Requirements in the 21st Century: Current Practice and Emerging Trends

Bibliographic data

The paper was written in 2009, by Sean Hansen, Nicholas Berente and Kalle Lyytinen, and goes by the name "Requirements in the 21st Century: Current Practice and Emerging Trends". It is the 14th volume in a book series entitled Lecture Notes in Business Information Processing, published by Springer.

Theme of the paper

The paper approaches the subject of **requirements** as one the most significant challenges in software intensive systems' design.

It takes into consideration requirements research throughout the past two decades, reviews current state-of-the-art both in practice and theory of design requirements management, identifies the gap between research and current practice and points out drivers of change in the 21st century requirements design efforts.

Synthesis of the paper

Design requirements is an interdisciplinary area of study and different fields have their own nomenclatures and definitions of what requirements actually are. Bearing this in mind, *software engineering*, *computer science* and *information systems* are the fields mostly dedicated to the research of this topic. However, although there has been extensive research on the subject, there appears to be a discontinuity between the methods developed by researchers and the real practices and needs of designers. This is essentially what the paper aimed to look further into.

Literature has mainly focused on advancing theoretical or empirical understanding of how to discover, define, negotiate and manage design requirements and why these processes are so difficult, but "prescriptive modeling and process methodologies have actually seldom been subjected to rigorous empirical scrutiny due to issues of cost, access and threats to internal validity". This means that, although there is a lot of research, the methods are actually not being tested out and exhausted as should be. This paper also intended to achieve a better understanding of up to which degree those developed methods had actually been put to use in the real world.

Firstly, it was introduced the concept of **design requirements processes** as the set of activities involved in determining what features and functions an artifact must embody and the constraints it must satisfy. This definition helps to understand that there is an intricate interaction between the designers and the end users. This close relationship between the two parties, subjected to its adversarial nature, is often pinpointed as a key impediment to effective requirements' processes. Even when the designers and stakeholders maintain a good relationship, it remains a problem for users to understand what they want. In fact, the 3 leading sources of project difficulty were identified as the lack of user input, incomplete requirements and changing specifications.

There were 9 emerging themes and challenges considered for the aforementioned paper: business process focus, systems transparency, integration focus, distributed requirements, layered requirements, criticality of information architectures, increased deployment of COTS and software components, design fluidity and interdependent complexity.

As **actual comparison** was attempted between research and practice, through the interviewing of 30 IT leading professionals, the authors realised that, on some aspects, practitioners follow many of the principles advocated by researchers, namely formal validation and sign-off, enterprise and functional modelling, user involvement, explicit risk management and the use of CASE tools. In addition, companies are even looking into increasing the degree of structure in their requirements practices.

On the other hand, they are less concerned with many of the distinctions researchers favoured in terms of phases of the requirements processes (*Discovery*, *Specification* and *Validation* & *Verification*) and the requirements types, i.e., in companies in the real world, the practices tend to happen simultaneously and they are so closely related that it becomes hard to draw the line between them. In the practitioners' opinion, requirements questions are properly interspersed in the design process so there is no need to create a formal separation of phases. Furthermore, they did not regularly follow formal methodologies nor stick to one single method. Interviewees did not even speak of specific modeling techniques, but actual tools, such as *IBM's Rational suite* and *Telelogic DOORS*. Besides, there continued to be a preference over the use of natural language to both capture and communicate the requirements which researchers strongly advocated against as it is subject to ambiguity.

The authors, understandably so, brought to attention the fact that the bulk of literature on the topic of requirement activities was developed according to the **1970s and 1980s' paradigm**, which resided in the development of systems from scratch.

This might be a possible reason why there is such a significant gap between what practitioners do and the expected by researchers' findings – **nowadays' paradigm** is simply very different. More than ever, the goal is not to develop a single system from scratch, but to bring together different systems that are platform independent, multipurpose, easy to integrate with other systems (*Integration Focus*) and which can be personalised to fit every business' needs. This has resulted in a shift from IT personnel roles from application developers to system integrators with the concern not to develop a single system but allow for the coalition between many different systems (*Interdependent Complexity* and *Layering of Requirements*).

There is a demand for transparency across software applications by business users and consumers, which means that technologies are expected to meet in a way that there is a seamless user experience and the perception of a single uniform service platform (*System Transparency*).

As of now, *commercial-of-the-shelf* software or modular systems are companies' favourites as they result in lower cost and are expected to be of higher quality (*Packaged Software Orientation*). A major centrality of information architectures is observable (*Centrality of Architectures*) and there has been an increase in the influence of web services/service-oriented architectures and outsourcing of development. This being said, development never ends and practitioners are very much aware of this, as increasingly so, they make the choice to limit the scope of projects intentionally with planned and managed

releases so the work may be developed iteratively with constant communication between stakeholders to change and perfect the requirements (*Fluidity of Designs*).

Globalization is also a critical force as it accounts for increased distribution of requirements processes across functional, organizational and geographic boundaries (*Distributed Requirements*) and there has been a consistent shift from focus on a particular application and its associated work practices to a focus on chains of work practices or business processes (*Business Process Focus*).

Curiously, some aspects researchers found troubling about design of requirements were the least of practitioners' worries. An example of this is how researchers worried about the prioritization or negotiation of requirements, while for most companies it is evident that stakeholders with more funds have a bigger say and that solved the matter for them, maintaining, of course, IT stakeholders' voice when said prioritization is subject to prior architectural decisions or constraints. Another example is how researchers focus on developing different methods in attempt to fix the arising problems of design of requirements, but, as far as practitioners are concerned, they don't even think the problems come from the existing technical resources or formal methods.

A point that, in reality, did present itself as a problem in real world companies was a factor that, although simple and considered obvious in nowadays busy world, is hard to be considered in research: time. In most organizations, the validation efforts are centred on explicit sign-offs by project sponsors and other stakeholders and, ideally, if they are not reviewed and approved then they cannot be accepted. Be that as it may, there is not enough time so design efforts are allowed to move forward in spite of the potential presence of errors and this presents itself as a real problem as, the further requirements with errors progress, the costlier it will be fix them.

To conclude, there are significant emerging trends that might explain why there is that seemingly large gap between theory and practice and Requirements Engineering will continue to be a vast area subject to the present paradigm. It remains a question if the existing assumptions about requirements need to change in order to evolve and fix the existing problems.

Questions and reflection

Q1: Has the practitioner community not caught up or are many of our scholarly assumptions just not relevant to requirements practice? Why the gap?

Q2: Is it indeed still fruitful to take the existing research literature as a starting point for studying the design of requirements? Or should research be made from scratch considering the new paradigm?

Q3: Does formal modelling effectively support interactions between distinct stakeholders or bridge the communicative gaps between the design team and other stakeholders?

In relation to the 3 questions I mentioned above and which were the ones that resonated with me the most throughout the paper, I strongly believe that the answer to all of them is similar or, at least, points in the same direction.

What research concludes and what actually works in the real world under real conditions is often not the same thing and that is understandable and already a given in several distinct

fields of study. It is just not realistic to expect that a controlled experience ideally designed inside a box to provide the same outcome as it would in the real world with all of its unforeseen events and, particularly, when we add human nature to the equation. More so, when we are considering a field of study that changes by the minute if not by the second.

Research should be done, but with the understanding that this area is ever changing and sometimes many years of knowledge and study will have to be put aside because, although they made a lot of sense at the time they were developed, it just will not be applicable at the present time. So maybe yes, many of the existing assumptions do not make sense at this point in time and the people actually putting it all into practice are less concerned about the formality and more concerned, as should be, with the "now" and are allowed to have personal preferences over different methods which they might find easier or more intuitive for themselves. Human nature comes into play again. It is not just about the paradigm but also about the most natural approach to the people putting it into use.

As much as certain conventions might hold, many will undeniably have to change.

As for the third question, perhaps formal modelling doesn't prove to be the best solution as far as communication methods go considering that not all people have the same knowledge of the techniques and will probably come from different areas. I personally believe natural language, as ambiguous as it might be, will remain a constant throughout the years as it is something we are absolutely certain all the stakeholders involved will always know and share. Another evidence of this is how the formal models remain on the side of the developers instead of being used as a communication tool with the end user… It is understood that the end user might not have the knowledge to understand it. Honestly, I do not see this is as a problem.

In my opinion, the paper addresses all of these matters beautifully in a way that most people can understand it and it strikes a chord with the reader in a way that, even if they don't know the topic they are reading about, they can realise how truly interdimensional it is. For me, as a reader, it is like suddenly requirements are everywhere.

In the future, I believe this will give me a new perspective on the already existing research. It allowed for a new found respect for the work of people in an area that is so incredibly volatile. Also I have always found myself a fan of practicality and systemization but am now paying more heed to natural language as I now see it as a means of universal communication.

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