Visualization of Feature Survival in Platform-Based Embedded System Development for Improved Understanding of Scope Dynamics

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Case Study Motivation

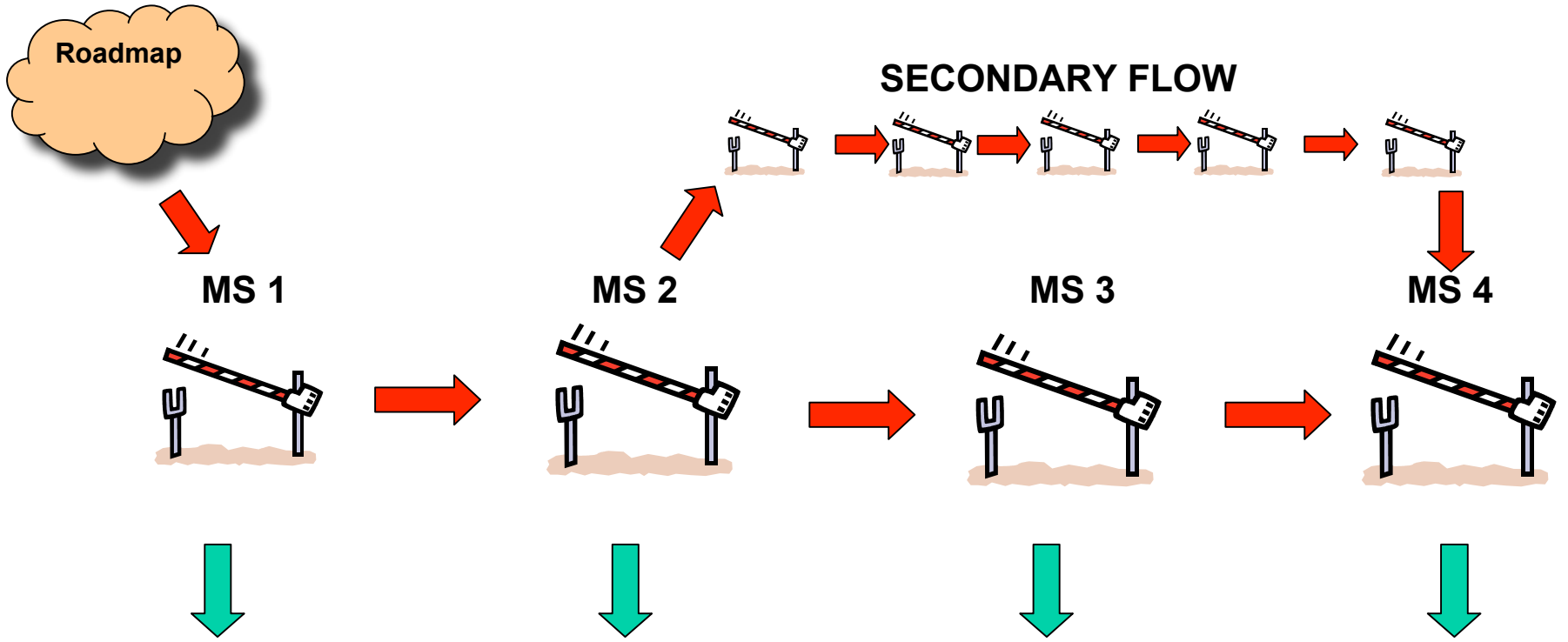
- **Our previous results revealed the problem of setting a good ballanced scope of the platform projects**
- **Why?**
  - decisions about new functionalities are made *a priori*
  - often changed by key customers or management
- **Solution - Visualization support for improved understanding of scoping decisions**

Case Study Introduction

- Empirical data from an industrial project at a large company (5000 employees) using a product line approach
- Develops embedded systems for a global market
- The company uses a stage-gate model for requirements projects
- *Feature* as a decision unit

Requirements Management Process

– **Requirements Teams *(RTs)* and Design Teams *(DTs)***



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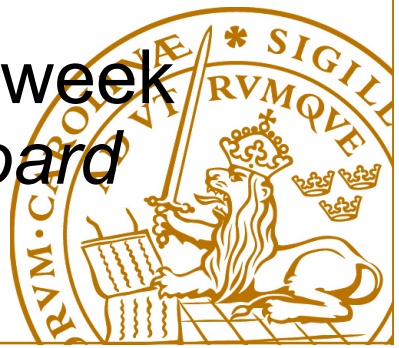
Scoping Process

- A feature as a basic entity for scoping process
- The market-value and effort estimates are obtained using a cost-value approach
- The scope is decided based on the ROI in relation to the available development resources within the DTs
- *Feature List (FL)* document contains the scope
- The FL is updated and baselined each week after decision in the *Change Control Board* (CCB)



Methodology

STEP 1: extraction the scoping information

- value of scope parameter was exported for each basene of Feature List document (result: 81 baselines between 300 and 600 features)

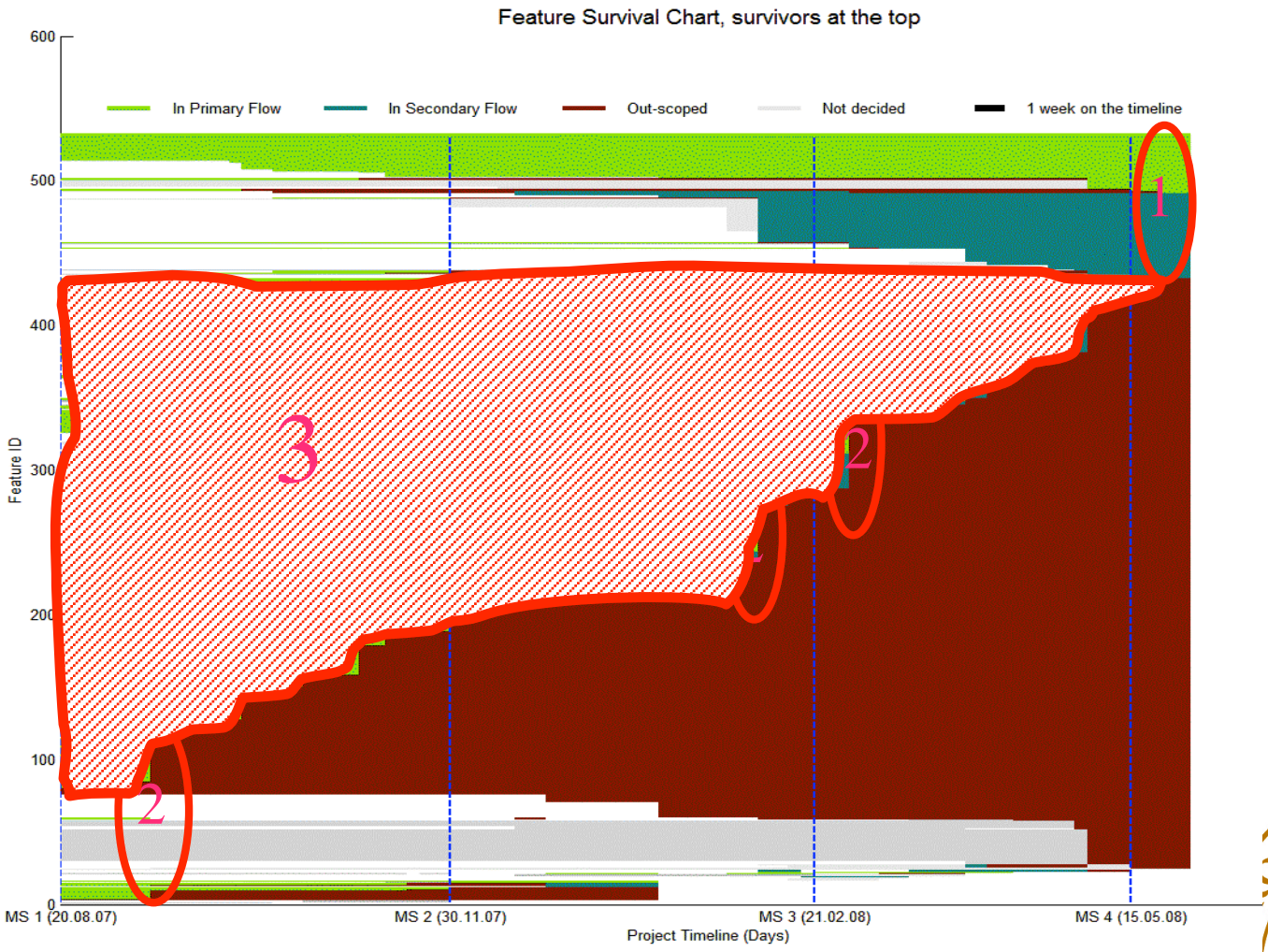
STEP 2: processing the data

- sampling policy as a result of validation of gathered data with requirements experts
- as a result 39 data points were considered as relevant

STEP 3: transformation of the data into a mathematical representation

- coding scheme: rows and columns
- value of the *Scope* attribute is mapped to integer value
- colloring scheme: green is in, red is out and gray is not yet decided

Feature Survival Chart



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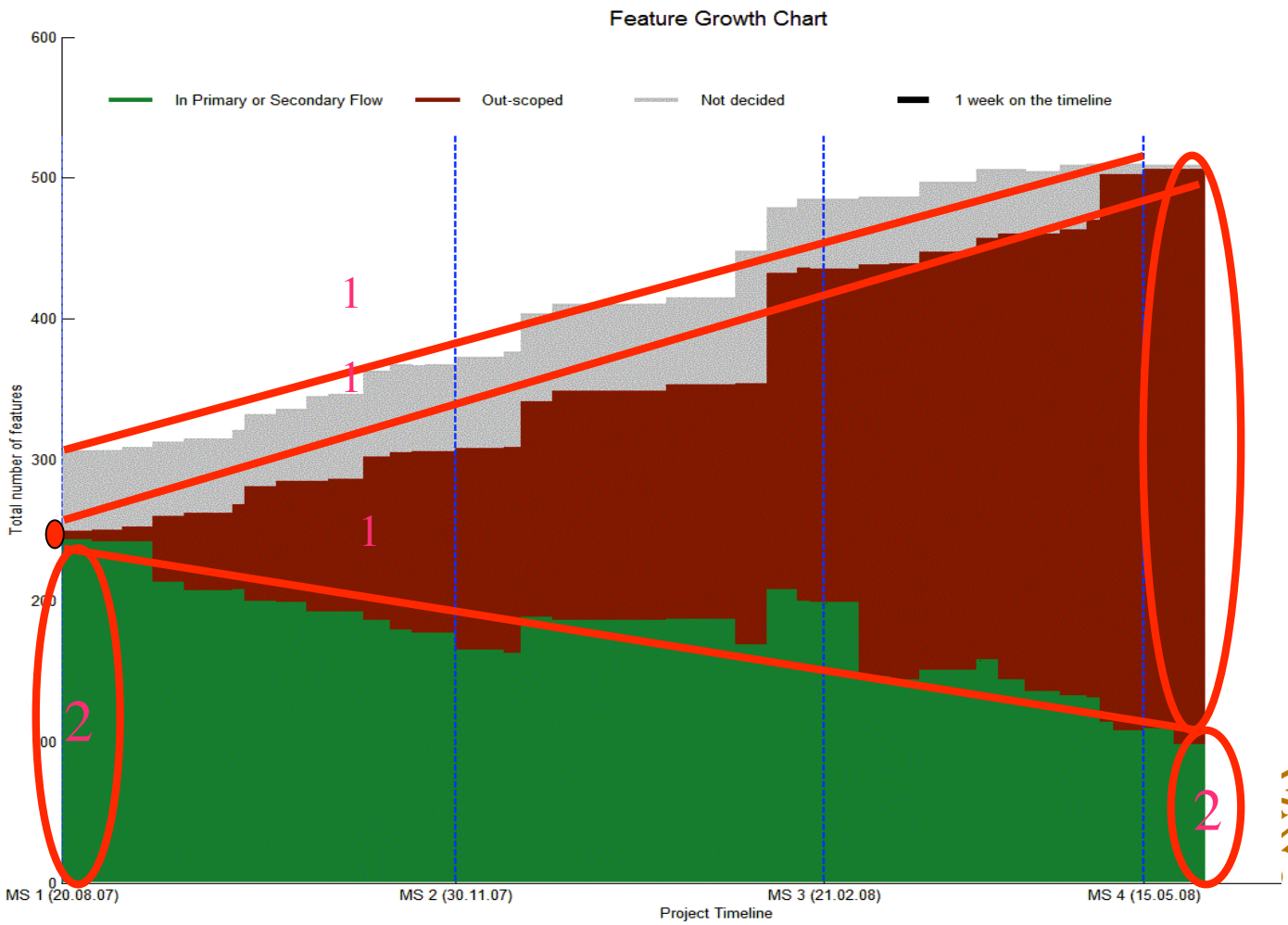
Feature Growth Chart



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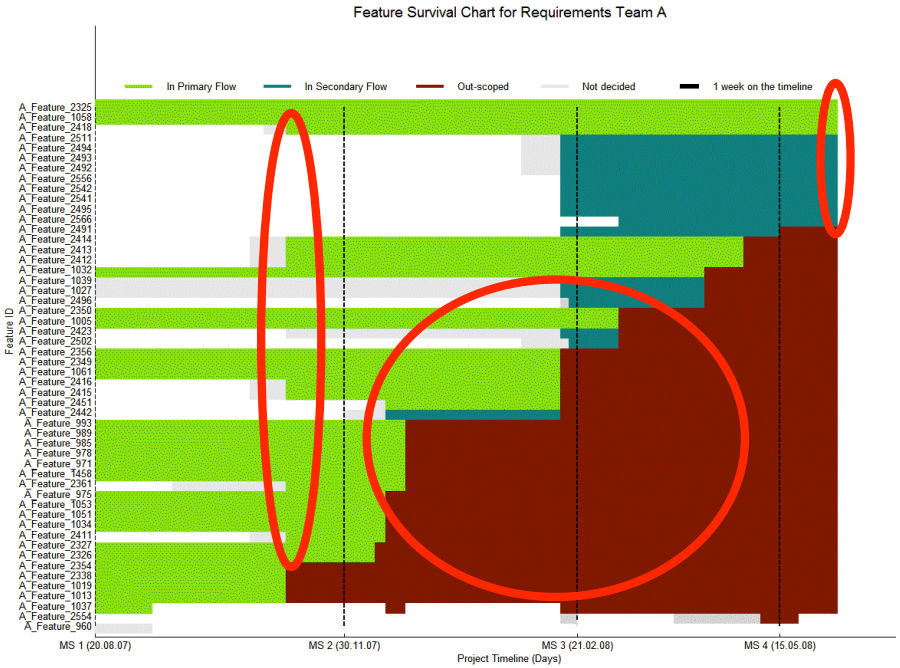
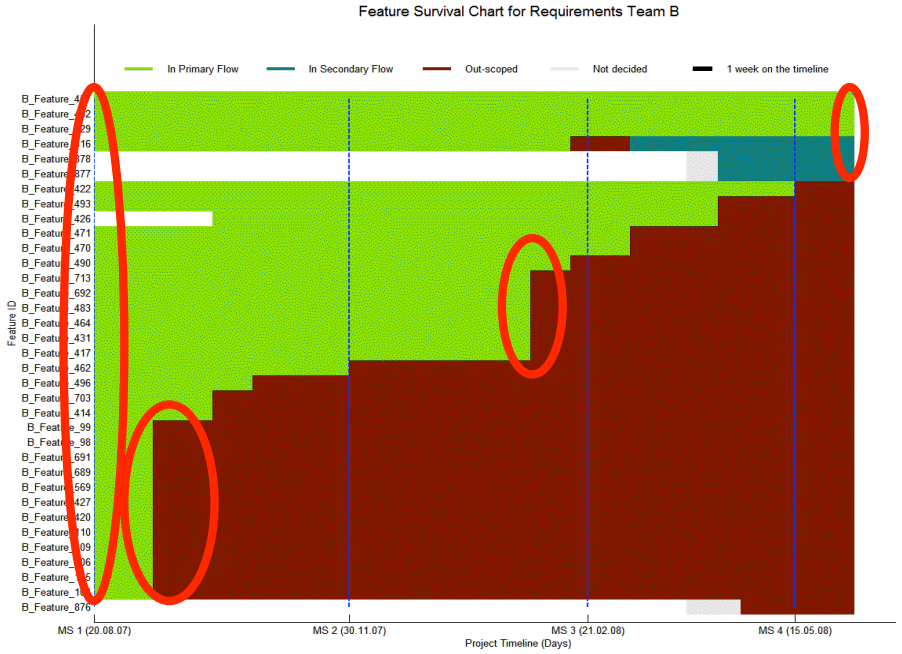
Graphs per RTs





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Validation

Three steps of validation

- **STEP 1:** Interviews with RTs to understand the challenges of setting a realistic scope early in the project (before generating the graphs).
- **STEP 2:** Performing visualization keeping in mind the issues and input received from the first step.
- **STEP 3:** Presenting the results to RTs and project management

Limitations

- A static two-dimensional figure
- Limited end-user's configurability
- Size of features in terms of number of sub-requirements, their criticality or implementation cost
- Tightly coupled with the specific requirements and the requirements engineering practices of this particular case

Conclusions

- Increases awareness of balancing between setting limited scope early and setting a too large scope
- Helps to identify what features and what time frames to analyze in order to find scoping problems
- May be useful in visualizing instability of the scope setting process
- Empirically evaluated in a large industrial environment
- Can be reused to visualize other attributes

Next steps

- Improve interaction with the user
- Improve configurability
- Y axis scaling – show underlying system requirements.
- Introduce additional attributes, such as criticality and implementation cost
- Introduce grouping the features based on feature dependencies for visualizing simultaneous scoping or de-scoping of related features.
- Add statistical measures such as average time to de-scoping of a feature and the total effort spend on non-survivors.
- More empirical results from other companies.

Questions?