to a case where ethical guidance is required, lead to a higher quality decision than one that relies on intuition or personal preferences alone [14] [40]. The aim of the paper is to identify the ethical issues invoked in the process of Requirements Elicitation (the *case*), via a Literature Review. Then by applying ethical normative principles to this case, the authors of this paper aim to produce several heuristics, that if adhered to by software developers can lead to higher quality decisions being arrived at compared to those attained without any conscious reasoning. These ethically defended decisions, i.e., heuristics, have the potential to address the ethical issues, which have been identified as concerns in this initial step of the software life cycle process.

This paper is divided into five sections. Section 2 will describe the motivation of this study in more detail and will introduce the respective background. The research methodology used will be described in section 3. Section 4 will briefly list the key milestones in the application of the selected methodology, leading on to section 5 where the results of the review will be explained. Finally, section 6 will discuss the findings and the limitations of the approach taken.

## 2 Ethical Challenges in Requirements Elicitation: A Literature Review

The International Council on Systems Engineering (INCOSE) outlines several guidelines for writing better requirements, e.g., the Guide to Writing Requirements (GtWR), the Needs and Requirements Manual (NRM), and the Guide to Needs and Requirements (GtNR). INCOSE state that when defining needs and requirements, it is important that they have the characteristics of well-formed needs and requirements, concluding that the underlying analysis from which a need or requirement was derived is as important as how well the need or requirement statement is formed [38].

ISO (International Organization for Standardization) and IEC (International Electrotechnical Commission) work in the development of International Standards to deal with fields of technical activity including systems and software engineering and the system life cycle processes. For example, ISO/IEC/IEEE 29148:2018 which provides a unified treatment of the processes and products involved in engineering requirements throughout the life cycle of systems and software [39].

Yet over 70% of project failures can be attributed to issue in the requirements gathering process [19]. Failure to gather requirements effectively typically lead to scope creep; running out of resources; missing deadlines; going over budget; and poor project delivery. Hussain et al. [20] argue that requirements engineering is pivotal and central to every successful software development project. They identified several reasons why software projects fail of which “*poorly elicited, documented, validated and managed requirements contribute grossly to software projects failure*”.

Systems development is a “*socio-technical endeavour to make use of human and technological resources to achieve a collective task*” [21]. Requirements elicitation, seen as being a key and vital facet of requirements engineering, is based on multiple viewpoints to define stakeholder needs. A close interaction between developers, end-users of the system, the customer et al. is needed by requirements’ gathering. Therefore, the resulting system’s functionality is intimately tied to this human context.

To commence with the elicitation of stakeholder requirements, the first step must be to identify the stakeholders from whom those requirements are to be gathered. The traditional definition of a stakeholder as someone who “*has a stake in the project—that is, someone who is affected by the system in some way or can affect the system in some way*” is not useful because it often difficult to find someone who is not affected by the system. Therefore, a more useful definition of a stakeholder is proposed: “*someone who has a right to influence the system*” [5].

But the method for selecting stakeholders must not overlook ethical concerns and marginalized social/stakeholder perspectives. The requirements gathered from only one group (level) will likely be biased by the “*level of abstraction from which those people conceive the problem, their planning horizon, detailed acquaintance with the application, personal preconceptions, goals, and responsibilities*” [22]. Therefore, a true articulation of the requirements can be obtained only from collecting information from all parties concerned. The authors also recognise the problems in fostering understanding among the different communities affected by the development of a given system.

Seyff et al. [23] argue that most approaches to requirements elicitation, prioritization and negotiation promote the involvement of success-critical stakeholders, for example, end users of the system. But these

approaches are found lacking because they do not sufficiently support non-traditional contexts such as mobile computing, cloud computing or software ecosystems. The authors argue that in these contexts the project requires the involvement of a vast number of “*heterogeneous, globally distributed and potentially anonymous stakeholders*”. Thus, these approaches to RE rightly involve success-critical stakeholders however, there is a lack of suitable elicitation techniques and novel RE approaches and methods are needed to give end users “*their own voice*”.

The requirements elicitation process often starts with an interview between a customer and a requirements analyst. It is in these interviews that ambiguities “*in the dialogic discourse may reveal the presence of tacit knowledge that needs to be made explicit*”. The authors, thus argue that it is important to understand the nature of ambiguities in interviews and to provide analysts with “*cognitive tools to identify and alleviate ambiguities*” [24]. Requirements maybe ambiguous, inconsistent, or incomplete, making it difficult for engineers to understand what the system should do. Ferrari et al. [25] argue that ambiguity in communication is often perceived as a major impediment for knowledge transfer, resulting in unclear and incomplete requirements documents. The authors define ambiguity as a class of four main sub-phenomena, i.e., unclarity, multiple understanding, incorrect disambiguation and correct disambiguation. Ambriola and Gervasi [26] present the ambiguity in requirements engineering, focused on natural language (NL) ambiguities in requirements documents (i.e., textual documents).

In the RE stage in addition to explicit communication and close collaboration between involved stakeholders, contextual, organizational, and cultural factors also need to be taken into consideration for increasing the probability of improved accuracy and completeness of the requirements, and ultimately success of the projects [6].

### **3 Defensible Ethical Principles**

There are a range of ethical theories that have been developed throughout history and one or a combination of these can be selected. Fundamentally there are two basic approaches to ethics: *Teleological* theories (consider the consequences of an action as a measure of goodness) and *Deontological* theories (emphasise the rightness of an action above the goodness it produces).

Teleological theories give priority to the good over the right, and they evaluate actions by the goal or consequences that they achieve. Thus, correct actions are those that produce the best or optimise the consequences of choices, whereas wrong actions are those that do not contribute to the good. Three examples of the Teleological approach to ethics are Egoism, Utilitarianism and Altruism, see Figure 2. According to a Deontological framework, actions are essentially right or wrong regardless of the consequences they produce. An ethical action might be deduced from a duty (Pluralism) or a basic human right (Contractarianism), see Figure 2, but it never depends on its projected outcome [13].

#### **3.1 Deontological Principles**

In duty-based ethics (Pluralism) there are seven basic moral duties that are binding on moral agents. In rights-based ethics (Contractarianism) a right can be defined as entitlement to something. In the field of Information Technology three specific rights are identified: 1. The right to know, 2. The right to privacy, and 3. The right to property [13]. Seven further rights were advocated as ones in a digital world [28]. All ten rights, and seven basic duties, are identified and listed in Figure 2.

#### **3.2 Teleological Principles**

Three examples of the Teleological approach to ethics are Egoism, Utilitarianism and Altruism [13]. Egoism is grounded in the concept of self-interest, which is used as justification when something is done to further an individual's own welfare. The principle of Utilitarianism embodies the notion of operating in the public interest rather than for personal benefit. The Utilitarian principle determines an action to be right if it maximises benefits over costs for all involved, everyone counting equal. Altruism is invoked when a decision results in benefit for others, even at a cost to some including the altruist himself/herself. Thus, an action is determined to be right if it maximises the benefits of some, even at the cost to others involved.

Kallman and Grillo [13] present a framework for ethical analysis. Amongst, a multitude of other details, it lists some basic moral principles and theories that can serve as normative guidelines for addressing the

moral issues, cases where ethical and professional issues may have been invoked. The Deontological and Teleological principles outlined in sections 3.1 and 3.2, above, constitute this framework. In addition, the normative principles of Autonomy, Informed Consent and the Golden Rule are also considered. Because of their simplicity and concreteness, these principles are seen as serving “*a more practical and direct way of coming to terms with a moral dilemma*” [14].

These Deontological and Teleological normative principles [13] [14] [27] [28] are enumerated in Figure 2.

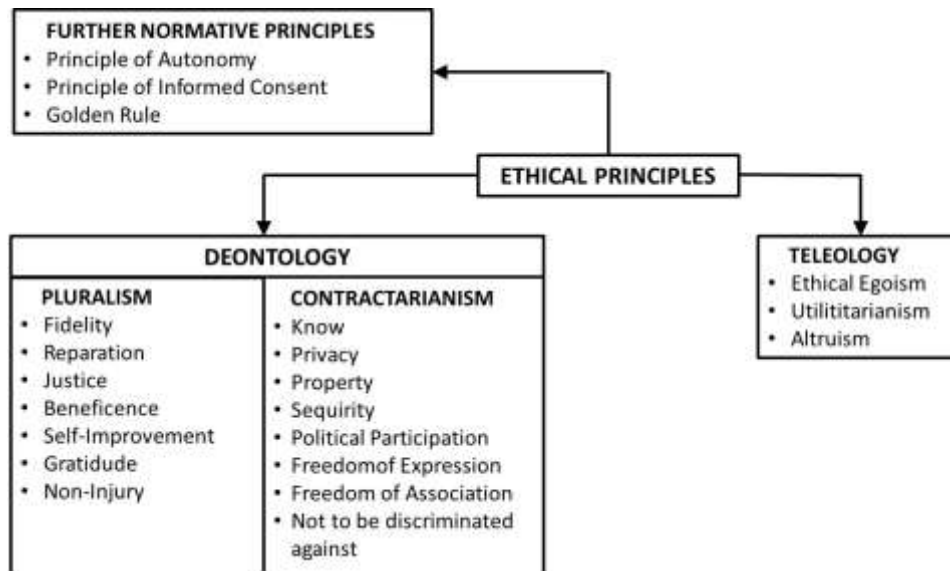


Figure 2 – Ethical Normative principles sourced from Ethical Theory.

The appropriate and respective normative principles presented above will be applied to the moral dilemmas that are invoked by systems development and deployment by business process engineers, software engineering teams, process improvement managers, and others

## 4 Heuristics

Several heuristics are suggested below, which if followed may lead to ethical requirements elicitation in RE. Each rule of thumb is substantiated by citing one or several ethical normative principles, listed in Figure 2, above. Often there is a lack of relevant knowledge or inexperience in both developers and clients. These heuristics offer ethical instruct in such circumstances.

1. **Use of Direct Observation:** Antona, et al. [29] advocate the use of Direct Observation, as a method of understanding and investigating the user experience, which is usually deployed in field research used in anthropology, ethnography and ethnomethodology. The authors argue that by examining the users in context it can potentially produce a richer understanding of the relationships between “*preference, behaviour, problems, and values*”. Four basic principles that underly Ethnographic methods are: *Natural settings* (The foundation in ethnography is field work, where people are studied in their everyday activities); *Holism* (People’s behaviours are understood in relation to how they are embedded in the social and historical fabric of everyday life); *Descriptive* (The ethnographers describe what people do, not what they should do. No judgment is involved); and *Members’ point of view* (The ethnographers create an understanding of the world from the point of view of those studied) [30].

- Deontology (Pluralism): Justice
- Deontology (Pluralism): Beneficence
- Deontology (Pluralism): Non-injury
- Deontology (Contractarianism): The right not to be discriminated against
- Deontology (Contractarianism): The right to fair access to, and development of communication resources
- Principle of Autonomy
- Teleology: Utilitarianism

2. **Use of Social Networks and Collaborative Filtering:** Mulla [31] argues for the methods to identify and prioritize stakeholders and their respective requirements, particularly so in large scale software projects. The author advocates a method for eliciting requirements in large scale software projects using social networks and collaborative filtering. A social network is a structure, comprising of actors (individuals, corporate/collective units, etc.) and the relation(s) conferred upon them. Actors are linked to one another via relational or social ties. Ties can be an evaluation of one person by another (friendship, liking or respect); transfer of material resources (e.g., business transaction); an association/affiliation (e.g., belonging to the same social group) and formal relations (e.g., authority). Valued relations are determined from stakeholders assigning values to the ties and thus overtime a well-connected network is achieved, which can be interrogated to identify and priorities requirements.

- Deontology (Pluralism): Justice
- Deontology (Pluralism): Beneficence
- Deontology (Pluralism): Non-injury
- Deontology (Contractarianism): Political Participation
- Deontology (Contractarianism): Freedom of Expression
- Deontology (Contractarianism): The right not to be discriminated against
- Teleology: Utilitarianism

3. **Use of Natural Language Processing (NLP):** Natural Language Processing is a field of research and application that analyses how with the help of machine we can comprehend and manipulate natural language for further exploration, utilizing numerous computational techniques for the automated analysis and representation of human language [32]. Ambiguity in Natural Language Processing can be removed using Word Sense Disambiguation; Part of Speech Tagger; HMM (Hidden Markov Model) Tagger; and/or Hybrid combination of taggers with machine learning techniques. These examples of cognitive tools can help identify and alleviate the issues of ambiguity that may be found in textual documents generated in the requirements elicitation process.

- Deontology (Pluralism): Beneficence
- Deontology (Pluralism): Non-injury
- Deontology (Contractarianism): The right to fair access to, and development of, communication resources
- Teleology: Utilitarianism

4. **Conduct an Operational Feasibility Study:** Stair and Reynolds [33] define an operational feasibility study as the process of determining how a system will be accepted by people (assessing employee resistance to change, gaining managerial support for the system, providing sufficient motivation and training, and rationalising any conflicts with organisational norms and policies) and how well it will meet various system performance expectations (for example, response time for frequent online transactions, number of concurrent users it must support, reliability, and ease of use). There is an ethical duty to assess the requirements elicited in the context of an operational feasibility study. In the first instance the study should determine how the requirements will be accepted by marginalized social/stakeholder perspectives. This may, for example, imply dialogue between analysts and trade unions representatives (expressing employee resistance). These representatives should have entitlements to be part of the consultation and elicitation process because the resulting system, which is designed and deployed, including the introduction and adoption of new technology, will affect its members' working practices.

- Deontology (Pluralism): Beneficence
- Deontology (Pluralism): Non-injury
- Deontology (Contractarianism): Political Participation
- Deontology (Contractarianism): Freedom of Expression
- Deontology (Contractarianism): The right not to be discriminated against
- Teleology: Utilitarianism
- Principle of Informed Consent

5. **Harness Social Network Site (SNS):** Seyff et al. [23] report on the efficacy of using a popular social network site to support requirements elicitation, prioritization and negotiation. The use of SNS in this approach was applied to allow potential stakeholders to actively participate in RE activities of projects. Although there are limitations reported, the results show that a popular social network site can effectively support distributed RE. The use of SNS is advantageous to cope with short time-to-market periods, when the methods to be used need to be fast, easy and inexpensive. Kengphanphanit and Muechaisri [34] report on an approach to extract requirements automatically



from user feedbacks on social media and classify user feedbacks to requirements and non-requirements using Naïve Bayes's Machine Learning.

- Deontology (Pluralism): Justice
- Deontology (Pluralism): Beneficence
- Deontology (Pluralism): Non-injury
- Deontology (Contractarianism): Political Participation
- Deontology (Contractarianism): Freedom of Expression
- Deontology (Contractarianism): The right not to be discriminated against
- Teleology: Utilitarianism

6. **Ethical User Stories in Agile software development:** A user story is used to acquire the details of a requirement from an end-user's point of view, in the Agile software development approach [35]. The user story articulates a simple concise description of a requirement told from the user's perspective, which specifies i) what type of user you are, ii) what you want and iii) the reason behind it. The authors of this paper argue that a fourth element be introduced into the structure that permits an expression by the end user that of specifying ethical rights and /or duties that could be exercised via the requirement.

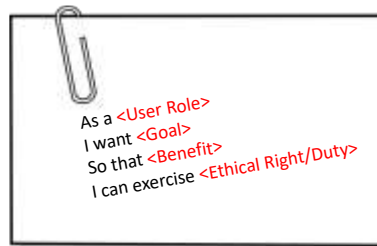


Figure 3 – Structure of an Ethical User Story

Scrum teams generally follow a simple approach for a user story: As a < type of user >, I want < some goal > so that < some reason >. With the proposed introduction of I can exercise <Ethical Right/Duty> the user story can be a call to conversation spoken in an ethical language. Although a user story is not part of a contractual agreement, it does permit a place for the conversation allowing the essence of what type of functionality the businesspeople want, why it is needed [36] and know its ethical defence. Thus, stakeholders, development team, and the product owner negotiate their details in the context of ethical aspects. All development should be seen through this *ethics* lens. The British Computer Society (BCS) [37] argues that this is vital if practitioners are to become responsible computing professionals that they do so. If an end user is uncertain of what the ethical rights/duties are which they can exercise, then it is the professional duty of the developer to inform them [37].

- Deontology (Pluralism): Justice
- Deontology (Pluralism): Self Improvement
- Deontology (Pluralism): Non-injury
- Deontology (Contractarianism): Political Participation
- Deontology (Contractarianism): Freedom of Expression
- Deontology (Contractarianism): The right not to be discriminated against
- Teleology: Utilitarianism

7. **Select success critical stakeholders:** In RE a judgement needs to be made as to whether a stakeholder is important enough to be engaged in the process. Stakeholders are important to identify and to manage for businesses and/or projects to have a high chance of success, but how can we ensure we use our limited resources, e.g., time and money, in an efficient way? Mendelow [41] proposes a power-interest grid, see Figure 4, which considers stakeholder power and expectations, therefore their likely interest(s). This matrix can be used to determine and present the potential influence of stakeholder groups.

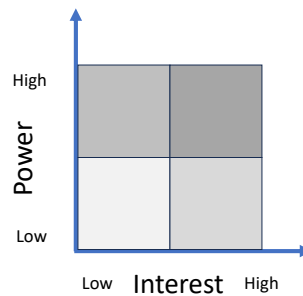


Figure 4 – A Mendelow Power-Interest grid

Therefore, in the approach to requirements elicitation, the potential use of the Mendelow power-interest grid can assist in the identification, prioritization and negotiation of success-critical stakeholders.

- Deontology (Pluralism): Justice
- Deontology (Pluralism): Beneficence
- Deontology (Pluralism): Non-injury
- Deontology (Contractarianism): Freedom of Expression
- Teleology: Utilitarianism

## 5 Conclusions

The rationale of applying the ethical framework presented in this paper was to identify and defend ethical stances that can be taken in the concerns over requirements elicitation, a crucial stage in Requirements Engineering. In doing so, the authors conclude that the importance of ethical considerations in the RE can be brought to the attention of the systems development and software engineering community, and all stakeholders, thus help raise the visibility its ethical use. In doing so it can also contribute to project success, avoiding the pitfalls that are present in failed software development projects, which fail to address the issues in the RE process.

The paper contributes to the current ethical and philosophical discourse relating to requirements elicitation. A set of heuristics for the ethical guidance has been proposed which will raise awareness of the moral issues and help guide analysts and users in the RE process. The development of a set of ethical heuristics presented this paper is an important one. There are instances where the relationship between law and ethics breaks down, and the law fails to provide moral guidance. Thus, to solely rely on the law for guidance, to exclusively fulfil legal duties, may lead to occasions where an individual fails to accomplish their ethical responsibility. A corresponding legal duty may not exist binding an analyst to undertake the proposed activities in the stated heuristics, but this should not be an obstacle stopping them from fulfilling these ethical obligations.

Additional research could include an ethical analysis of each phase of the systems development life cycle (SDLC). Thus, at each stage of the process for planning, analysing, designing, coding, testing, deploying and maintaining information system, systems analysts and developers will be conscious of the duty they have to incorporate ethical considerations into the system's specification and design. Another area of investigation is to conduct an ethical analysis, using the principles outlined in Figure 2, of the various elicitation techniques that are outlined in Figure 1, and in which circumstances they are most effective and efficient. The results of such an analysis may permit the identification of the ethical efficacy of each approach. This may assist RE engineers to identify the most appropriate RE technique(s) to deploy, whilst concurrently maximising the ethical advantages. Future research looks to conducting empirical research based on observation and measurement of IS development projects to confirm, and substantiate, the efficacy of the proposed heuristics in this paper.

Future literature review in terms of breadth of coverage may flag further ethical challenges in the Requirements Elicitation process, and thus enable additional heuristics to be identified and presented.

The notion of ethical duty needs to be explicitly addressed in the SPI Manifesto. Although these are implied in the manifesto's three values and ten respective principles, there needs to be a much more unequivocal statement with regards to how these notions must govern organisational and personal

behaviour in relation to Software Process Improvement work. Thus, a fourth value could be appended to the SPI Manifesto: Ethical Duties and corresponding principles declared and adopted.

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