Automated requirements analysis
For early sizing and quality on agile development

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80 years and over 1000 projects

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Goal
Working software that meets the business need
To time and Cost

Start with
Requirements written in English (natural language)

Need
Reliable estimates

Avoid
Surprises / scope creep
Delays
Technical debt
Requirements are about communication

**Requirements - Precision Matters**

Requirements are like Blueprints

...that tell you how deep to dig your foundations, the type of windows to order and how much cabling is needed.

English words translated to Code
1 word or requirements : 25 SLOC*

=> Defects are amplified

*ScopeMaster analysis of 25000 user stories across 70 projects
Get the requirements as good as you can as early as you can

Cognitively intensive
Changing midstream is disruptive

Evolve
Commonly
\[ \pm 2\% \]
Per month

Typical
Committed
Completed

Goal is to reduce these
De-scoped
Added
Modified
Unchanged
**Example User Story**

**Requirements in Agile**

“User Stories” are the catalyst of the conversation.

**Add Delivery Details**

- **As a** Site visitor
- **I want** Add my delivery address
- **So that** I can receive my goods

**Acceptance/Test Criteria**

I can click pencil to enter my zip code and full home address

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**I set out to automate the functional sizing of user stories**
Discovering functional intent

Automated Functional Sizing

Delete Profile
As a ... Administrator
I want ... Delete a profile......
So that ... I can receive my goods

Deleting a profile
As an administrator I want to delete a profile. Then the system should send a confirmation email to the team.

Who & what → Functions → Data movements
User Story = Requirements?

Outsource development makes it harder to create the ideal conditions ideal for agile software development.

In the absence of anything else, yes the user story is the primary articulation of requirements.
Challenges - Multiple meanings of the same word

Book the book from the book library
Challenges - common potential ambiguities

... I’d like to **assess** ...  
...I’d like to **see**...  
...I’d like to **decide**...
Distinguish between:

Objects vs properties of objects
People as users vs people as objects
Singular vs plurals
“... the **tilt sensor** sends the **realtime angularity** reading to the **inclinator**...”
1. Reads the user story, analyses with NLP+
2. Detects the functional intent(s)
3. Detects likely users and objects
4. Ontology agnostic
5. Compares the story with all the other stories
6. Finds problems and suggests fixes (>50%)
7. Proposes functional test cases
8. Produces clear documentation
9. Takes only 2-4 seconds per story
Case Study

160 defects found and fixed in 16 hours
Intelligent Analysis of User Stories

“As Registered user I want to search for products”

Benefits:

- Fewer ambiguities
- Fewer omissions, duplicates
- Fewer inconsistencies
- Better documentation
- Reduced scope churn & creep
- Less rework & fewer bad fixes
- Less effort to get good quality

Sizing

- Reliable, valid estimates
- ±20% accuracy
- 100% consistent
- Estimate faster
- More Reliable planning
- Metrics to manage S,V,Q

Quality

- Fewer ambiguities
- Fewer omissions, duplicates
- Fewer inconsistencies
- Better documentation
- Reduced scope churn & creep
- Less rework & fewer bad fixes
- Less effort to get good quality

CSV

ScopeMaster

No setup

refine

CSV
COSMIC Functional Sizing - the successor to IFPUG

Different from IFPUG
Evolved from inc improvements
Principles not rules
Suitable for all S/W
Works on incomplete / Agile
Open source

https://cosmic-sizing.org

\[ \sum E, X, R, W = CFP \]

2016 NIST - canonical reference reference for a FP
Sizing software

Functional Size Metrics on Software Projects

- Agile Story Points
- SLOC
- RICEFW
- IFPUG FP

**Very Flawed**
- Not Valid
- Inconsistent
- Easy to game

**Flawed**
- Not Valid
- Inconsistent
- Easy to game

**Good**
- ISO Standard
- Consistent
- User stories insufficient
- Not ideal for embedded

**Best**
- ISO Standard
- Incomplete OK
- Principle-based
- Automated
- US. GAO Recommended
Case study to compare SP vs CFP

Story points vs actual effort
\( R^2 = 0.33 \)

CFP vs actual effort
\( R^2 = 0.97 \)

Conclusion:
CFP is a better predictor of effort than story points.

Typical Source of Defects on Software Projects

1,000 FP Application
Source: Capers Jones
Applied Software Measurement, third edition
Using ScopeMaster, you can fix many requirements problems in minutes, sometimes seconds.
Valid Metrics based on CFP

1. **Scope**  
   CFP estimated, delivered, removed

2. **Velocity**  
   Rate of delivery of CFP

3. **Cost**  
   to develop and test CFP

4. **Quality**  
   Defects delivered per CFP
Agile development contracts...

Promise

Reality

With CFP-based contracts
Benefits of just knowing the software / project size up front

### Value of knowing the size

Given a typical Cost of $2,000 per CFP

<table>
<thead>
<tr>
<th>Description</th>
<th>Indicative Benefits</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vendor negotiation, reasonable price, quality &amp; schedule</td>
<td>$200</td>
<td>10%</td>
</tr>
<tr>
<td>Efficient project management (scope, effort, cost, quality)</td>
<td>$100</td>
<td>5%</td>
</tr>
<tr>
<td>Avoid de-scoping and reduce rework by using size to manage &amp; ensure quality of each activity early.</td>
<td>$300</td>
<td>15%</td>
</tr>
</tbody>
</table>

**Total** $600 Per CFP 30%
## Functional Sizing Automation is Available

### Tools:

<table>
<thead>
<tr>
<th>Based on</th>
<th>Tool</th>
<th>Additional Benefits</th>
<th>Links</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-requirements</td>
<td>Namcook Analytics LLC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High level written</td>
<td>ScopeMaster Ltd</td>
<td>1. Requirements QA</td>
<td></td>
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<tr>
<td>requirements</td>
<td></td>
<td>2. Functional test generation</td>
<td></td>
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<tr>
<td>Code</td>
<td>Castsoftware</td>
<td>1. Structural software analysis</td>
<td></td>
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</tbody>
</table>
1. Knowing the functional size is valuable
2. Early functional sizing analysis leads to better quality
3. Functional sizing automation is here
4. COSMIC FSM is ideal for Agile projects & contracts