

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

**Natarajan Meghanathan,B.K.
Kaushik,Dhinaharan Nagamalai**

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

Computing Handbook Allen Tucker, Teofilo Gonzalez, Heikki Topi, Jorge Diaz-Herrera, 2022-05-29 This two volume set of the Computing Handbook Third Edition previously the Computer Science Handbook provides up to date information on a wide range of topics in computer science information systems IS information technology IT and software engineering The third edition of this popular handbook addresses not only the dramatic growth of computing as a discipline but also the relatively new delineation of computing as a family of separate disciplines as described by the Association for Computing Machinery ACM the IEEE Computer Society IEEE CS and the Association for Information Systems AIS Both volumes in the set describe what occurs in research laboratories educational institutions and public and private organizations to advance the effective development and use of computers and computing in today s world Research level survey articles provide deep insights into the computing discipline enabling readers to understand the principles and practices that drive computing education research and development in the twenty first century Chapters are organized with minimal interdependence so that they can be read in any order and each volume contains a table of contents and subject index offering easy access to specific topics The first volume of this popular handbook mirrors the modern taxonomy of computer science and software engineering as described by the Association for Computing Machinery ACM and the IEEE Computer Society IEEE CS Written by established leading experts and influential young researchers it examines the elements involved in designing and implementing software new areas in which computers are being used and ways to solve computing problems The book also explores our current understanding of software engineering and its effect on the practice of software development and the education of software professionals The second volume of this popular handbook demonstrates the richness and breadth of the IS and IT disciplines The book explores their close links to the practice of using managing and developing IT based solutions to advance the goals of modern organizational environments Established leading experts and influential young researchers present introductions to the current status and future directions of research and give in depth perspectives on the contributions of academic research to the practice of IS and IT development use and management

Computing Handbook Teofilo Gonzalez, Jorge Diaz-Herrera, Allen Tucker, 2014-05-07 The first volume of this popular handbook mirrors the modern taxonomy of computer science and software engineering as described by the Association for Computing Machinery ACM and the IEEE Computer Society IEEE CS Written by established leading experts and influential young researchers it examines the elements involved in designing and implementing software new areas in which computers are being used and ways to solve computing problems The book also explores our current understanding of

software engineering and its effect on the practice of software development and the education of software professionals

Social Science, Technical Systems, and Cooperative Work Geoffrey Bowker, Susan Leigh Star, Les Gasser, William Turner, 2014-05-12 This book is the first to directly address the question of how to bridge what has been termed the great divide between the approaches of systems developers and those of social scientists to computer supported cooperative work a question that has been vigorously debated in the systems development literature Traditionally developers have been trained in formal methods and oriented to engineering and formal theoretical problems many social scientists in the CSCW field come from humanistic traditions in which results are reported in a narrative mode In spite of their differences in style the two groups have been cooperating more and more in the last decade as the people problems associated with computing become increasingly evident to everyone The authors have been encouraged to examine rigorously and in depth the theoretical basis of CSCW With contributions from field leaders in the United Kingdom France Scandinavia Mexico and the United States this volume offers an exciting overview of the cutting edge of research and theory It constitutes a solid foundation for the rapidly coalescing field of social informatics Divided into three parts this volume covers social theory design theory and the sociotechnical system with respect to CSCW The first set of chapters looks at ways of rethinking basic social categories with the development of distributed collaborative computing technology concepts of the group technology information user and text The next section concentrates more on the lessons that can be learned at the design stage given that one wants to build a CSCW system incorporating these insights what kind of work does one need to do and how is understanding of design affected The final part looks at the integration of social and technical in the operation of working sociotechnical systems Collectively the contributors make the argument that the social and technical are irremediably linked in practice and so the great divide not only should be a thing of the past it should never have existed in the first place

Requirements Engineering as the Reconciliation of Technical and Social Issues Joseph A. Goguen, Oxford University Computing Laboratory. Programming Research Group, 1994

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

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revised full papers presented in this volume were carefully reviewed and selected The papers are organized in topical sections on soft computing such as AI Neural Networks Fuzzy Systems etc distributed and parallel systems and algorithms security and information assurance ad hoc and ubiquitous computing wireless ad hoc networks and sensor networks

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