Predicting Release Time based on Software Reliability Model

Hironori Washizaki, Kiyoshi Honda, Yoshiaki Fukazawa
Waseda University
Twitter: @Hiro_Washi
washizaki@waseda.jp
http://www.washi.cs.waseda.ac.jp/
When to release?

• Predicting completion based on cumulative flow diagram [Power, Agile’14]

• It could have a broad range of completion time.
• Ready to release in terms of reliability?

[Diagram showing cumulative flow with Backlog, WIP, and Done stages]

Software reliability model (SRM)

#Issues

- Actual
- Predicted

K. Honda, et al., Predicting Time Range Based on Generalized Software Reliability Model, APSEC'14
Our challenges in SRM

1. Predicting past or future?
2. Prediction with respect to each release, iteration, or testing level?
3. Uncertainty?
Our challenges in SRM

1. Predicting past or future?

2. Prediction with respect to each release, iteration, or testing level?

3. Uncertainty?
Predicting, what?

Past?

Future!

Mbz1, The fossils from Cretaceous age found in Lebanon.jpg CC BY-SA 3.0
https://en.wikipedia.org/wiki/Fossil#/media/File:The_fossils_from_Cretaceous_age_found_in_Lebanon.jpg
Industrial case

#Issues

- Actual
- Predicted

K. Honda, et al., Predicting Time Range Based on Generalized Software Reliability Model, APSEC'14
SRM for runtime future prediction

#Issues

#Total issues predicted at each time point

![Graph showing issues and total issues predicted over time](image-url)
SRM for runtime future prediction

#Issues

#Total issues predicted at each time point
SRM as actionable metric!

#Issues

Something happened!

#Total issues predicted at each time point

Predication became stable.

SRM as actionable metric!
Our challenges in SRM

1. Predicting past or future?
2. Prediction with respect to each release, iteration, or testing level?
3. Uncertainty?
Prediction with respect to release: a OSS case

predicted release date: 498

“Foundation”
http://foundation.zurb.com/
Our challenges in SRM

1. Predicting past or future?
2. Prediction with respect to each release, iteration, or testing level?
3. Uncertainty?
Uncertainty
Prediction with uncertainty

![Graph showing prediction with uncertainty. The graph compares actual data with our model's predictions over time. The y-axis represents the number of issues, while the x-axis represents time. The graph includes two lines: one for actual data and one for our model's predictions.](image-url)
Prediction with uncertainty

![Graph showing prediction with uncertainty with timelines T1 and T2, and actual data compared to our model. The graph includes lines for the best-case and worst-case scenarios.]
Uncertainty patterns and prediction

Increase

Constant

Decrease

Prediction with Width 1

Prediction with Width 2

Prediction with Width 3
Conclusion and future work

• Our contributions: using SRM
  – Predicting future
  – Prediction with respect to release and testing level
  – Uncertainty patterns
  – Tool available as Jenkins plug-in (https://jenkins-ci.org/)

• Future work
  – How to specify appropriate uncertainty pattern?
  – Prediction with respect to release, testing level or iteration?
  – How work well for Agile developments?
  – Combination of feature completion (Cumulative Flow Diagram) and issues (Software Reliability Model)?
Thank you very much! Questions?

- washizaki@waseda.jp
- @Hiro_Washi