UNIVERSITY OF CALGARY

When-to-release Decisions in Iterative Development

A Prototype Tool

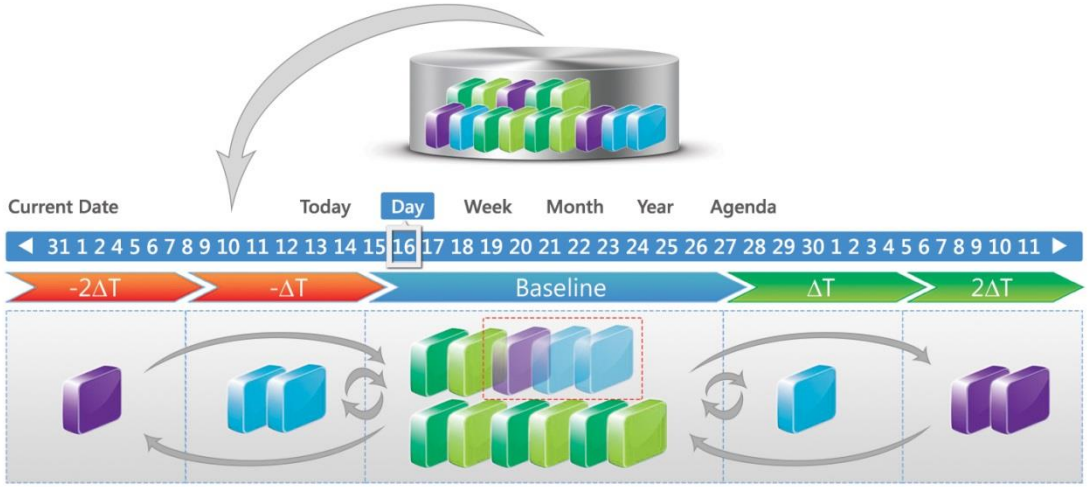
Jason Ho, Shawn Shahnewaz, and Guenther Ruhe
University of Calgary

UNIVERSITY OF CALGARY

Outline

- Definitions
  - When-to-release Problem (W2RP)
  - Total Release Value
  - Total Release Quality
- Approach
  - Process Workflow
  - Prototype Implementation
  - Demonstration
- Evaluation - Case Study
- Outlooks
- References
- Q & A

When-to-release (W2RP)



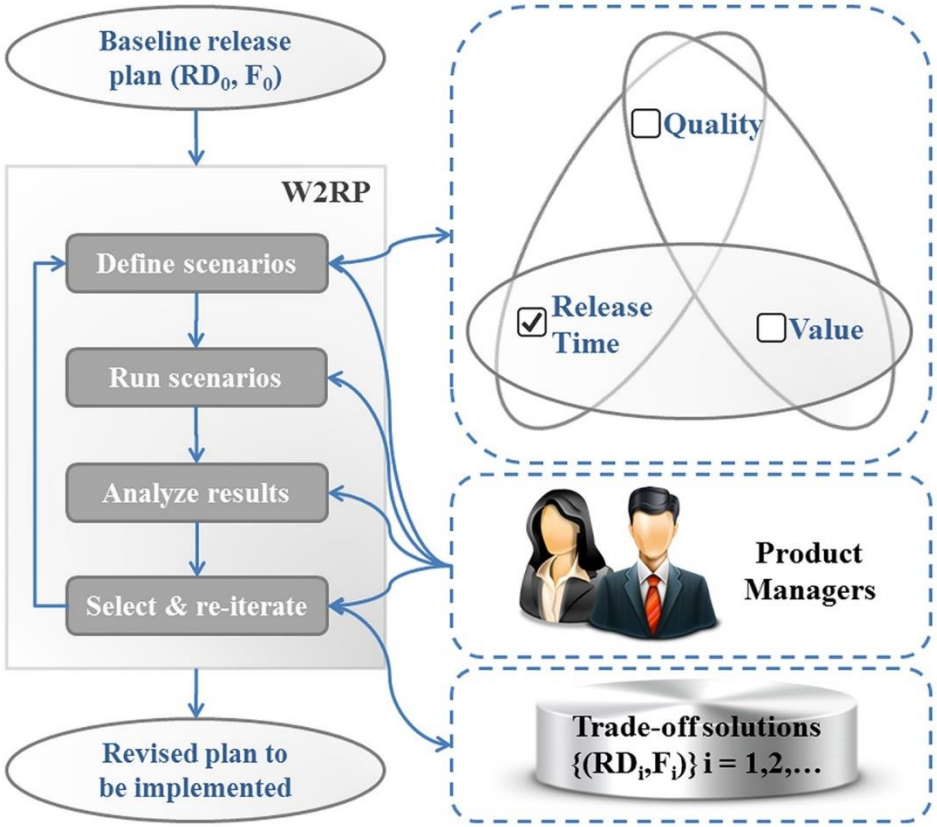
- RQ1: Given a *specific release date*, by varying around a duration, how can we identify an optimized release date?
- RQ2: What is the trade-off between *the value* (stakeholders' satisfaction) and *the assured quality* (reliability) of the release plan?

UNIVERSITY OF CALGARY

Modeling

- Time:
  - RD: *Targeted time* to be released by stakeholders (calendar dates)
  - RD ± ΔT: The duration in which the release date can be varied to find the *optimized release time*
- Values:
  - Measured by Customers' *weighted satisfaction* score
  - As each feature consumes resources, values is affected by capacity of the resources assigned to that feature set.
- Quality:
  - Approximate expected quality of a release through the result of the effort invested in testing. This relates to number of defects found and fixed [14]
  - By varying the test effort, we can estimate the minimum and maximum release quality by aggregating the quality values of features

Approach

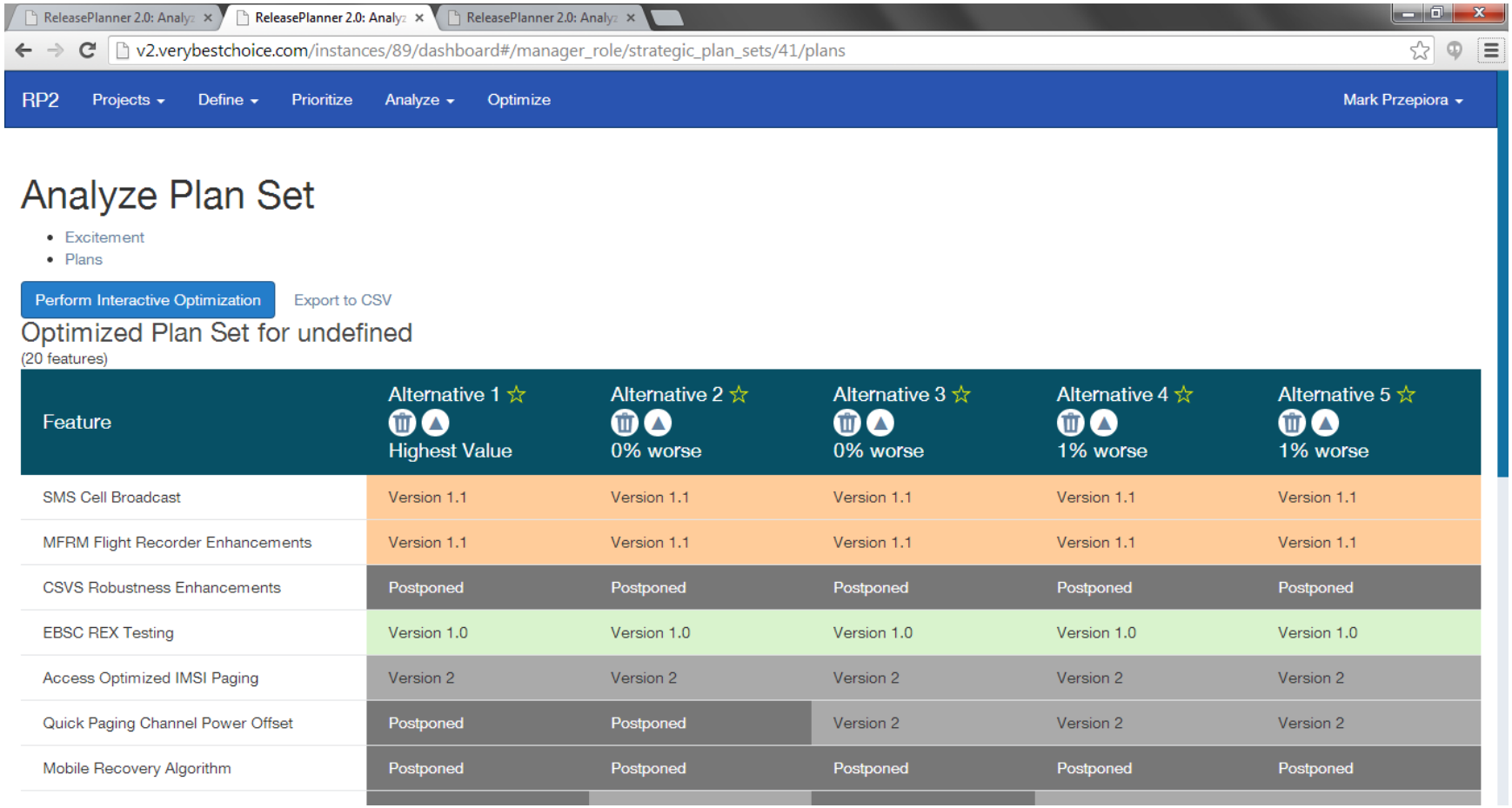


Use case 1: Fixed feature sets (fix TRV), interactively changing the release date, view predicted release quality (vary TRQ)

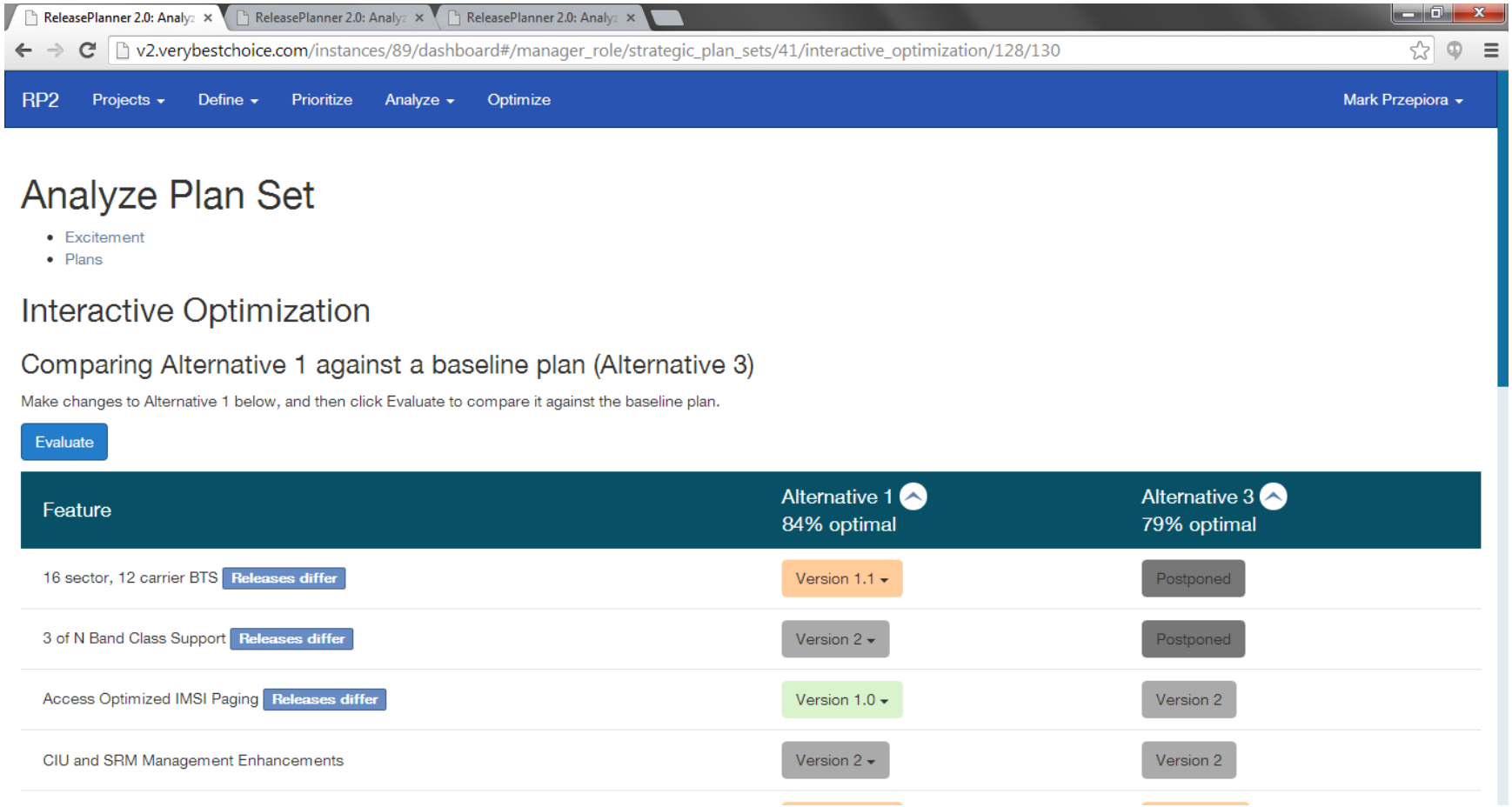
Use case 2: Interactively vary feature sets (vary TRV), view the predicted release date, at the same TRQ

Use case 3: Fix release date, playing what-if scenarios between testing and development efforts

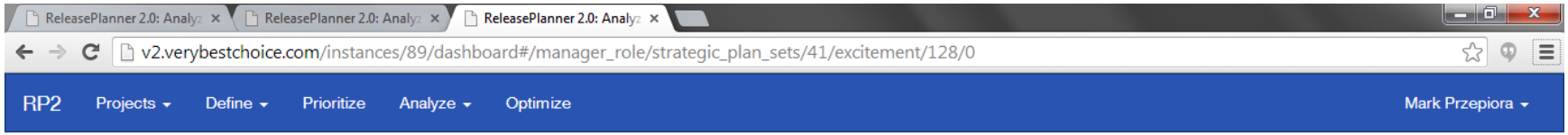
Tool Demonstration (1/4)



Tool Demonstration (2/4)



Tool Demonstration (3/4)



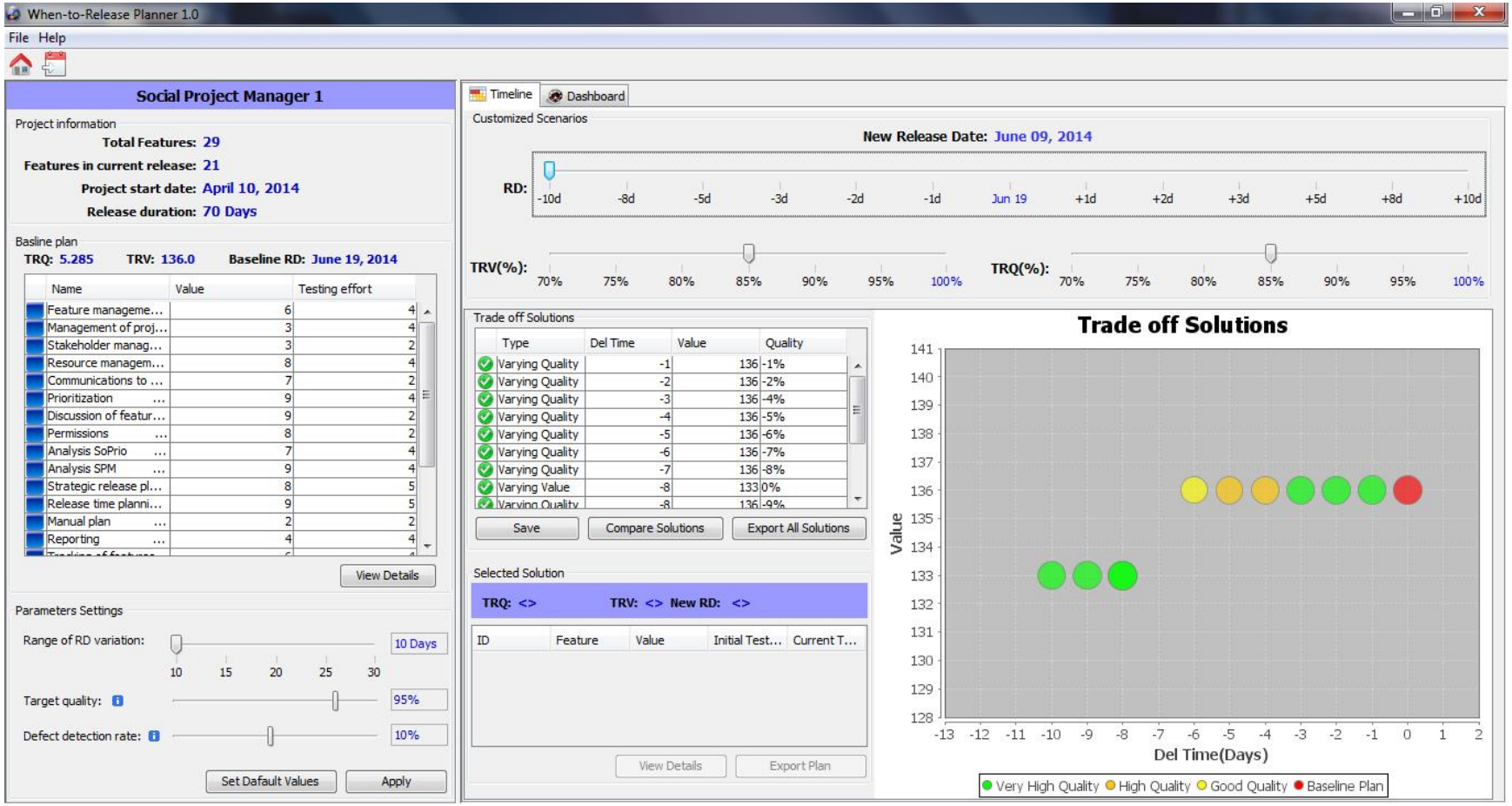
Analyze Plan Set

- Excitement
- Plans

Excitement profile for Alternative 1 and the opinions of each stakeholder about Total

Excitement Score	Total	Lonnie Cremer	Kornelia Streb	Marylou Viruet	guenther ruhe	Jeanie Linke	Sofia Mazzotta	Christian Gerling	Mark Przepiora	Tia Dauber	Sofia Bencomo	maleknaz	PORKODI THIAGARAJAN
Very Excited	1%	0	0	0	0	1	2	0	0	0	0	1	0
Excited	3%	1	1	0	0	2	2	1	0	1	1	2	0
Neutral	49%	14	17	10	9	10	18	15	16	17	15	16	1
Disappointed	19%	5	4	5	3	5	6	8	7	4	7	8	0
Very Disappointed	16%	4	6	3	1	7	4	2	7	6	3	9	0
Surprised	7%	4	2	0	0	1	1	2	5	1	3	4	0
Very Surprised	4%	3	0	1	0	2	0	0	4	1	2	0	0

Tool Demonstration (4/4)



UNIVERSITY OF CALGARY

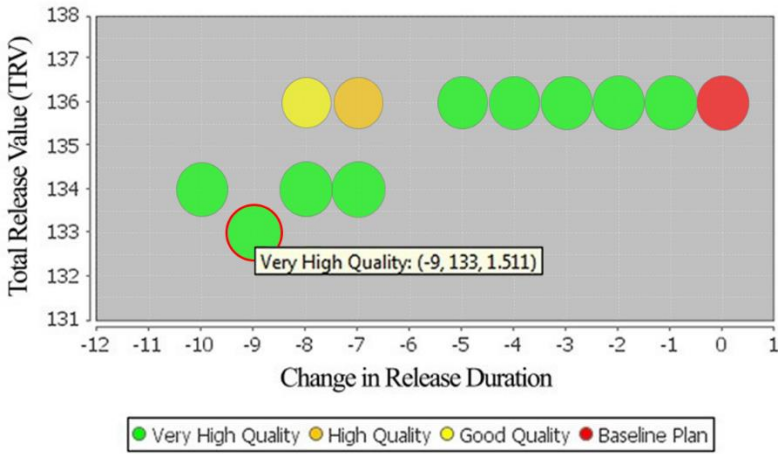
Evaluation - Case Study

- We evaluate the approach using a Case study from a real life technical product project
- Objectives:
  - Evaluate Optimization approach
  - Collect data on potential Trade-off solutions
- Case set up:

Project Title	Bronco Project
Description	Honeywell's Bronco Project
Maximum Number of Planning Items (Features)	66
Original Release Date RD_0	80
Features in next release F_0	22
Number of Resources	7
Maximum Number of Stakeholders	40

Case-study – Trade-off Solutions

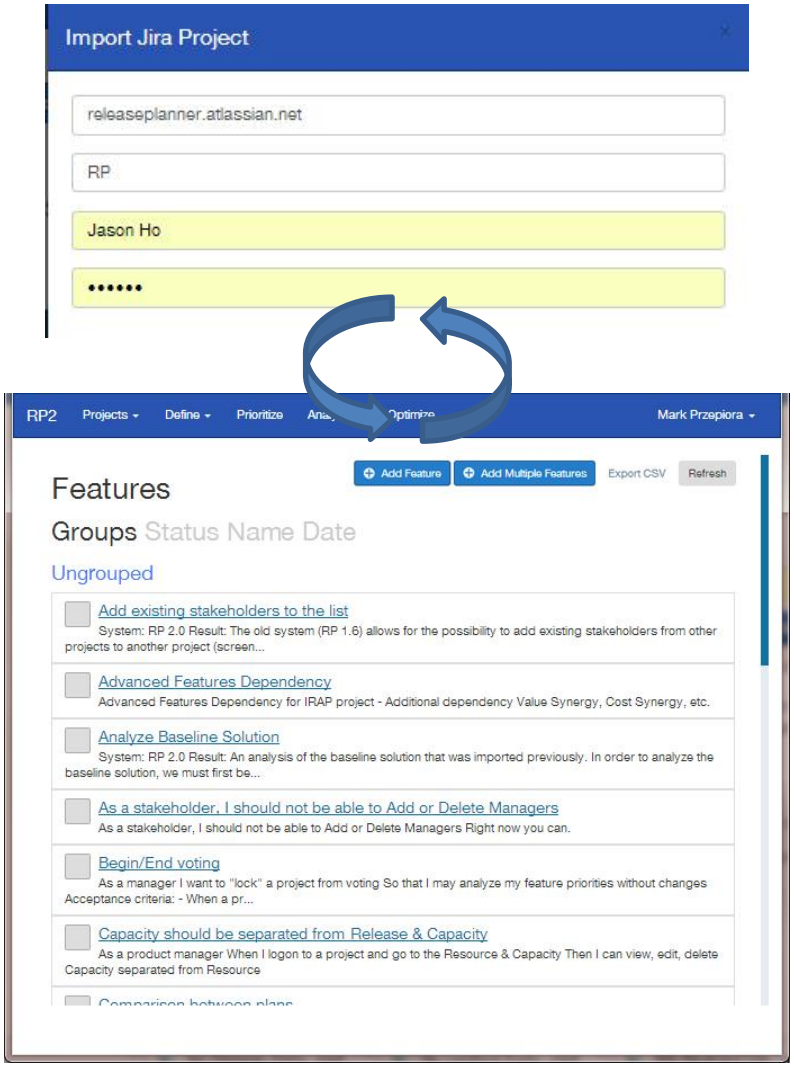
- Potential trade-off solutions
  - Maximize Total Release Values TRV(F_i)
  - Maximize Total Release Quality TRQ(F_i)
  - Minimize Time to release RD_i



Trade off Solutions (TRV = 136)					
ΔT	TRV	ΔTRV (%)	ΔTRQ (%)	Initial Test effort (person day)	Current test effort (person day)
-1	136	0%	-1%	107	105
-2	136	0%	-2%	107	104
-3	136	0%	-2%	107	103
-5	136	0%	-3%	107	101
-6	136	0%	-4%	107	100
-7	134	-1%	1%	107	101
-8	136	0%	-5%	107	98
-8	134	-1%	1%	107	100
-9	133	-2%	0%	107	102
-9	136	0%	-6%	107	97
2	136	0%	1%	107	109
4	136	0%	3%	107	111
5	136	0%	3%	107	112
6	136	0%	4%	107	113
8	136	0%	6%	107	115
7	144	6%	0%	107	112
9	136	0%	6%	107	116
9	144	6%	1%	107	114

Outlook

- "Not all defects are created equal"
  - Integration with issues tracking tools (JIRA, Teamtrack, Fogbugz)
- How about Technical Debt and Cross-cutting design concerns?
  - Design F_0 with these concerns as Features with high business value, yet high efforts estimate
- Continuous Release?
  - This design is especially effective for release cycle 2-4 weeks
  - Continuous sync to issues tracking and version control



Contact & Tool access

- Software Decision Support Labs (SEDS) - created in July 2001 at the University of Calgary
  - Research team of 10 researchers
  - Research topics: Decision support (systems)

- University start-up company: Expert Decisions Inc. (http://expertdecisions.com/)

- Jason Ho
  - Department of Computer Science
  - University of Calgary
  - +1 587 891 8822
  - hott@ucalgary.ca

UNIVERSITY OF CALGARY

References

1. B. Boehm, V. R. Basili, "Defect Reduction Top 10 List", in *Computer,* vol. 34, no. 1, 2001, pp. 135-137.
2. C. Ebert, S. Brinkkemper, "Software product management – An industry evaluation" in *The Journal of Systems and Software,* 2014 , http://dx.doi.org/10.1016/j.jss.2013.12.042
3. B.H. Far, "Software Reliability Models", in *Dependability & Reliability of Software Systems* (LN U of Calgary), 2012.
4. J. Ho, G. Ruhe, "Releasing Sooner or Later: An Optimization Approach and Its Case Study Evaluation", in *Proceedings Workshop RELENG on Release Engineering at ICSE*, 2013.
5. R. Lai, G. Mohit, P. K. Kapur, "A Study of When to Release a Software Product from the Perspective of Software Reliability Models" in *Journal of Software,* vol. 6, 2011, pp. 651-661.
6. J. McElroy, G. Ruhe, "When-to-release decisions for features with time-dependent value functions", in *Requirements Engineering Journal,* vol. 15, 2010, pp. 337-358.
7. C. Morris A., J. Eliasberg, T.H. Ho, "New product development: The performance and time-to-market tradeoff." in *Management Science* vol. 42.2, 1996, pp. 173-186.
8. H. Ohtera, S. Yamada, "Optimum Software-Release Time Considering an Error-Detection Phenomenon During Operation," in *IEEE Trans. Reliability*, vol. 39, 1990.
9. R. Peng, et al. "Testing effort dependent software reliability model for imperfect debugging process considering both detection and correction" in *Reliability Engineering & System Safety*, 2014.
10. G. Ruhe, "Product Release Planning: Methods, Tools and Applications", CRC Press, 2010.
11. K.E. Wiegers, "Software requirements," Microsoft Press, 2009.
12. A. Wood, "Software reliability growth models: assumptions vs. reality" in *Proceedings from the Eighth International Symposium on Software Reliability Engineering. IEEE.* 1997.
13. Z.S. Xu, Q.L. Da, "An overview of operators for aggregating information" in *International Journal of Intelligent Systems*, vol 18, 2003, pp. 953–969.
14. Michael Felderer, Amir Beer, "On the role of testing requirements for release planning: experiences from comparing two products", submitted to RE Industry Track, 2014.