The Integrator

INCOSE North Star Chapter

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North Star Newsletter

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Systems Engineering at its Best!

Properties of a High Quality Informal Requirements Document - Richard E. Schneider, Dr. Dennis M. Buede (2000)

INTRODUCTION. Requirements engineering is one of the earliest phases in the life cycle of a system. During this phase requirements are elicited, documented. One objective of this phase is to develop and document a set of high quality system level requirements representing the needs of the Stakeholders. Every document has properties and an Informal Requirements Document (IRD) must have specific properties to serve this purpose. Analysis can improve the quality of this document through inspections by reviewing it for certain properties representative of high quality and fixing any defects found. The focus of the paper is on the process for identifying those properties which represent high quality in a system level IRD. These goodness properties are called High Quality Properties (HQPs). An IRD is a set of requirements, usually written in English, using some Stakeholder terminology. In contrast, a formal requirements document is written in a formal specification language. Following the notation of (Buede, 2000), the IRD is the same as the ORD (Operating Requirements Document or Originating Requirements Document).

The Problem. Systems are still being built that do not meet Stakeholders needs. Systems are built to IRDs but the IRDs are flawed. Significant unresolved errors exist in final IRDs. This means that despite analysis focused on making sure an IRD has high quality, errors still get through.

We think one reason more IRD errors are not found during inspection using goodness criteria involves the

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Chapter President's Corner

Mark Elpers, Medtronic
INCOSE North Star Chapter 2010 President

Welcome again to the North Star chapter of INCOSE! We are clearly into summer weather now and many are preparing for the International Symposia in Chicago in July. One item I am particularly interested in discussing with the leaders that will be present there is the feedback I have been receiving from some of our members that there seem to be two classes of systems development companies. The first class contains those companies who have institutionalized the methods and have a significant amount of infrastructure in place to enable the practice of systems engineering. The second class includes those companies who have only recently become responsible for developing systems of a level of complexity where they need this systems engineering infrastructure. The first class of companies is already over the "hump" and can enjoy the benefits we all speak of during our monthly meetings. The second class of companies is staring up at the hump, trying to figure out how to sell it to management and to employees, how to fund it, how staff it and how to create the processes, tools and other infrastructure necessary to start realizing these benefits. Most importantly, what do they do first? How do they evolve to this utopian state of being on the other side of the hump?

I will be asking these questions at the IS and hope to bring back some answers to my company and to the chapter. If your company is also in the second class, I encourage you to do the same if you are attending the IS. If your company is in the first class, please work to help our chapter convey to those in the second class how they can help their companies evolve to the first class.

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goodness criteria itself. IRD inspections using goodness criteria are very labor intensive because they are done manually, driven by the informal nature of an IRD. But they are seldom done the same way twice. One reason reviews differ so much is there is no standard list of properties for a high quality IRD. If a list is missing some key properties (insufficient), some errors in the IRD will not be found. If some properties on the list do not contribute to the quality of the IRD (unnecessary) then valuable review time is wasted. Wasted review time means checking time runs out with some key properties not checked. For these reasons it is important to have just the right properties.

Although lists of properties abound in the literature, little information is provided on which list to use or how such lists were developed. Clearly the focus is on uncovering more of the significant errors in IRDs. Our approach is to develop a better set of goodness properties (called HQPs) which focus more on uncovering these significant errors.

Refinement. Through the process of refinement, and based on issues which surfaced during the application of the selection criteria, the final set of HQPs emerged, as defined in the table below.

High Quality Properties	**Definitions**
Annotated/nec	All requirements annotated for relative necessity (must have, desirable, optional)
Complete	For each requirement, all requirement parts are necessary & sufficient (exactly the right parts are there, no missing or extra)
Consistent/req	No 2 requirements are in conflict with each other
Consistent/part	For each requirement, there is no conflict between any of its parts
Consistent/need	No requirement is in conflict with a Stakeholders needs statement
Correct	For each requirement, all requirement parts have just the right information (accurate to the appropriate level)
Design independent	Requirements do not unnecessarily constrain the design
Feasible	At least one system could be built to meet the requirements
Organized/form	Requirements are organized according to a document standard
Organized/stor	Requirements are electronically stored to allow basic modification
Testable	For each requirement, a procedure can be found to verify that the system meets the requirement
Traceable/need	For each basic requirements, there is a link to its Stakeholder needs statement
Traceable/req	Each requirement has a link to its parent in the IRD
Unambiguous	Each requirement has exactly one interpretation to all reviewers
Understand	Each requirement can be comprehended by its reviewers

This brutal process of qualifying the original list of 108 Candidate Properties (CP), especially discarding, did not result in the loss of information. The list of names was reduced but insights from their information base were merged into surviving CPs. But then the surviving CPs (HQPs now) needed to be refined. Several of the HQPs were made up of smaller quality attributes. When this occurred, each such HQP was split into smaller HQPs and checked against the selection criteria again. Any part that passed became a separate HQP. We claim that the final set of HQPs cover all the meaningful errors, based on the assumption that the original set of 108 CPs could be used to uncover all the meaningful errors.

WELCOME, NORTH STAR NEW MEMBERS!

Name	**Company**	**Title**
John Bangs	BAE Sys	
Ruth Bielski	Boston Sci.	Sr SE
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Kristen Cattin	Medtronic	Prin. SE
Katie Clark	Eaton Corp.	Engineer
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Leanne Engelbrekt	Medronic	
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Kunal Paralikar	Medtronic	Sr SE
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Michael Renninger	GDAIS	Sys & SW
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Dennis Skelton	Medtronic	SE
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