PACE UNIVERSITY
Seidenberg School of Computer Science and Information Systems

CS631G Software Verification

USING RCT FOR AGILE PLANNING AND TESTING (W10)

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Outline

Using RCT for Agile Planning:

- RCT and Agile requirements
- Using an RCT to plan Agile iterations
- Using an RCT to develop acceptance tests

Class Objectives

- The objective of this class is to explain how the Requirements Composition Table (RCT) can complement the RoadMap on Agile projects to improve planning.
- The RoadMap lacks details of crosscuts that present a significant part of Sprint development.
- Hence, using the RCT can help us better estimate the Sprint Velocity and make Agile planning more accurate.

User Stories

- User stories are the agile substitute for the what traditionally has been referred to as software requirements.
- User stories were originally introduced in XP, and are now part of Scrum, XP, and most other agile implementations.
- In agile, user stories are the primary objects that carry the customer's requirements through the value stream – from needs analysis through code and implementation.
- User stories are brief statements of intent that describe something the system needs to do for some users. They are commonly captured in a standard "user-voice" form:

As a <user role>, I can <activity> so that <business value>

Can help prioritizing stories

Card, Conversation, and Confirmation

There are three elements of a user story:

Card

- Represents two or three sentences used to describe the intent of the story.
- The card serves as a memorable token, which summarizes the intent and represents a more detailed requirement, whose details remain to be determined. RCT can help us identify story constraints or exceptions and capture them on the back of the card.

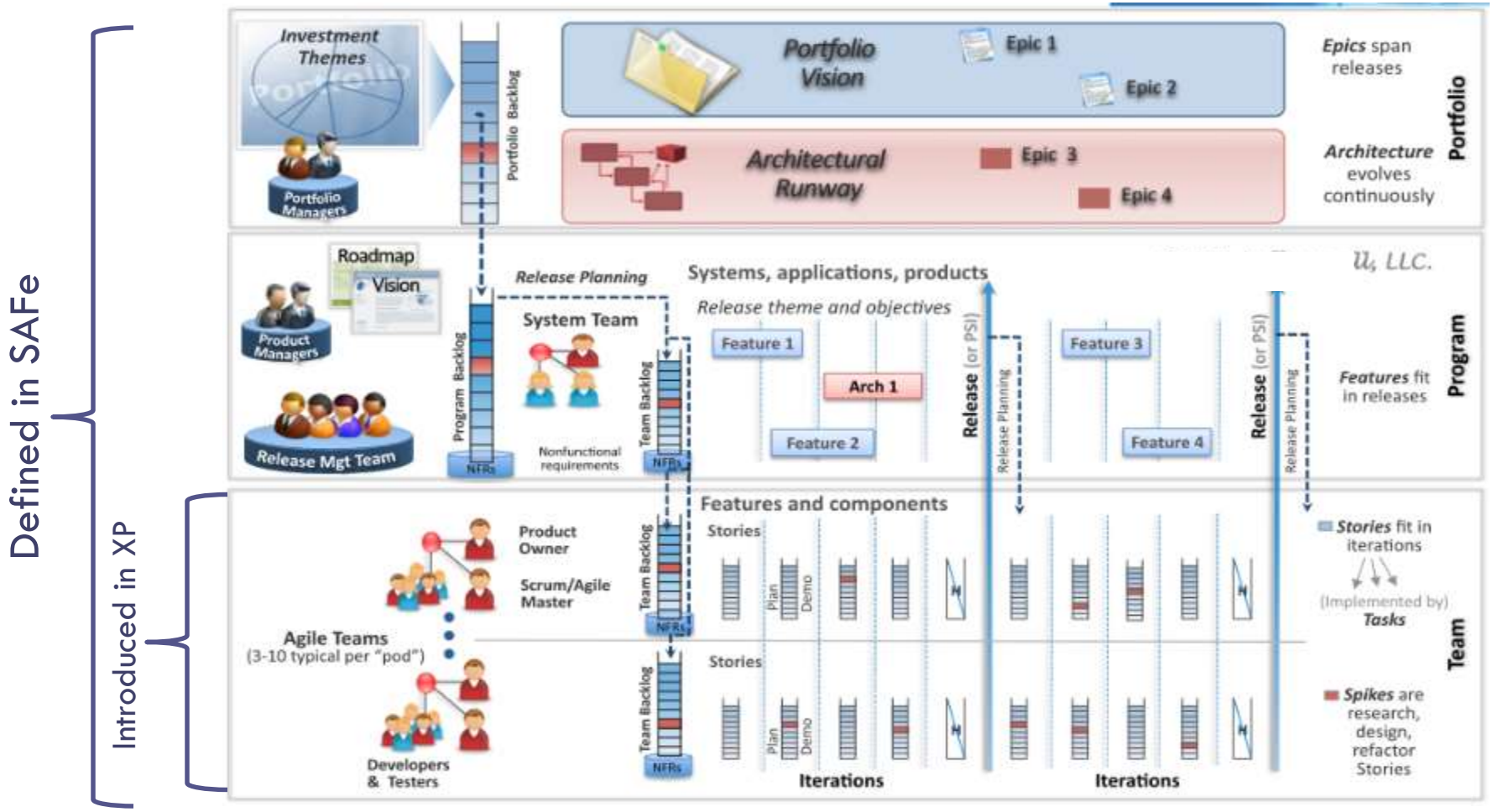
Conversation

Represents a discussion between the team, customer, product owner, and other stakeholders, which is necessary to determine the more details of the intent. Here, a list of crosscuts from the RCT can be used as a checklist for the conversation.

Confirmation

Represents the acceptance tests, which the Customer or Product Owner will execute to confirm that the story has been implemented to their satisfaction, whether the story fulfills the intent. Here, a list of crosscuts from the RCT can help us develop test ideas.

SAFe: The Big Picture of Agile Requirements



https://www.scaledagileframework.com/

Big-Picture Highlights

The Team Level

- At the Team level, agile teams of from 7 to 9 members define, build and test user stories in a series of iterations and releases.
- The responsibility for managing the backlog of user stories and other things the team needs to do belongs to the team's *Product Owner*.

The Program Level

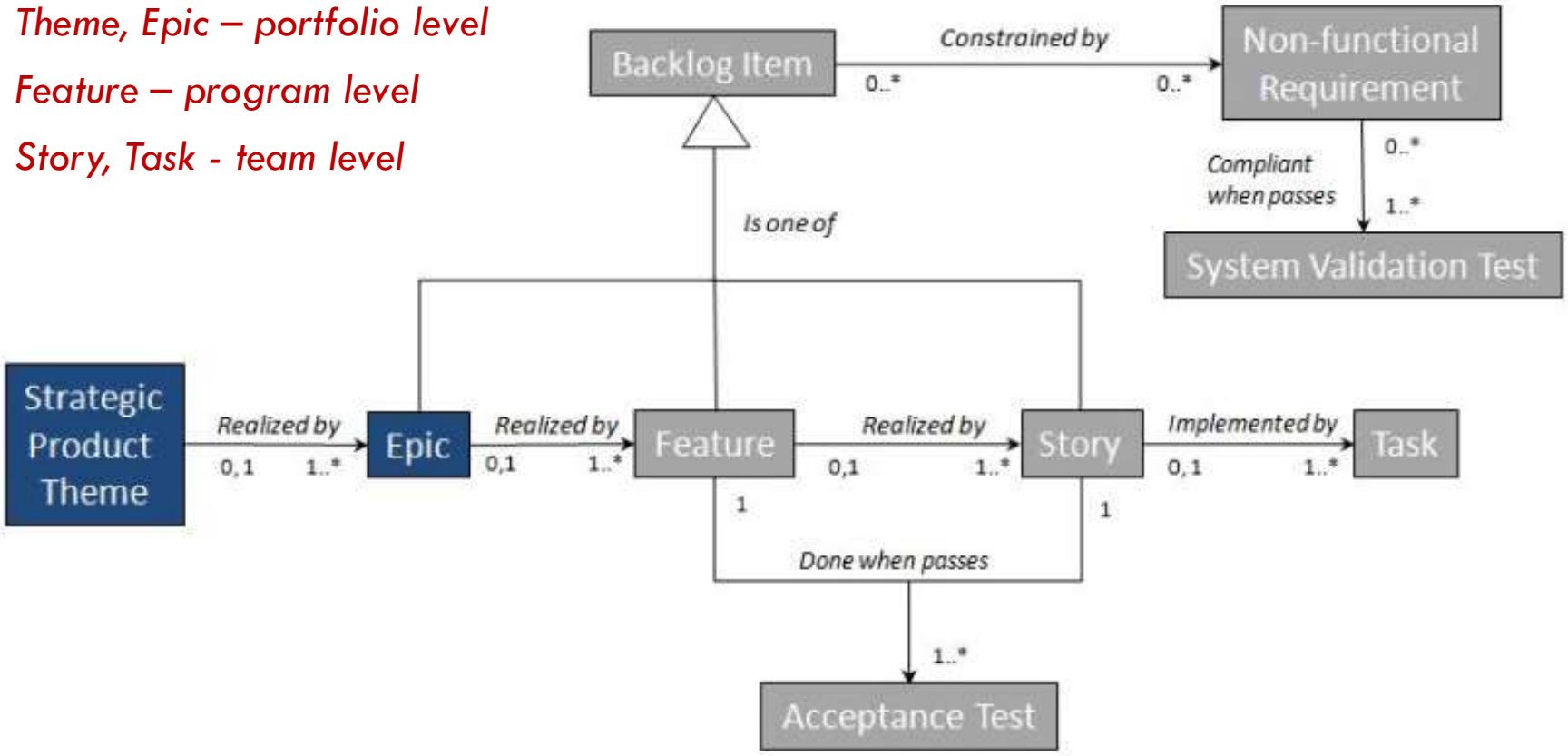
- At the Program level, the development of large-scale systems is accomplished via multiple teams in a synchronized Agile Release Train (ART).
- The ART is a standard cadence of timeboxed iterations and milestones that are date-and quality-fixed, but scope is variable.
- The ART produces releases and potentially shippable increments (PSIs) at frequent, typically fixed intervals of 60- to 120-day cycles.

The Portfolio Level

- At the Portfolio level, we talk about a mix of investment themes that are used to drive the investment priorities for the enterprise.
- Investment themes drive the portfolio vision, which is expressed as a series of larger, epic- scale initiatives, which will be allocated to various Agile Release Trains over time.

Types of Agile Requirements

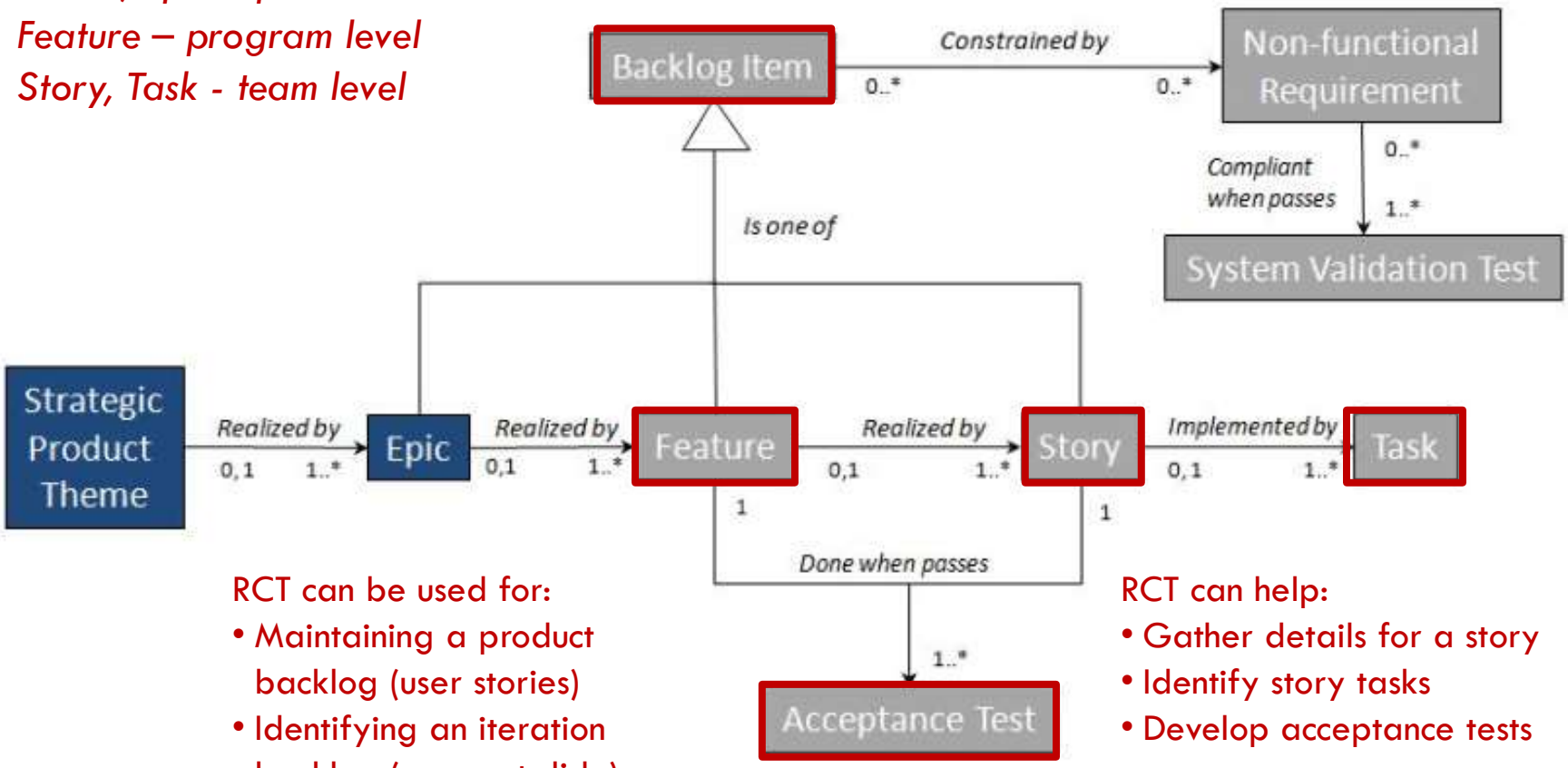
- *Theme, Epic – portfolio level*
- *Feature – program level*
- *Story, Task - team level*



Portfolio Level → Program Level → Team Level

RCT & Agile Requirements

- *Theme, Epic – portfolio level*
- *Feature – program level*
- *Story, Task - team level*



RCT can be used for:

- Maintaining a product backlog (user stories)
- Identifying an iteration backlog (see next slide)

RCT can help:

- Gather details for a story
- Identify story tasks
- Develop acceptance tests

Example: Using an RCT to Plan Agile Iterations

- Core functionality of user stories is developed as part of Iterations 1, 3
- Details of crosscuts are added and developed as part of Iterations 2, 4

Top-Down Approach

01. Front Office Module

Concern Types	UC.1.01 Create Guest Reservation	UC.1.02 Update Guest Reservation	UC.1.03 Cancel Guest Reservation	UC.1.04 Create Company Account	UC.1.05 Update Company Account	UC.1.06 Close Company Account	UC.1.08 Check-In Guest	UC.1.09 Check-Out Guest	UC.1.10 Post Charges to Folio	UC.1.11 View, Update Folio Charges	UC.1.12 Quick Posting of Folio Charges	UC.1.13 Create New Message	UC.1.14 View, Cancel Message	UC.1.15 Create Group	UC.1.16 View, Update Group	UC.1.17 Cancel, Close Group
Core Functionality	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GUI - User Interface	1	1	1	1	0	0	1	1	1	1	1	1	0	1	0	0
Crosscutting Concerns																
ET - Entitlements	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
FV - Field Validation	1	1	0	1	1	0	1	1	1	0	1	1	0	1	1	0
DDV - Data-Dependency Validation	1	1	1	1	1	0	1	0	1	0	1	1	0	0	1	1
DDD - Data-Driven Defaults	1	1	0	1	1	0	1	1	0	0	0	0	0	1	1	0
CL - Calculations	1	1	0	0	0	0	1	1	1	1	1	0	0	0	0	0
CC - Concurrency	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
CN - Connectivity	1	1	1	0	0	0	1	1	0	0	0	0	0	0	0	0
TST - Transaction Status	0	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1
DF-In - Data Flow In	0	1	1	0	1	1	1	1	1	1	1	0	1	0	1	1
DF-Out - Data Flow Out	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SI-In - System Interface In	1	1	0	0	0	0	1	0	1	1	1	0	0	0	0	0
SI-Out - System Interface Out	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1

Iteration 1

Iteration 3

Example

Iteration 2

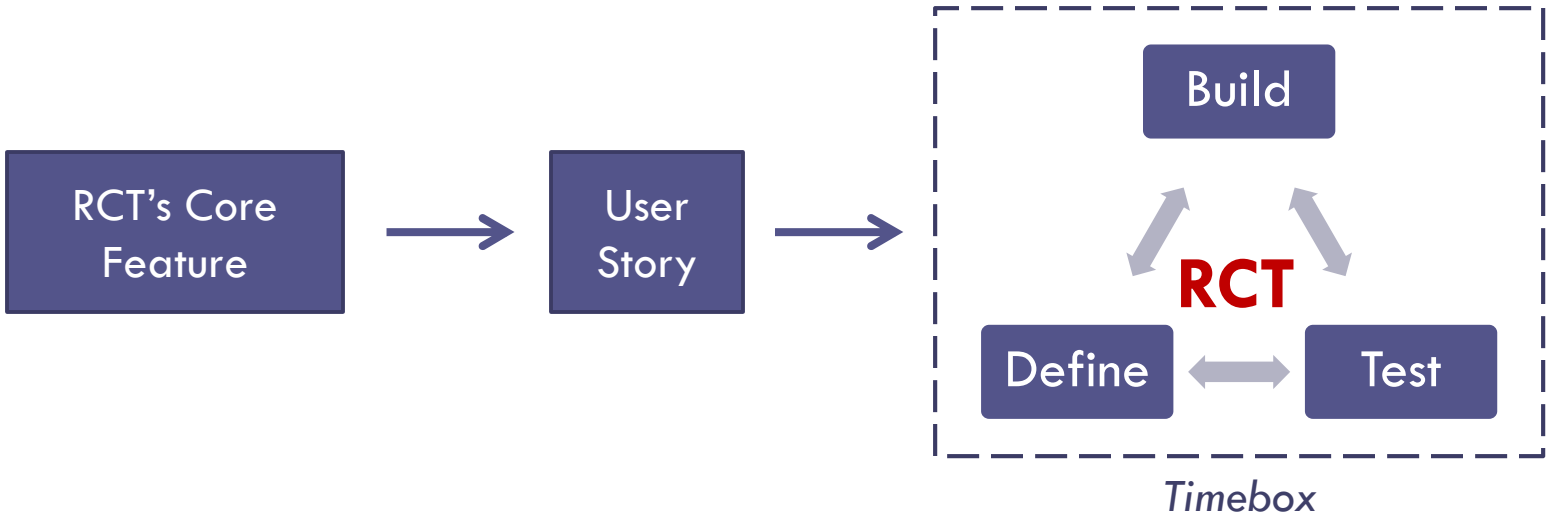
Iteration 4

Rel. 1

Rel. 2

RCT-Driven User Story Development

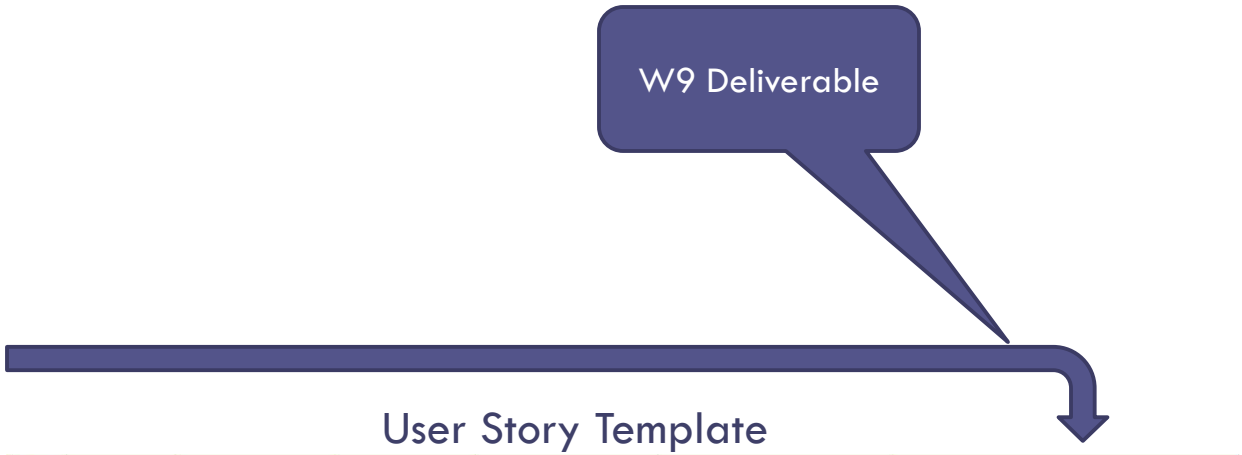
- The basic unit of work for the agile team is the user story.
- The team's objective is to define, build, and test some number of user stories in the scope of an iteration.
- Each story has a short intense development cycle, where RCT can be used for each phase.



Using an RCT to Gather Story Details

- A list of Crosscuts can be used to gather story details, in particular, story acceptance criteria that includes story constraints and exceptions.
- The applicable Crosscuts can also be used to identify test ideas.

Concern Types	UC.1.01 Create Guest Reservation	UC.1.02 Update Guest Reservation	UC.1.03 Cancel Guest Reservation
Core Functionality	1	1	1
GUI - User Interface	1	1	1
Crosscutting Concerns			
ET - Entitlements	1	1	1
FV - Field Validation	1	1	0
DDV - Data-Dependency Validation	1	1	0
DDD - Data-Driven Defaults	1	1	0
CL - Calculations	1	1	0
CC - Concurrency	0	1	0
CN - Connectivity	1	1	1
TST - Transaction Status	0	1	1
DF-In - Data Flow In	0	1	1
DF-Out - Data Flow Out	1	1	1
SI-In - System Interface In	1	1	0
SI-Out - System Interface Out	1	1	1

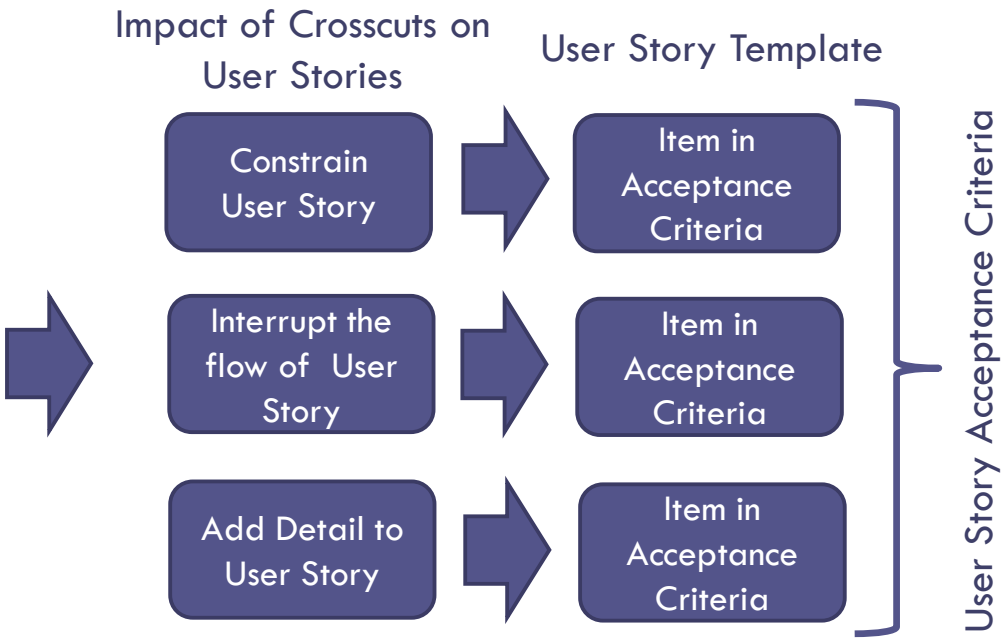


Using an RCT to Gather Story Details (cont'd)

Applicable Crosscuts in RCT

List of Concerns	01. Search		
	01.01 Search Restaurant	01.02 Search Recipes	01.03 Search Beverages
Core Functionality	I1	I1	1
GUI Features	I1	I1	1
Crosscutting Concerns			
ET-In - Internal Entitlements	1	1	1
ET-Ex - External Entitlements	1	1	1
PT - Product Type	1	1	1
FV - Field Validation	1	1	0
CC - Concurrency	1	1	0
CN - Connectivity	1	1	1
DF-In - Data Flow In	1	1	1
DF- Out- Data Flow Out	1	1	1
SI-In System Interface (inbound)	1	1	1
SI-Out - System Interface (outbound)	1	1	1
CA - Cache	1	1	1
ExHL - Exception Handling and Logging	1	1	1
PF - Performance	1	1	1

User story Acceptance Criteria are a set of conditions or requirements that must be met for a user story to be considered complete and ready for deployment.



All story details should be tested and have their testing tasks.

Using an RCT to Identify Story Tasks

- To better support agile estimation and planning, each user story can be broken into a set of tasks (development and testing) to implement a story.
- A list of applicable crosscuts in the RCT can help us identify development and testing tasks:

List of Dev. Tasks for a Story

- Develop core functionality
- Develop GUI

- Implement entitlements
- Implement field validation
- Implement calculations
- ….

Concern Types	UC.1.01 Create Guest Reservation	UC.1.02 Update Guest Reservation	UC.1.03 Cancel Guest Reservation
Core Functionality	1	1	1
GUI - User Interface	1	1	1
Crosscutting Concerns			
ET - Entitlements	1	1	1
FV - Field Validation	1	1	0
DDV - Data-Dependency Validation	1	1	0
DDD - Data-Driven Defaults	1	1	0
CL - Calculations	1	1	0
CC - Concurrency	0	1	0
CN - Connectivity	1	1	1
TST - Transaction Status	0	1	1
DF-In - Data Flow In	0	1	1
DF-Out - Data Flow Out	1	1	1
SI-In - System Interface In	1	1	0
SI-Out - System Interface Out	1	1	1

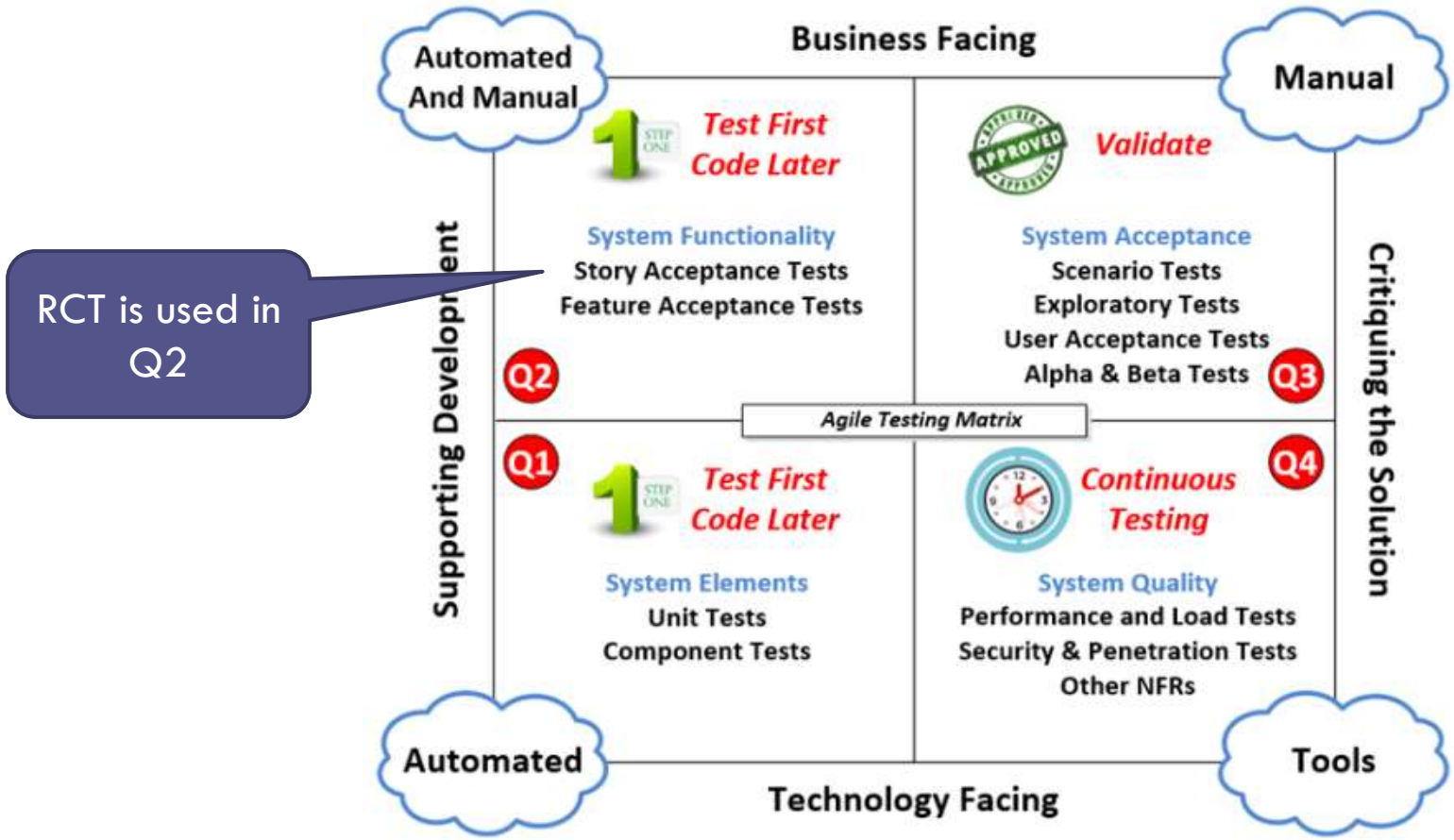
List of Testing Tasks for a Story

- Develop tests for core functionality
- Develop tests for GUI

- Develop tests for entitlements
- Develop tests for field validation
- Develop tests for calculations
- ….

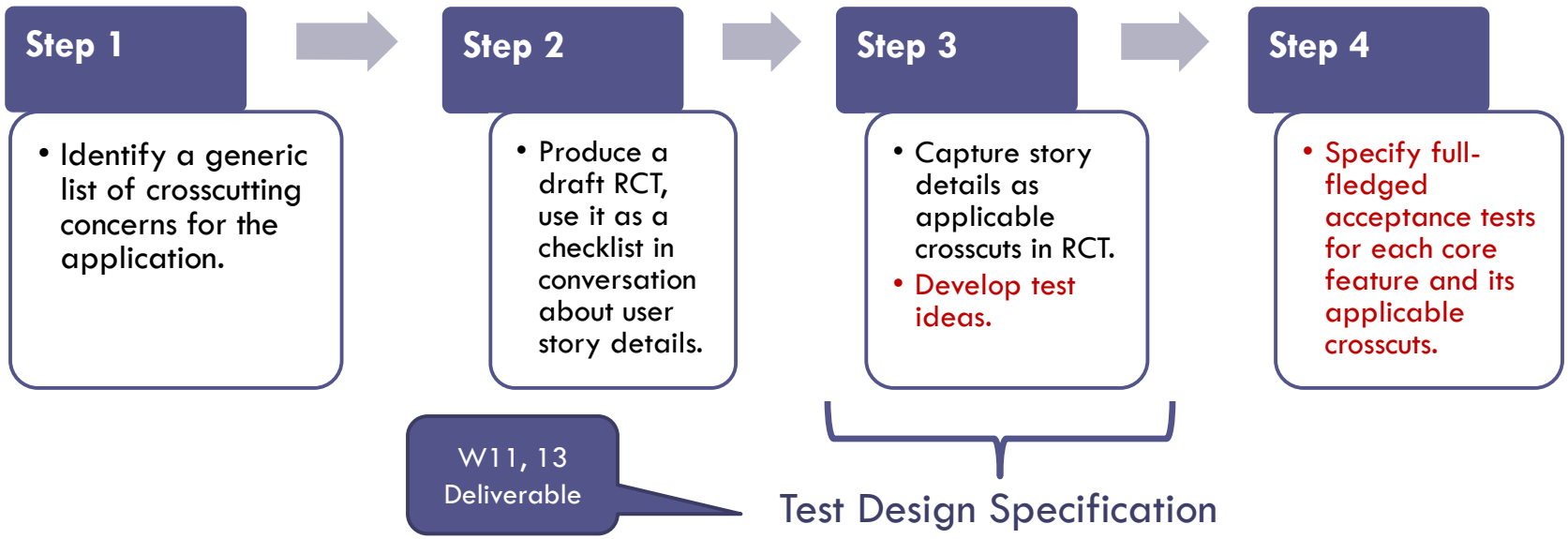
The Agile Testing Matrix

Q1, Q2 – agile-specific testing
Q3, Q4 – conventional testing, part of agile projects



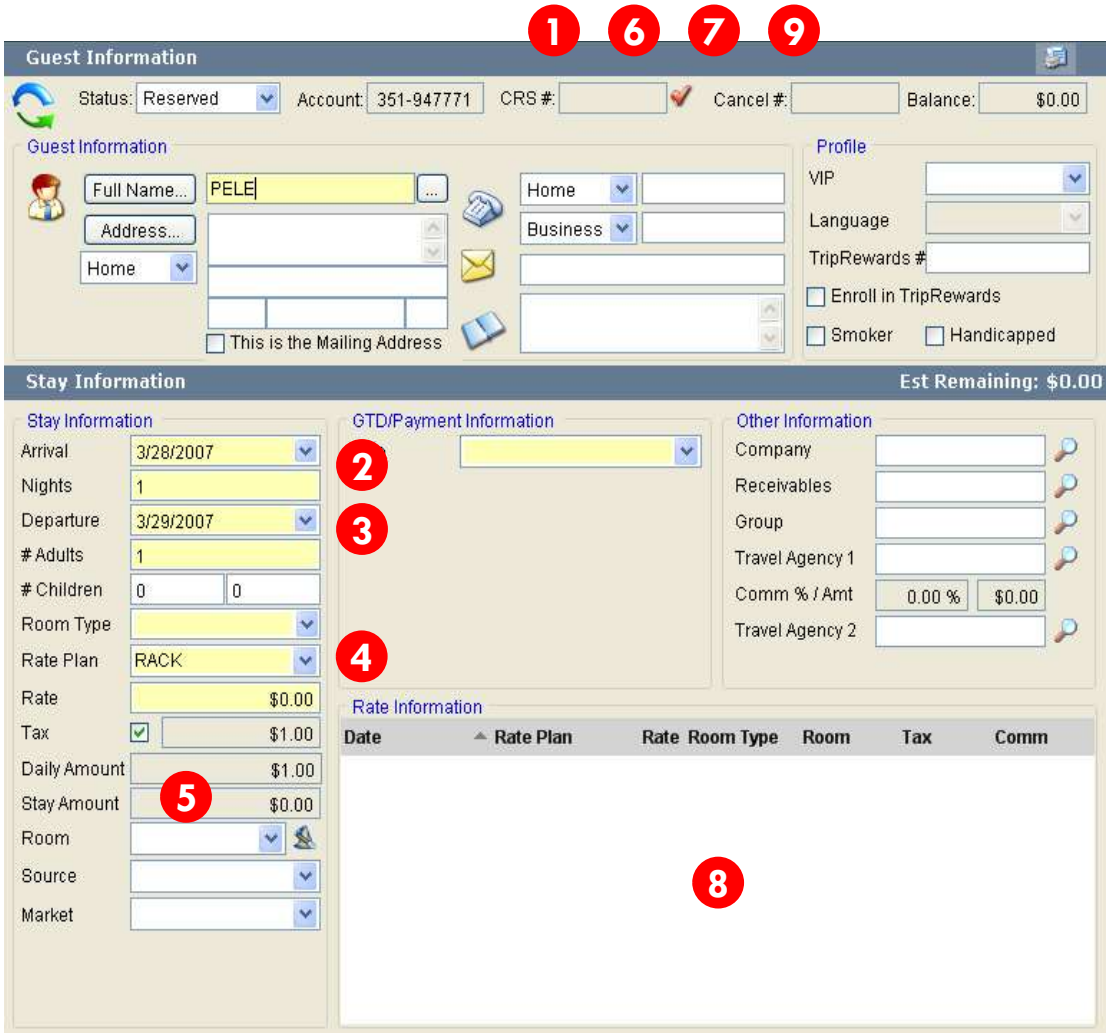
RCT-Driven User Story Testing

- One reason for writing acceptance tests is to express and capture many of the details that result from the conversations between customers and developers.
- Acceptance tests need to be specified in collaboration with the customer, where an RCT can be used as a checklist to conduct a conversation.
- Using the RCT for developing story acceptance tests can be done as a four-step process:



HMS Example: Identifying Story Acceptance Tests

RCT Fragment Concern Types	Create Guest Reservation
Core Functionality	1
GUI - User Interface	1
Crosscutting Concerns	
❶ ET - Entitlements	1
❷ FV - Field Validation	1
❸ DDV - Data-Dependency Validation	1
❹ DDD - Data-Driven Defaults	1
❺ CL - Calculations	1
CC - Concurrency	0
❻ CN - Connectivity	1
TST - Transaction Status	0
DF-In - Data Flow In	0
❼ DF-Out - Data Flow Out	1
❽ SI-In - System Interface In	1
❾ SI-Out - System Interface Out	1



HMS: User Story Acceptance Test Examples

User Story "Create Guest Reservation"

As a front desk clerk, I can create a guest reservation, so the guest will be allocated a room and her account will be properly charged.

Acceptance Testing Ideas

- FV Testing. Try to leave the field "Number of Nights" blank or enter a negative number.
- DDD Testing. Validate that the default room rate is displayed based on the selected room type and rate plan.
- CN Testing. Try to check-in a guest when the system is in the disconnected state; the reservation should be stored and processed late when the connectivity is restored.
- ET Testing. Login as the Accountant role and try to check-in a guest, the system should not allow this action for the role.

We use the list of crosscuts in the RCT as a checklist to identify and develop acceptance tests for a user story.