Modeling and Measuring Technical Debt

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Abstract:
Technical Debt refers to a phenomenon that often occurs in software maintenance, in which decisions are made that result in short-term gain (e.g. increased productivity, shorter cycle time) at the expense of a more uncertain long-term cost (e.g. increased complexity, more fragile code, more defects, deferred work). In particular, Technical Debt most commonly refers to the cumulative effect of such decisions over time. Such decisions represent a type of “debt” that the development team “owes” the system under maintenance, in the form of more time that should have been spent. This “debt” will eventually incur “interest” in the form of more expensive maintenance tasks in the future. However, unlike the analogous financial debt, the timing, amount, and form of the interest is uncertain, which makes the management of technical debt especially challenging.

The Technical Debt metaphor is in many ways a restatement of a general software engineering problem that has existed as long as software has. Research into Technical Debt has increased quickly over the last several years, resulting in an energetic community (including several ISERN members) which is working to make this concept more tractable to research and provide actionable decision support to developers.

Technical Debt research draws heavily from established lines of research in program analysis, software metrics, project management, software maintenance and evolution, and risk management. This broad reach yields many exciting synergies with existing work, although it can also make the topic so diffuse that the new research contribution can be hard to articulate and scope.

We propose this session as a working meeting with the members of the ISERN community who are working in, or interested in, Technical Debt research. We will bring specific existing studies to bear to create a composite model of Technical Debt which articulates Debt as a measureable concept, and create an objective and repeatable framework that incorporates measureable attributes that can be used to tie together such research.

Session Goals:
Our goal is to get community agreement on a concrete framework for Technical Debt which includes:

- Objective indicators of Debt. What measureable independent variables have been shown, or are hypothesized to be, actionable indicators of Technical Debt in software development or acquisition?
- Outcome variables. What are the dependent (and measureable) variables which Technical Debt has either been demonstrated to affect, or is hypothesized to affect?
- Context and other dimensions that are expected to affect the result.

Development of the Session:
The session will be organized with minimal presentations, and maximum time for discussion. Our planned agenda consists of:

- Very brief opening presentation: The Technical Debt metaphor, examples of empirical studies on Debt, summary of the 2014 ISERN session
- Participant introduction: What Debt-related studies are we running / planning?
- Scenario brainstorming: 3-4 scenarios drawn from participant experiences of how software developers or acquirers are using Technical Debt in their decision-making.
- Populating the model:
- Specific measures that indicate accumulating Technical Debt (independent variables)
- Specific measures of outcomes (dependent variables)
• Context factors that can influence the relationship between independent and dependent variables
• For all of the above, we will carefully delineate which relationships have been shown to hold versus which are only hypothesized (which may inspire research agendas going forward)

**Background and Recommended Reading:**
A general introduction to Technical Debt research and some insights as to the state of the practice are found in this blog post: [http://blog.sei.cmu.edu/post.cfm/field-study-technical-debt-208?WT.ac=Blog27Jul2015](http://blog.sei.cmu.edu/post.cfm/field-study-technical-debt-208?WT.ac=Blog27Jul2015)

Another short introduction with examples from several different contexts is:

Also see:

**Expected Outcomes:**
The outcome will be written up and submitted for publication.
We also expect that the session will lead to additional collaborations among ISERN members.