

Engineering Requirements for Social Sustainability

Maryam Al Hinai
 Department of Computer Science
 University of Leicester
 Leicester, UK
 Email: msah1@le.ac.uk

Rozanna Chitchyan
 Department of Computer Science
 University of Leicester
 Leicester, UK
 Email: rc256@le.ac.uk

Abstract—Software is no longer a passive tool, but is an active agent in shaping modern communities. Yet, to date, software engineers do not endeavour to explicitly state requirements which a software system must fulfil if it is to positively contribute to the well-being (that is the social sustainability) of its user community. This paper presents a proposal on how to bridge this gap. It notes that social sustainability requirements stem from key societal values, such as equity, security, education, which can be elicited into value patterns. Such patterns can then serve as templates for software requirements specification. The viability of this proposal is demonstrated through formation of equity value patterns, which are instantiated as requirements to 6 sample studies. We observe that while each organisation and sub-community will have own diverse cultural and traditional values with respective requirements, the fundamental notions (such as equity, security, freedom) that serve as the core of social sustainability remain relatively stable. It is such values that we propose to elicit into patterns for requirements specification.

Index Terms—social sustainability, requirements engineering, value-based design, value patterns

I. INTRODUCTION

Social sustainability is often defined as ability of a society to maintain its “social capital” which creates the “basic framework for society”, including “cohesion of community for mutual benefit, connectedness between groups of people, ... standards of ...ethics..., rules, laws, and information...” [38]. It lowers the cost of working together and facilitates cooperation, e.g., trust lowers transaction costs [38]. Because the functionality, constraints, and properties of a software system are set through Requirements Engineering (RE), RE is also the key stage for engineering sustainability into software [16]. Sustainable software is described as “software whose direct and indirect negative impacts on economy, society, human beings, and the environment resulting from development, deployment, and usage of the software is minimal and/or [such software] has a positive effect on sustainable development” [30].

Nevertheless, requirements engineers have not yet incorporated *social sustainability requirements*¹ into software systems engineering [25]. One of the reasons for this is that requirements engineers do not have clear guidelines on what is “positive impact on communities”, and how it can be identified, modeled, or measured [25] (except when the functionality of the software is aimed explicitly at supporting

the disadvantaged users, e.g., speech synthesizing software to support those with severe speech impediments [6]).

Yet, the problem of software impact on its user communities has been faced, primarily within the organisational context, for a long time [32] [58] [57] [49] [39] and has, to some degree, been addressed via such techniques as value-based design [36] [29] [42], participatory design [23] [54] [60], user experience evaluation [44] [75] [22], and even iterative agile development [65]. Essentially, all these techniques allow for explicit [29] or implicit [65] [23] incorporation of user values into the intended software systems. In this paper we maintain that the positive contribution of software systems to “user communities” (i.e., its positive contribution to organisational and social structure) manifests when the given software system supports and promotes the social values of the given user community.

However, all of the previously noted techniques [36] [29] [42] [23] [54] [60] [44] [75] [22] [65] set out to discover “from scratch” the values and their respective requirements that would improve the software acceptance in a community or organisation, or would increase user satisfaction with it. While we agree that each organisation and sub-community will have own diverse cultural and traditional values with respective requirements, we also note that there are certain central values (such as equality, security, freedom) that are recognised as fundamental to modern societal well-being. These remain relatively stable, though may have distinctive flavour in various types of communities (e.g., gender equality in western society vs. eastern one). Such values are often universally recognised (e.g., Human Rights convention [1] [4]) and even standardised (e.g., International Standard on Social Accountability [12]). In this paper we propose that such fundamental values should become the starting point of engineering social sustainability requirements for software.

The key contributions of this paper are in:

- Presenting a generic requirements identification methodology that is based on core societal values and, thus, is clearly directed toward social sustainability objective. This methodology is abstract and can be instantiated to support social sustainability requirements in various domains.
- Demonstrating an instantiation of this methodology to support the equity-related requirements. The instantiated methodology is applied to six studies of previously

¹As shown in Table III, any type of requirements - irrespective of being functional or non-functional, can affect social sustainability, i.e., be a social sustainability requirement.

Requirements Engineering Social And Technical Issues

**Joseph A. Goguen, Oxford University
Computing Laboratory. Programming
Research Group**

Requirements Engineering Social And Technical Issues:

Requirements Engineering Marina Jirotko, Joseph Goguen, 1994 The book is divided into two parts Part 1 examines issues in current requirements engineering methods and practice Part 2 details the way in which a particular orientation on the social aspect of the area can increase our understanding of the requirements process and also inform current requirements practice

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Methodologies for Developing and Managing Emerging Technology Based Information Systems Trevor Wood-Harper, Nimal Jayaratna, Bob Wood, 2013-06-29 This volume contains the proceedings of the 6th International Conference of the BCS Specialist Group on Information Systems Methodologies The conference brought together papers on methodology issues related to the development and management of emerging technology based information systems As usual there was a good range of papers addressing the soft and hard aspects of IS development and management Methodologies for Developing and Managing Emerging Technology based Information Systems will be of interest to practitioners who are engaged in systems development and modifying or aligning existing methodologies to practice **Requirements**

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