



Getting and Writing IT Requirements in a Lean / Agile World

Business Analysis Techniques for Discovering Requirements, User Stories, Features, and Gherkin (Given-When-Then) Scenarios

Requirements in an Agile World

Topics Covered in this Section

- Agile and Lean Philosophies
- Requirements Constructs in a Lean Environment
- Cynefin: A Framework for Quantifying Uncertainty
- Analysis in Agile Environments



What Flavor of AGILE Does Your Organization LEAN toward?



WAGILEANFALL
OR
WATERKANSCRUMBANFALL

Conventional Requirement Levels

Business Requirements

(Goals and Objectives benefiting group as a whole)

- ↳ **The IRS** will increase tax arrests by 15% through online spying by December 31 this year
- ↳ **Claims Processing** needs to reduce the time required to process a claim from 10 days to 4 days



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Conventional Requirement Levels

Stakeholder Requirements

(Needs and wants of individuals or subset)

- ↳ As a **passenger**, I can view available seats to select my preference
- ↳ To be HIPPA compliant, **pharmacy customers** will not be able to see other customers prescriptions



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Conventional Requirement Levels

Solution Requirements

(Functional and Non-Functional details)

- ↳ **Functional:** Calculate total charges including delivery charges and taxes
- ↳ **Non-Functional:** Average response time will not exceed 3 seconds



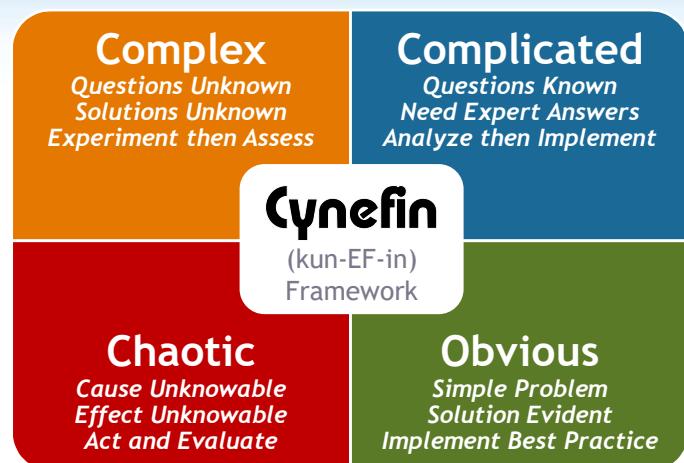
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Requirements Constructs in an Agile or Lean Environment



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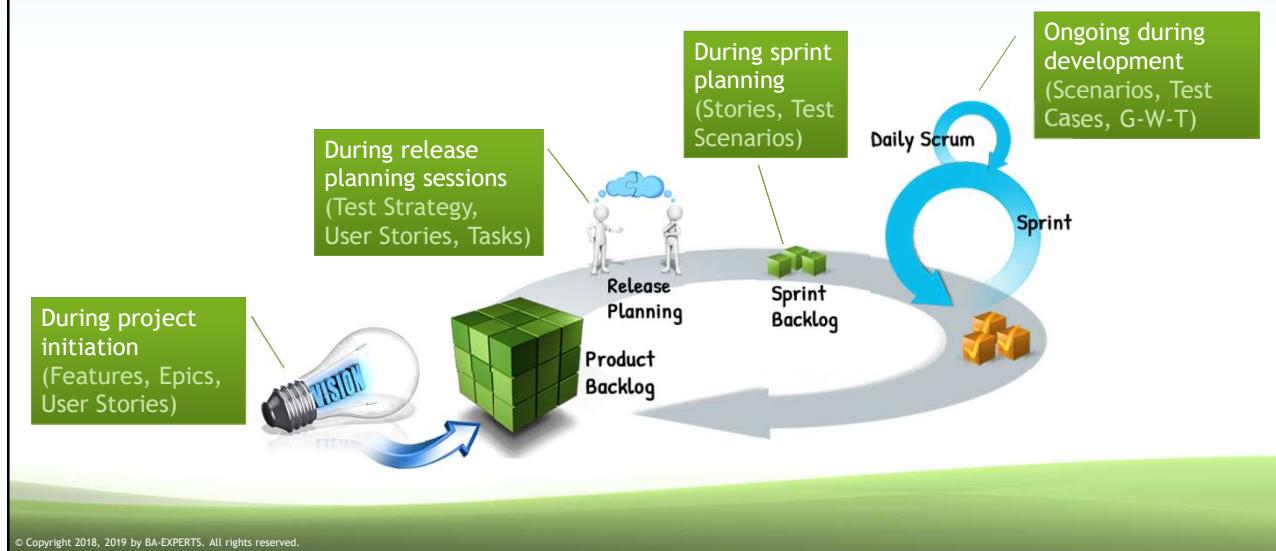
A Framework for Quantifying Uncertainty



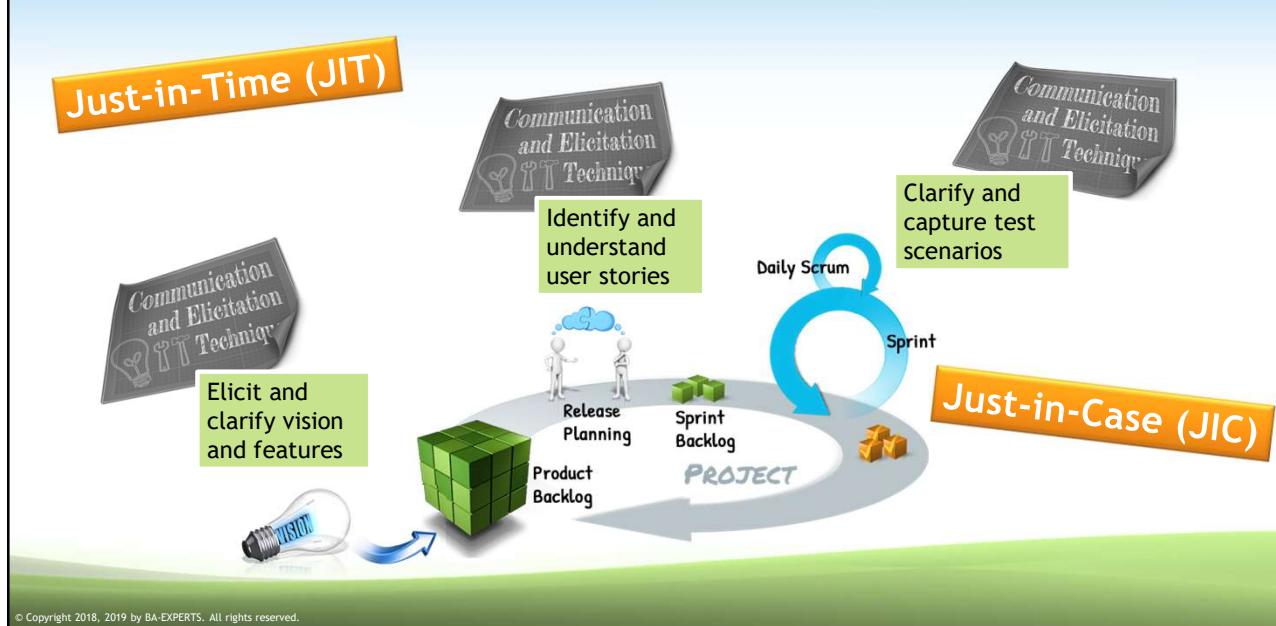
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Timing of Analysis in an Agile Environment

In an Agile environment, most typical analysis activities are needed at many levels:



JIT/JIC Communication in Lean and Agile



Discovering Requirements for Agile and Traditional IT Projects

Topics Covered in this Section

- Common Elicitation Techniques and Challenges
- Tips and Tricks for Effective Conversations
- Identifying and Interacting with Stakeholders
- Discovering Requirements thru Problem Analysis
- Recognizing Analysis Progress with a Question file



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Fishing for Requirements

Asking Questions

- | |
|---|
| What's wrong with the current solution? |
| What's right in the current solution? |
| What's missing from the current solution? |
| How can we improve the current solution? |

Analyze Documents and Discussions

Models and Examples

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Engaging with the Business Community

- ☞ Can be intimidating
- ☞ Need bag of tricks / techniques
- ☞ Communicating purpose and scope of discussion
- ☞ Asking the Right Questions



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A Question File

Q-Date	Question	Who	Answer	A-Date
12/4	What is the average age of human beings in the wild?	Game Project Leader	35 Years	1/1
12/5	Will manmade devices exceed the speed of light in our lifetime?	Stephen Hawking		
12/7	Is there intelligent life on other planets?	???		
12/19	What's wrong with my golf swing?	Tiger Woods		
1/1	When will quantum computers be commercially available?	Elon Musk		

(#Q - OpQ) / #Q = Completion %

(#Q - AssumedA) / #Q = Confidence %

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Elicitation Steps



PREPARING AND PLANNING

(for Elicitation Meetings)



ELICITING

(getting what you need)



FOLLOW-UP

(It ain't over when it's over!)

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Preparing for Effective Communication



Preparing the right questions



Managing the logistics



Finding the right people



Deciding how to capture the responses



Clearly communicating the objective of the conversation

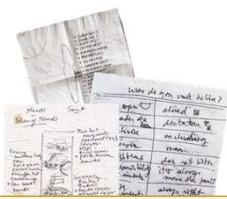
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Choosing the Right Target and Tools

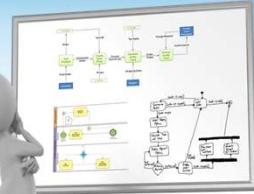


Functional and
Non-Functional Dimensions

Targeting the right level of
questions to the other party



Picking the best representation medium
(flip chart, electronic, cocktail napkin)



Swimlane Diagrams
System Flow Charts



Data Flow Diagrams
Workflow Models

Using the right mode
(visual, verbal, text)

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Options for Conducting a Productive Conversation



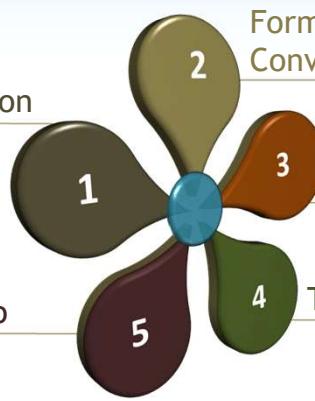
Informal
Conversation



Formal F2F
Conversation



Workshop



Email or IM



Teleconferencing



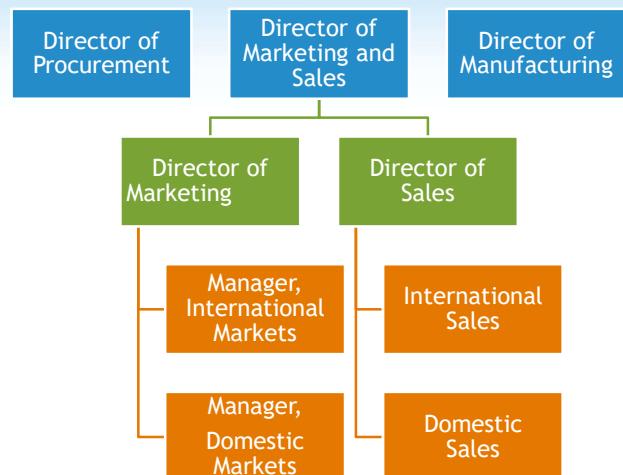
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Basic Stakeholder Identification



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Using an Org Chart



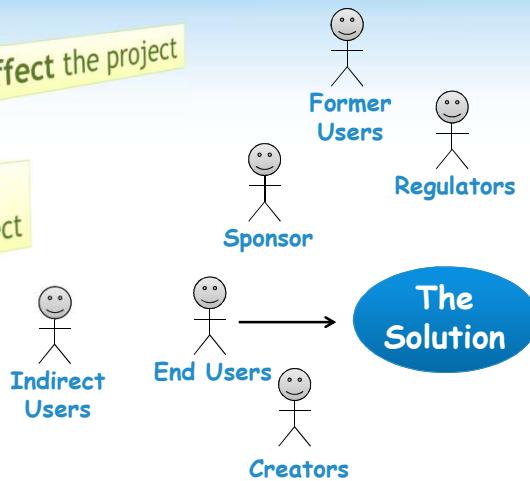
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A Stakeholder Is....

Anyone who could affect the project

Anyone who could be affected by the project

Anyone who is working with you on the project



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Conducting an Elicitation Conversation

- 💡 Building Rapport (small talk)
- 💡 Staying on topic
- 💡 Non-Verbal Communication
- 💡 Minimizing Misunderstandings
- 💡 Listening Techniques
- 💡 Dealing with Difficult People
- 💡 Using open- and close-ended questions
- 💡 To thine own self be true!



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The Human Element

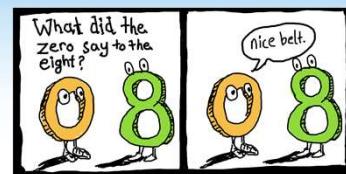


Genuinely Interested



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Focus Is Fine but People Are People



Having Fun!



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Four C's of Non-Verbal Communication

Context



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Four C's of Non-Verbal Communication

Context

Cluster



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Four C's of Non-Verbal Communication

Context

Cluster

Culture



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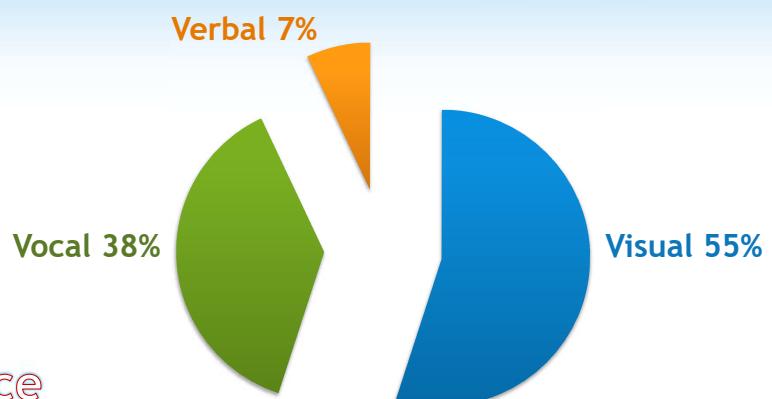
Four C's of Non-Verbal Communication

Context

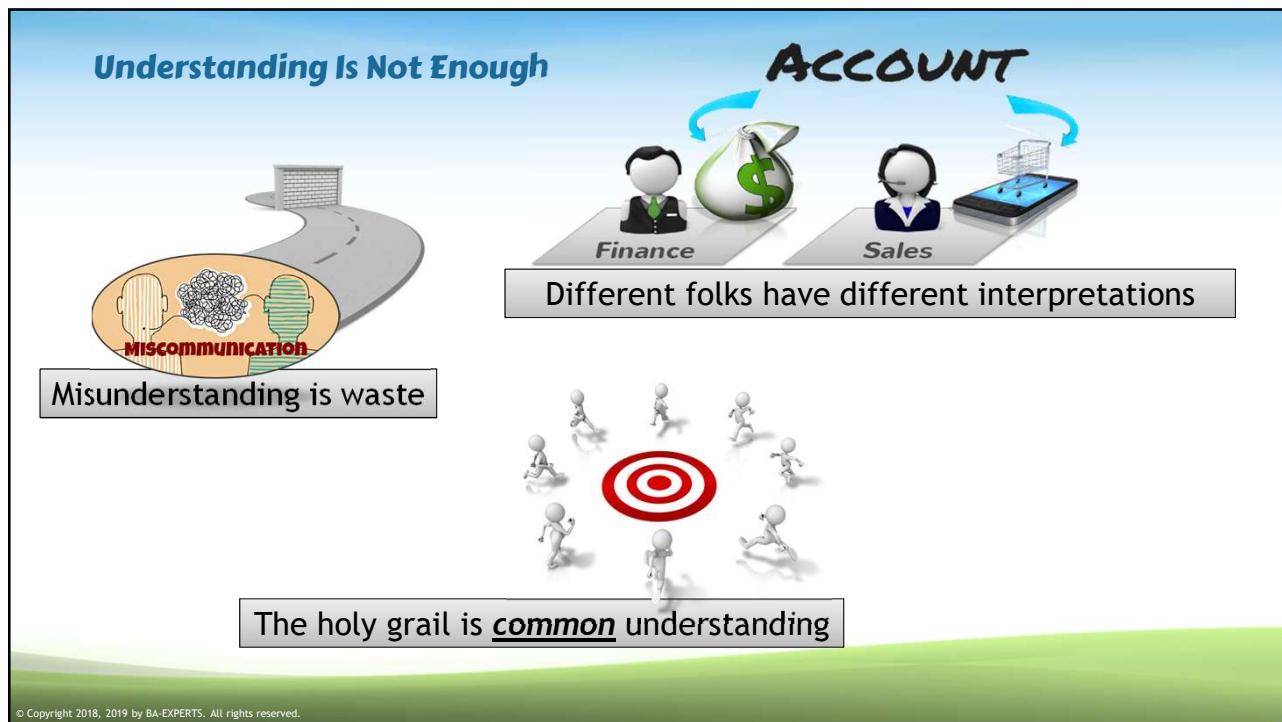
Cluster

Culture

Congruence



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Common Listening Techniques

-  Maintaining eye contact
-  Nodding agreement
-  Verbal cues
-  Paraphrasing
-  Highway 350



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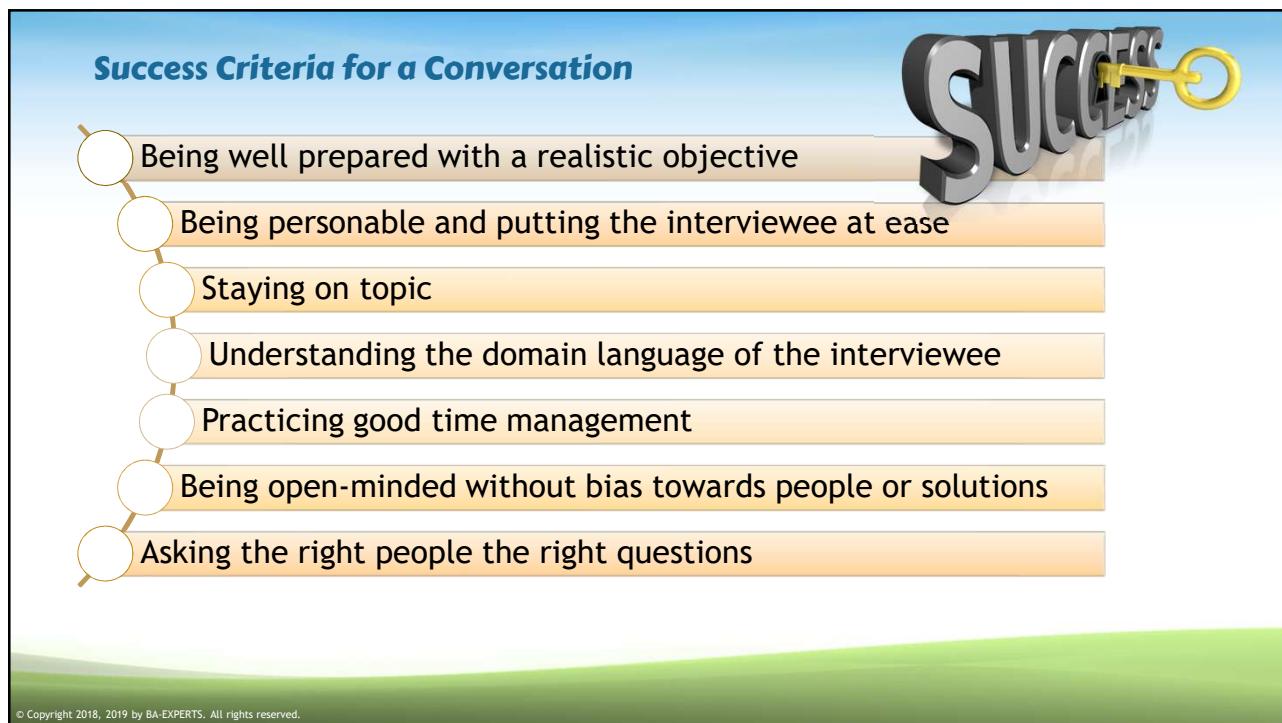
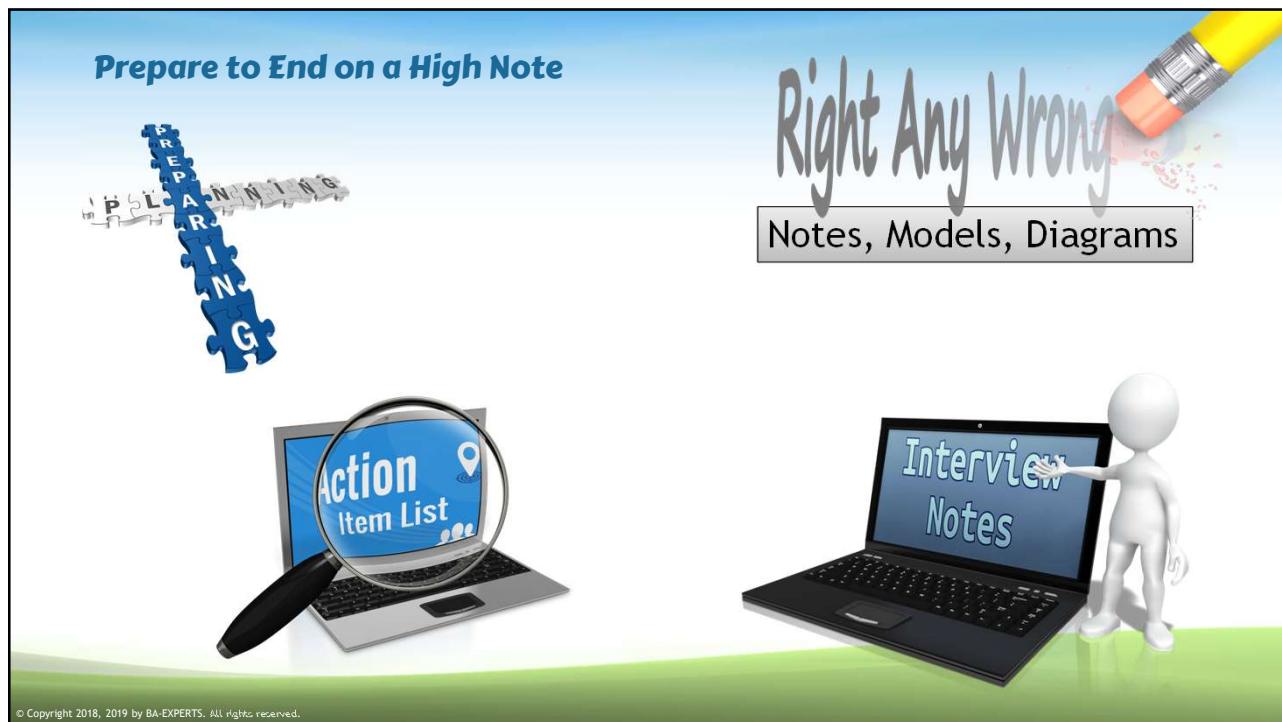
Bias Is in the Brain

Confirmation Bias
Emotional Bias
Vividness Effect



Recognize it but
don't let it distract you

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Clarification via Email or IM Tips

1. Determine your purpose before writing your open-ended questions
2. Express **why** you need their response in the subject of the email
3. Let the interviewee know what your role is
4. Keep your questions clear and short and provide a simple example of what kind of answer you would like
5. Keep the number of questions short (7 +/- 2 ?)
6. List your questions numerically and allow unlimited space for their answer
7. Include a final open question,
“Anything I didn’t think about?”
8. Schedule a date for the answer
(What if you don’t get all the responses?)
9. Don’t forget to thank your interviewee in advance
10. Once you receive a response, reply with follow on questions



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Defining the Real Problem



What is the real problem? ●



How do you define problems?

Whose problem is it? ●



● Where does the problem come from?



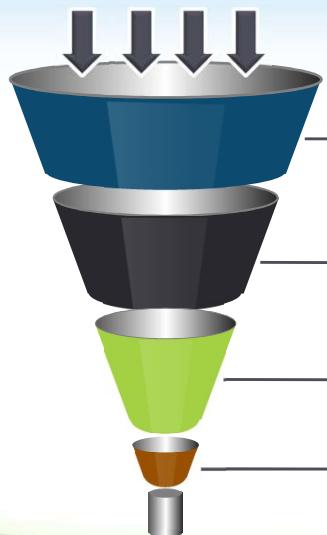
● What is the problem?

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Aristotelian Problem/Symptom Reduction



Identifying the *real* problems is a 4 step process.



Discuss each potential problem with all impacted stakeholders to ensure a common understanding and acceptance of the statement.

For each item on your list, can anyone involved on the project do anything about it? If not, it is Out of Scope (OOS).

For each item on your reduced list, does it describe how the problem can be eliminated? If so it is a solution (SOL).

For each item on the remaining list, assuming it could be solved, would any other item on the list “go away”? If yes then the item that would go away is a Symptom (SYM).

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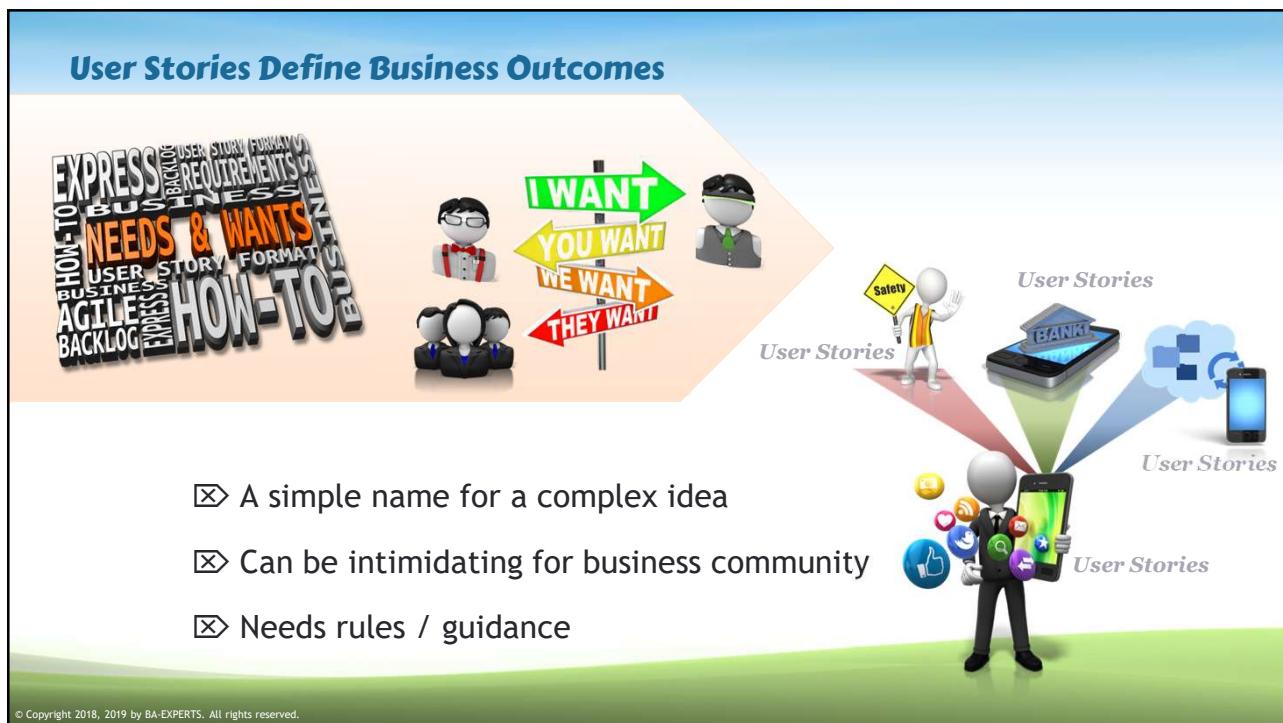
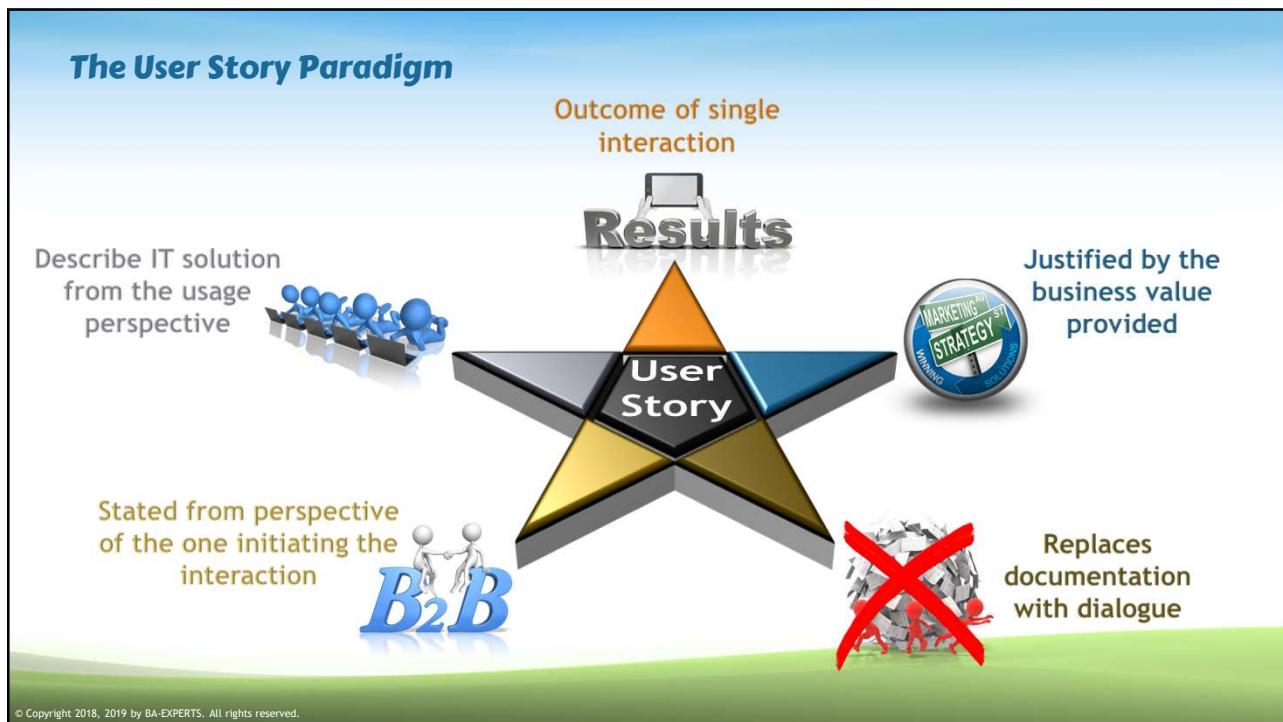
Writing Business and Stakeholder Features and Requirements

Topics Covered in this Section

- User Stories Are Stakeholder Requirements
- Reducing Complexity Increases Comprehension
- A Complete Sentence Forces a Complete Thought
- Acknowledging Decision Making Authority
- Relevance of Features, Requirements, and User Stories



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Well-Formed User Story Templates

EXAMPLE

As a {role the author represents},

I can {do or have this}

{with these qualifiers}

to {goal or value provided}.

→ Role-Focused

Goal-Focused →

EXAMPLE

To {goal or value provided},

{roles who need this}

Can {do or have this}

{with these qualifiers}).

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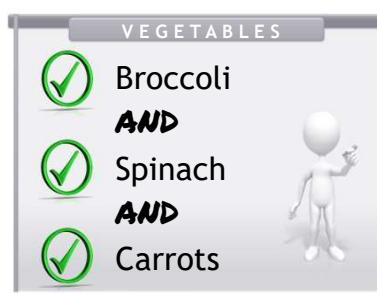
Simple User Stories Increase Understanding



VERB AND NOUN + VERB AND NOUN



~~IF
AND
BUT~~



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The Different Flavors of And

As an applicant, I can navigate to the coverage screen, enter personal and vehicle data, Connected Data NOUN and submit the application online to request VERB NOUN Compound Sentence automobile insurance coverage.

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Splitting User Stories for Simplicity



As an applicant, I can navigate to the coverage screen, enter personal and vehicle data, and submit the application online to request automobile insurance coverage

Contains three distinct thoughts

As an applicant, I can navigate to the coverage screen to select the insurance coverage I need

As an applicant, I can enter personal and vehicle data to compare premiums

As an applicant, I can submit an application online to request automobile insurance coverage

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Simplicity Increases Clarity

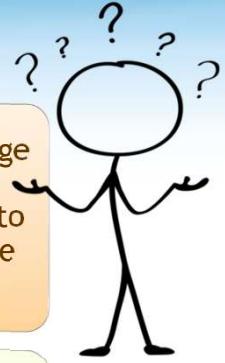


As an underwriter, I can override a coverage denial for an applicant to increase our customer base unless the denial was due to bad credit in which case I can confirm the denial to protect our customer base

Contains two user stories

As an underwriter, I can override a coverage denial for an applicant to increase our customer base

As an underwriter, I can confirm coverage denial for an applicant with bad credit to protect our customer base



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Examples of Well-Formed User Stories

EXAMPLE



To save money, **visitors** can select the lowest fare flight that meets their travel needs.

EXAMPLE



As a policyholder, I can view the account balances on all of my policies to manage my financial obligations.

EXAMPLE



To plan their career paths, **students** can see all classes that offer necessary training topics for the upcoming 6 months.

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Qualities of a Good User Story



Kudos to Bill Wake as the originator of this useful mnemonic!

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Good User Stories Avoid Preconceived Solutions



As a traveler, I can book a flight leaving the day before the class starts to be on time for the class.



As a traveler, I can be at the customer site at the designated time on the morning of the first day to begin the class on time.

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Focus on the Business Value to the Author

WHAT

HOW



As an earth citizen,
I need windmills installed
to save the planet



Better energy efficiency?



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Ignore Technology as Much as Possible

HOW

As an applicant, I can select my state from a drop-down box of abbreviations to avoid entering an invalid state.



WHAT

As an applicant, I can submit a valid state abbreviation to ensure an accurate quote for insurance coverage.



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Avoiding the “How-to” Trap

1

Avoids preconceived solutions



2

Expresses business outcome regardless of technology



3

Focused on destination, not the journey



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User Stories Are Not Just for End Users

EXAMPLE

As a Business Rules Administrator, I can modify mortgage conditions to allow the organization to adapt to changing market conditions.



EXAMPLE

As the CashForecaster System, I need access to the bank's transactions so I can compare my projections to actuals.



Non-End Users

EXAMPLE

As a Webmaster, I can modify the bandwidth to accommodate surges in usage during peak seasons.



EXAMPLE

As a Database Administrator, I can recognize when thrashing negatively impacts performance so I can redistribute the tables.



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Relevant Requirements, Features, and User Stories

A “relevant” statement targets specific components, meaning it

- Defines a desired attribute of one or more components your solution
- Can be implemented without violating defined scope
- Does not implicitly or explicitly cause changes that exceed your inherent authority

EXAMPLE

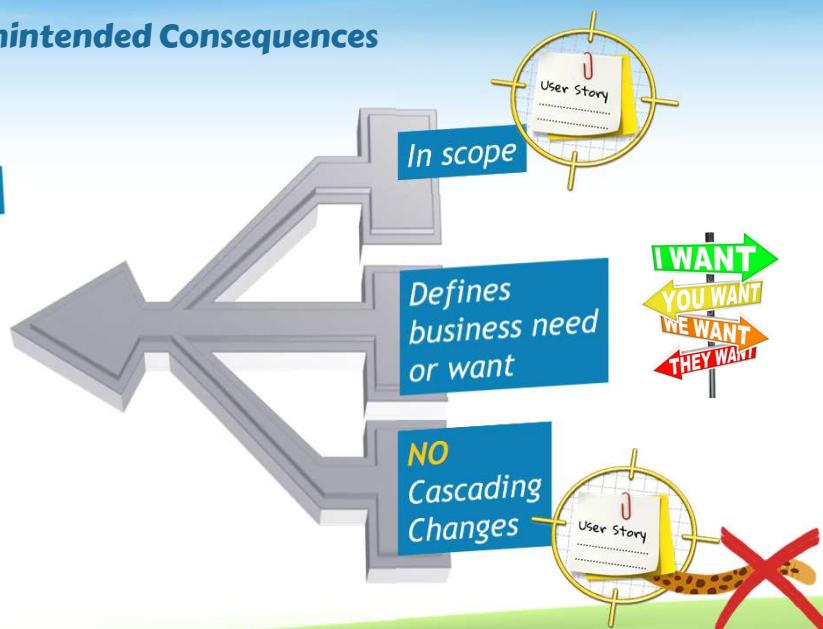
Original	Relevant?
The system should calculate collision premiums based on replacement value of the vehicle including applicable sales taxes.	<p>The system should calculate collision premiums based on the replacement value of the vehicle.</p> <p>Replacement value should include applicable sales taxes.</p> <p>NO</p>

YES

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Beware the Law of Unintended Consequences

Relevant Component



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Avoiding Ambiguity and Subjectivity

Topics Covered in this Section

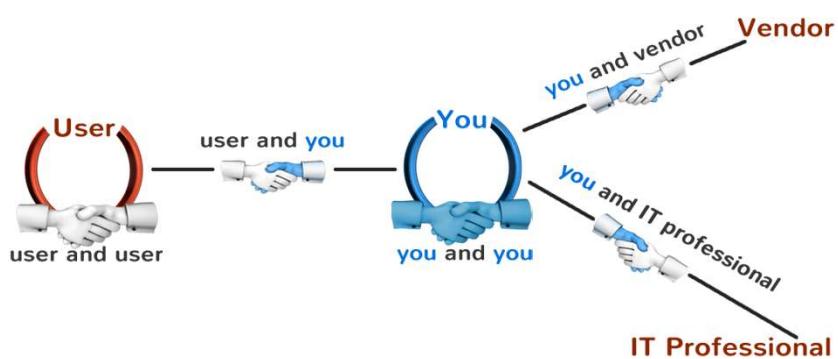
- Misunderstandings Kill Projects
- Sources of Ambiguity
- Clarifying thru Context and Content
- Ensuring a Common Understanding
- Revealing and Removing Ambiguity
- The Never-ending Story



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Who Needs Clarity, Anyway?

Clarity = Common Understanding and Agreement between:



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Ambiguity and Subjectivity Feed Misunderstanding

Ambiguity:

open to multiple legitimate interpretations

Resolved primarily through context



Subjectivity:

based on or influenced by personal feelings, tastes, or opinions

Resolved by objectifying



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The Importance of Asking Questions

An unambiguous requirement avoids confusion by

- adding context to any term or phrase that needs it
- adding missing information needed for clarity



Asking questions



Making assumptions

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Misunderstandings Kill Projects



Misunderstood, ambiguous, and assumption-laden



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Pronouns Can Be Ambiguous

EXAMPLE

1. The system should add the sales tax to the total amount.

THE SALES TAX

2. ~~It~~ is 7% of the total amount.

EXAMPLE

Applications should be processed by underwriters within 3 business days or they will be returned.

~~THE APPLICATION~~

Words and Phrases



Interpretation

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Generic Verbs Are Ambiguous

An understandable statement has a single possible interpretation, meaning it

- leaves no doubt about the meaning of any of the words within the context
- cannot be interpreted differently by different stakeholders

EXAMPLE

Applications should be processed by underwriters within 3 business days or the application will be returned.

EXAMPLE

Insurance applications which are neither accepted nor denied by underwriters within 3 business days will be returned.

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Acronyms Can Be Ambiguous

A clear requirement is easily understood by knowledge peers in that it

- defines or expands all acronyms for clarity



Federal Emergency Management Agency (US Government)
Facilities Equipment Maintenance Applications
Failure Effects & Mode Analysis
Farm Equipment Manufacturers Association
Federation of European Motorcyclists Association
Fire Equipment Manufacturers' Association, Inc.
Flavor and Extract Manufacturer's Association
Foreign Exchange Management Act 1999 (India)
Friendly Enemies Meeting Association

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Standard Terms Reduce Ambiguity

EXAMPLE

Extensions should not be processed
for accounts that are overdue.

EXAMPLE

Reject Policy extension requests
from customers with overdue
accounts

Assuming “Overdue Account”
is defined in a business rule!

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The Challenge to Understanding

All requirements seem perfectly understandable to the person who wrote them.

The system should
predict the amount
of stuff we will sell.

What could possibly be misunderstood in this statement?

Time span?



This requirement is:

- 1) A simple, complete, well-structured sentence
- 2) Emphasize “what” should be done, not “how” to do it
- 3) Target components that are in scope for your project

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Increasing the Clarity of Your Requirements

A clear requirement is easily understood by knowledge peers in that it

- defines or expands all acronyms for clarity
- uses corporate or industry standard terms wherever possible
- uses glossary entries that are obvious to the reader

7. before being granted access, **quantity in case lots**
8. The system should predict the amount of
product that we will sell.
9. The system should recognize any



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Adding Context and Other Missing Information

Raymond gripped the bat tightly.



Raymond watched the bat flitting through the air.



ONE MEANING



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Remove Ambiguity by Adding Clarifying Content

Raymond gripped the bat tightly.

Raymond gripped the **baseball** bat tightly.

Raymond watched the bat flitting through the air.

Raymond watched the bat flitting through the air **using its sonar to guide it**.



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Specificity Adds Clarifying Content

EXAMPLE

Insurance applications which are neither accepted nor denied by underwriting within 3 business days will be returned.

EXAMPLE

Insurance applications which are neither accepted nor denied by underwriting at the close of business on the 3rd business day after receipt will be returned.



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Desk Checking and Peer Reviews Identify Ambiguity



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Revealing and Removing Ambiguity

Ask one or more of your peers (not the author) to express the meaning of a requirement (feature, user story, etc.) using different words.

NOTE: They are not allowed to use any of the original words except for:

- ❖ articles (i.e., a, an, the, etc.)
- ❖ prepositions (i.e., of, with, for, etc.)
- ❖ conjunctions (i.e. and, or, but, etc.)



Do not *use the same:*
Nouns, Verbs,
Adverbs,
Adjectives

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Revising User Stories to Reduce Ambiguity

Original

As a telephone operator, I can complete at least 12 reservations per hour during peak volume to reduce the wait times for customers.

Rewrite

As a reservationist, I am able to process a minimum of a dozen requests for travel accommodations within 60 minutes during the busiest time of the year to minimize dropped calls.

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Leverage People's Differences for Maximum Advantage

ORIGINAL USER STORY



REWRITTEN USER STORY



Different gender



REWRITTEN USER STORY



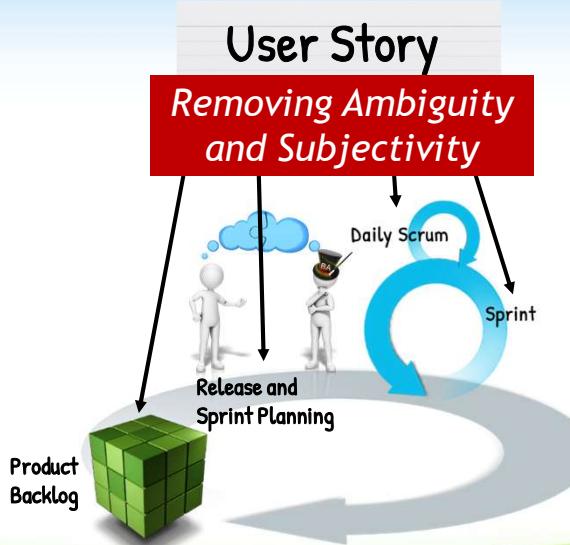
Different thinking styles

REWRITTEN USER STORY



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Removing Ambiguity and Subjectivity Requires Constant Vigilance



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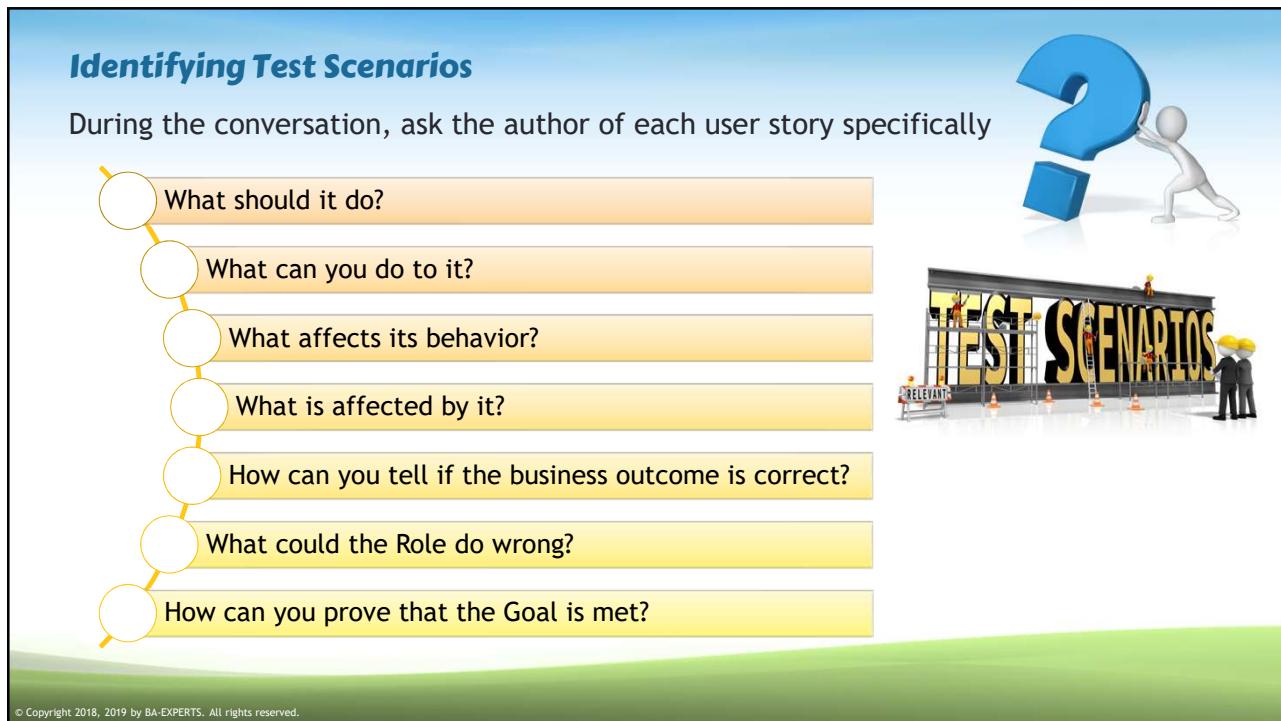
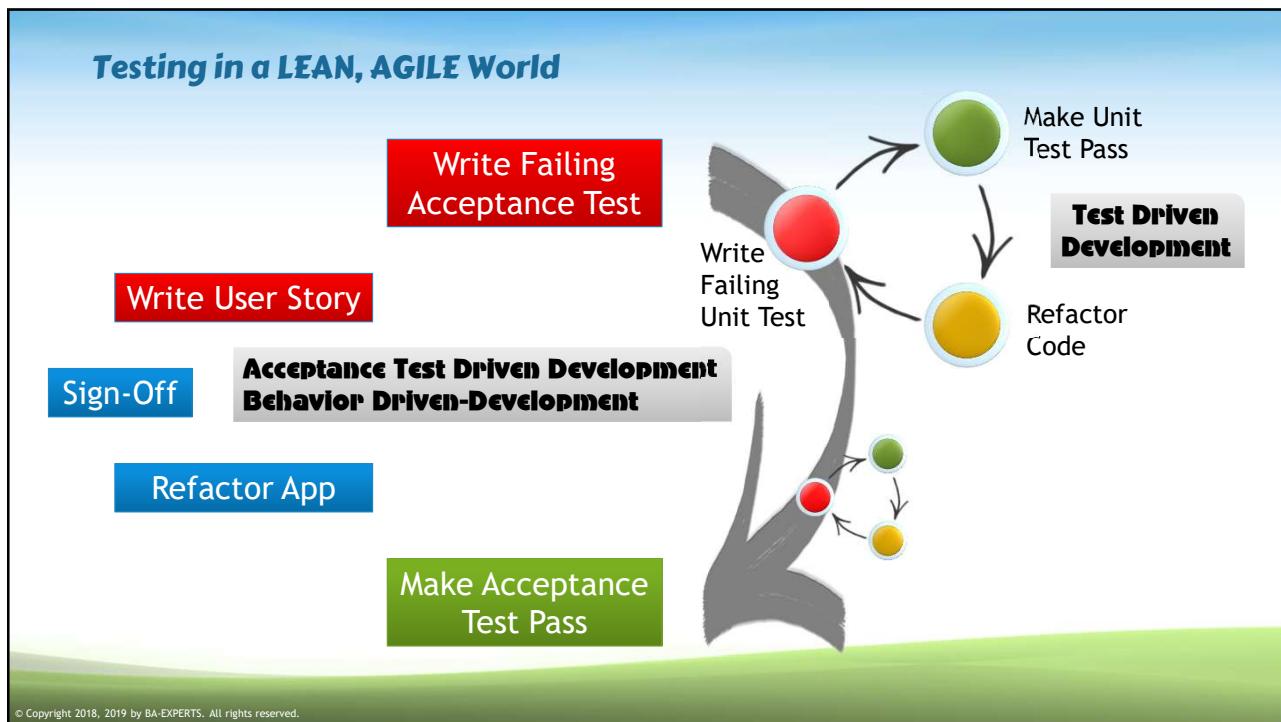
Finding Test Scenarios in a LEAN, AGILE World

Topics Covered in this Section

- Testing in a LEAN, AGILE World
- Getting to Test Scenarios
- Functional Decomposition
- From Test Scenarios to Test Cases
- Engineering AGILE Test Data



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Writing Test Scenarios in Gherkin

EXAMPLE

To plan their career development path, students can see all classes that offer necessary training topics for the upcoming six months.

Scenario: Fred requests recommended training topics

GIVEN Fred is logged in to website

And Fred has completed BASE

And Fred has unfinished training topics

WHEN Fred requests training plan

THEN Fred's customized training plan is viewable

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Beyond Simple Test Scenarios

Scenario Outline: A user withdraws money from an ATM

GIVEN <Name> has a valid Credit or Debit card

And their account balance is <OriginalBalance>

WHEN they insert their card

And withdraw <WithdrawalAmount>

THEN the ATM should return <WithdrawalAmount>

And their account balance is <NewBalance>

And the outcome is <Result>

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From Test Scenarios to Test Cases

Name	Old Balance	Withdrawal Amount	New Balance	Result
Tom	\$125	\$25	\$100	<i>Dispersed</i>
Fred	\$15	\$25	\$15	<i>Amount not available</i>
Nancy	\$10,287	\$1,000	\$10,287	<i>Daily limit exceeded</i>
NoAccount	N/A	N/A	N/A	<i>Card returned</i>

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Engineering AGILE Test Data

Types of test data to engineer:

GIVEN

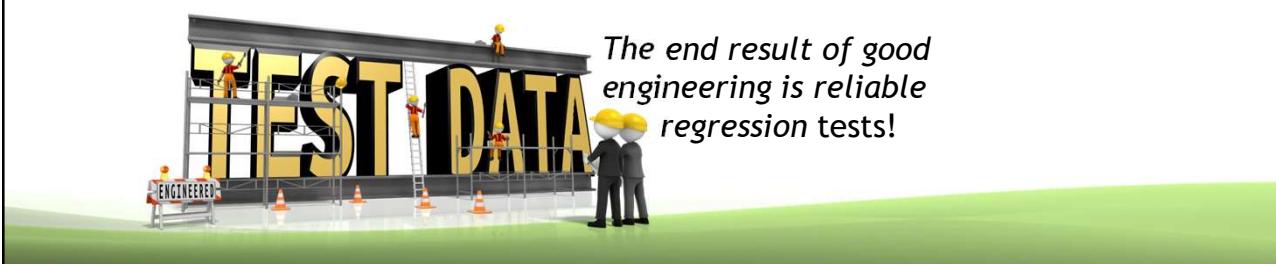
Set-up encompasses any data, files, records, data bases, hardware conditions, or whatever has to be in a specified state prior to executing a selected test

WHEN

Execution data defines any values or actions required to conduct the test

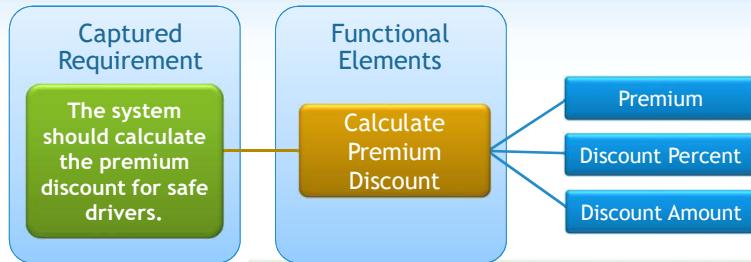
THEN

Will always be predictable if Given and When are properly engineered



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Test Cases for Functional Requirements



Scenario: Calculate Premium Discount

GIVEN A **Premium** of \$1500
And a **Discount Percent** of 5%
WHEN customer qualifies for a discount
THEN **Discount Amount** = \$75

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Optimizing the Number of Test Cases

Data most likely to succeed (in finding bugs):

Equivalence class

(Don't test the same old, same old over and over)

Any set of data that will produce a similar result

Valid months (1 - 12)

Invalid months (< 1, > 12, not numeric)

Boundary values

(Edges are much more dangerous than flat surfaces)

On, above, or below the edges of equivalence classes

Valid months (1, 12)

Invalid months (0, 13, XX)

Probable error

(If it's happened before, it'll happen again. Unfortunately!)

Situations more likely to find a bug based on experience (yours or someone else's)

(Blank, null, 99, 00, _1, 1_)

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Testing Business Rules

If the customer's current debt load plus the credit request is greater than 4 times their gross income, then deny the request unless their credit is excellent and they have been on the same job for over 5 years. If this is the case, approve the request but require a co-signer. If the total new debt is less than 4 times their gross income, and their credit is excellent or good, approve the request. If they only have good credit and have been in their current job less than 5 years, approve with a co-signer. Otherwise, reject the order.

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Using a Decision Table to Identify Test Scenarios

Decision Table

Debt > 4 X Income	Y	Y	Y	N	N	N	N
Job > 5 Years	Y		N	Y	Y	N	N
Credit Excellent	Y	N		Y	N	Y	N
Credit Good					Y		
Approve	✓			✓	✓	✓	
Request Co-Signer	✓				✓		
Deny		✓	✓				✓

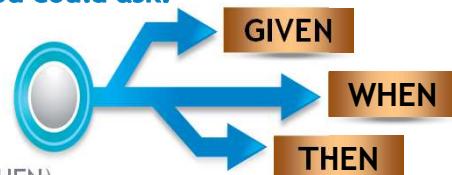
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Symptoms Are Great Test Scenarios

The primary test of a feature or user story is if it provides the business value

If you performed problem/symptom reduction, you could ask:

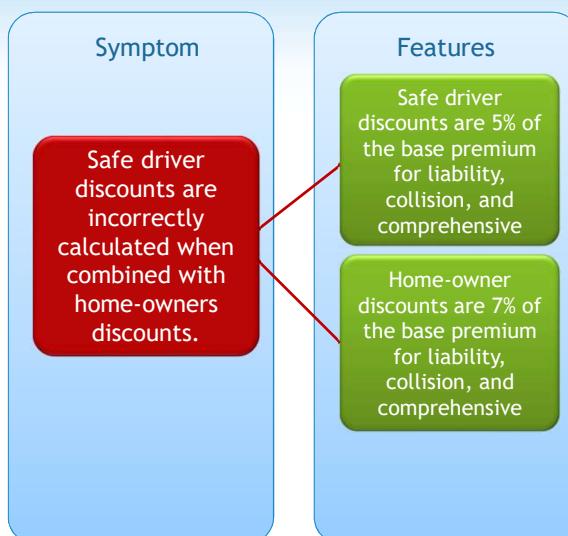
- How can I set the stage for the problem (GIVEN)
- What action(s) or event(s) trigger it (WHEN)
- How to recognize that the symptoms disappeared (THEN)



Focus on **WHAT** not how

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Getting Requirements from Problems

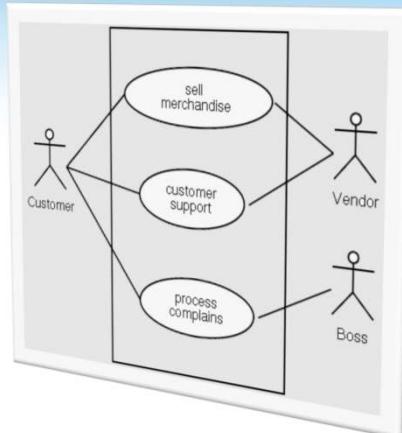


GIVEN A policy with a combined premium \$1,500 per year
WHEN Policyholder qualifies for safe driver discount
AND Policyholder qualifies for home-owners discount
THEN Total discount is \$180

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Inside a Use Case

- Trigger
- List of Actors
- Description (Value added)
 - Preconditions
 - Standard Path
 - Post-conditions
 - Alternate Paths
 - Exception Paths
- Assumptions
 - Measures
 - ...



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Getting Positive and Negative Tests from Use Cases

Positive Tests

- Validate the standard path
- Validate each alternate path
- Validate each exception path

Negative Tests

- Violate preconditions or triggers
- Violate each combination of preconditions or outcomes

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Sample Test Scenarios from a Use Case

Use Case: Customer Cancels Coverage

Preconditions: Customer has an account

1. Customer logs in
2. System displays menu
3. Customer selects "View active Policies"
4. System displays active policies
5. Customer selects policy and chooses "Cancel" action
6. System requests confirmation
7. Customer confirms
8. System cancels policy and notifies Underwriting
9. System displays menu
10. Customer logs off

Post condition: Policy is "Pending cancellation" status and assigned to Underwriting

Alternate Paths:

A01 @4 Customer has no active policies

- A01.01 System displays "No active policies available"
- A01.10 Resume @ 2

Test Scenario Examples

1. Customer in good standing with active policy and no outstanding balance
2. Customer has no active policies
3. Customer has policy with overdue amount
4. Customer choose not to cancel policy
5. Customer does not respond in allotted time
6. Customer does not have an account
7. ...

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Exception-Based Test Scenarios

To find additional test scenarios, ask:



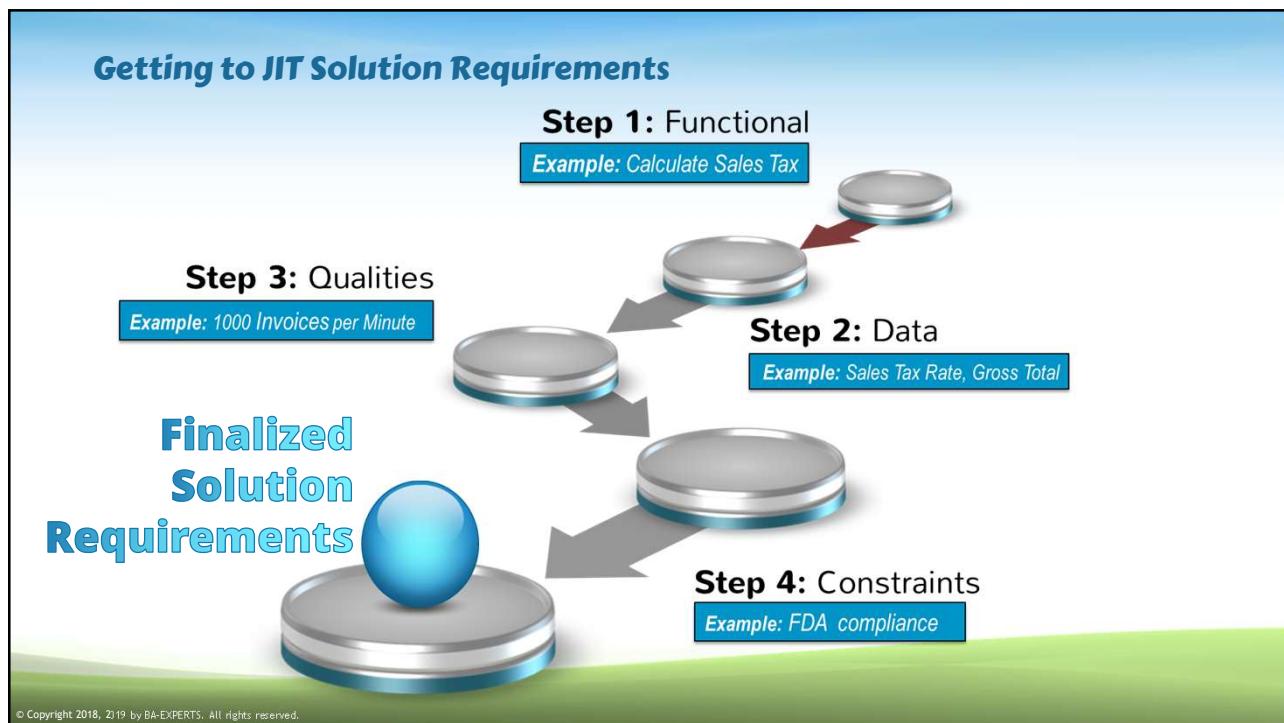
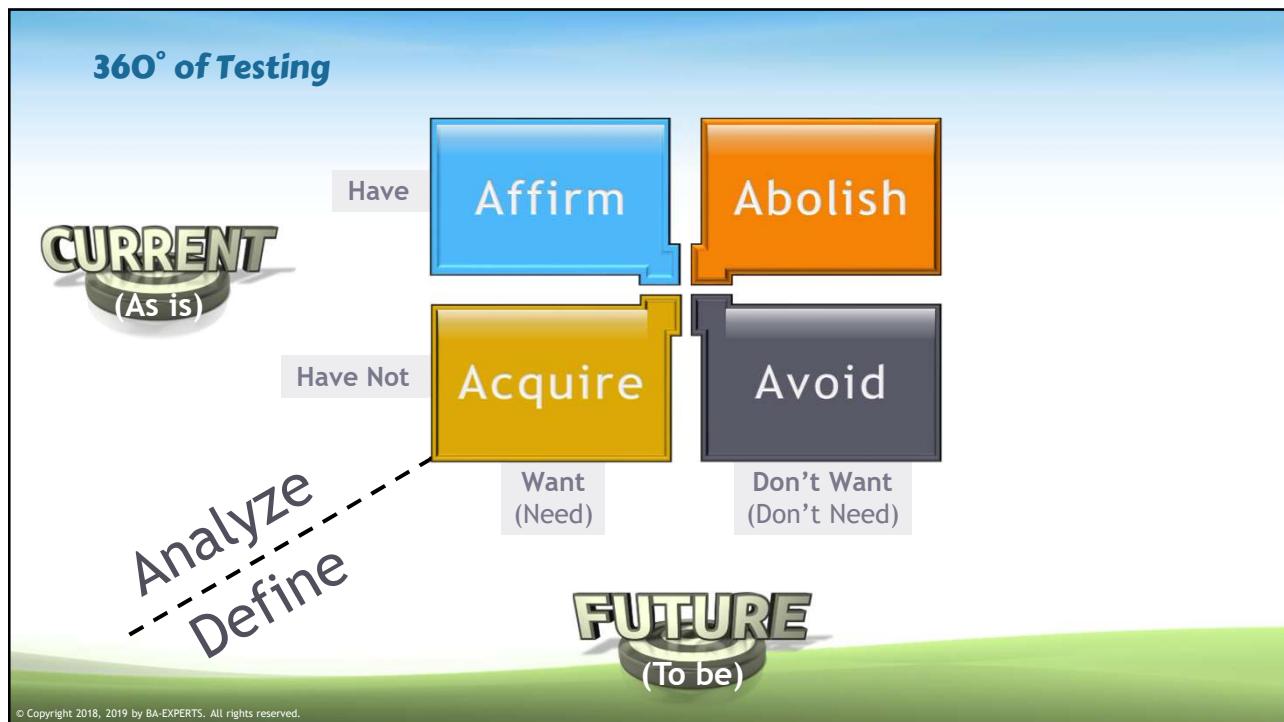
What could happen that could negatively affect this event (activity, process, function, entity, or whatever)?

How could the application know that it happened?

How can you evaluate whether the application will respond correctly in this situation?

What do you have to do to simulate the situation?

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Solution Requirements Hide inside Features, Statements, or User Stories

EXAMPLE

To make responsible financial decisions, the Chief Financial Officer (CFO) needs to know the Projected Net Income (PNI) for the upcoming 12month period.

Solution Requirements (Incomplete)

- F231** Calculate Projected Net Income
- D987**: Projected Gross Income
- D994**: Projected Expenditures
- D011**: Current Date
- ...
- U895**: Cash Forecast Window
- ...
- BR687**: Rolling 12-month Period
- ...
- S681**: Limit Access to CFO

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The Functional Perspective

Functional requirements *at some level of detail*:



define what a proposed business solution will do

are expressed as an active verb and a direct object

What examples do you have in your environment?

Process Order

Calculate Sales Tax

Access Customer Credit Limit

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Functions and Informational Requirements

To understand a function, you need to know the data it creates or consumes.

FUNCTIONAL



INFORMATIONAL



Complete

Accurate

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The Data Dimension

Every function needs three basic things:

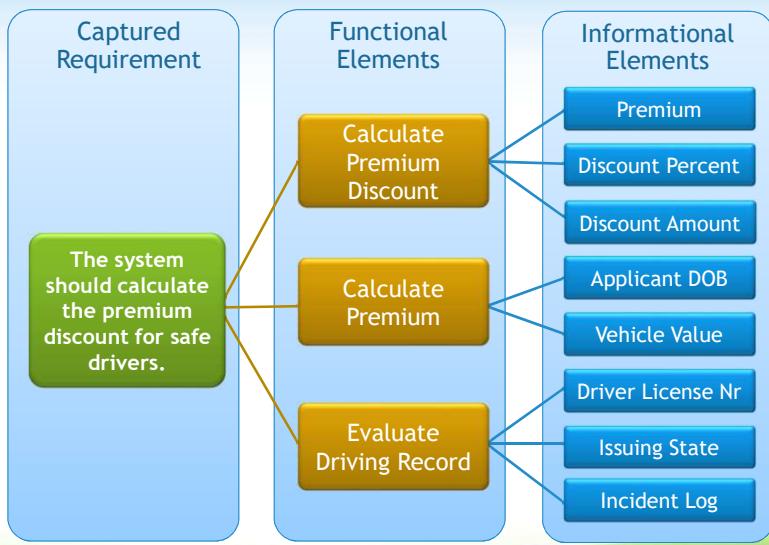


1. Data coming in (input)
2. Data going out (output)
3. Formulas or rules for transforming incoming data to outgoing data



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Finding Informational Elements



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Dealing with Non-Functional Requirements

Defining Characteristics of Non-Functional Requirements (NFR)

Common Categories of NFR

Discovering and Measuring NFR

Validating NFR in Gherkin

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Quantified NFR's are the Bridge to Project Success



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The Problem Dimension of Requirements



NON-FUNCTIONAL REQUIREMENTS (NFR)

↳ Define criteria or properties that individual functions or the entire solution must meet

- ➔ *The nuclear power plant radiation level monitor function has to be available 24/7/365*
- ➔ *Only personal with pay grade E8 and higher can update the Andromeda files*
- ➔ *Access will be controlled with retinal scan, fingerprint, and voice recognition*

↳ Define criteria or properties of the related data

- ➔ *Customer-id is a unique, 15-digit, positive, real number that identifies a single customer*

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Categories of Non-Functional Requirements

Constraints

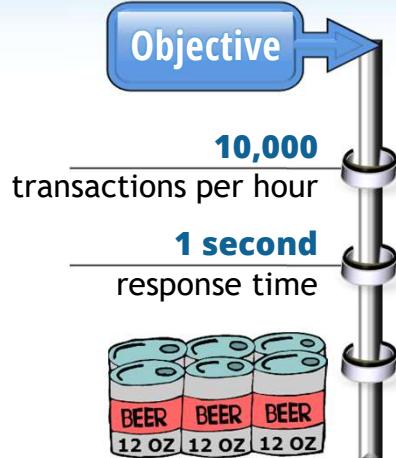
Performance

User Experience

Volatility

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NFR's Need to Be Measurable



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What Are Performance Requirements and Who Defines Them?



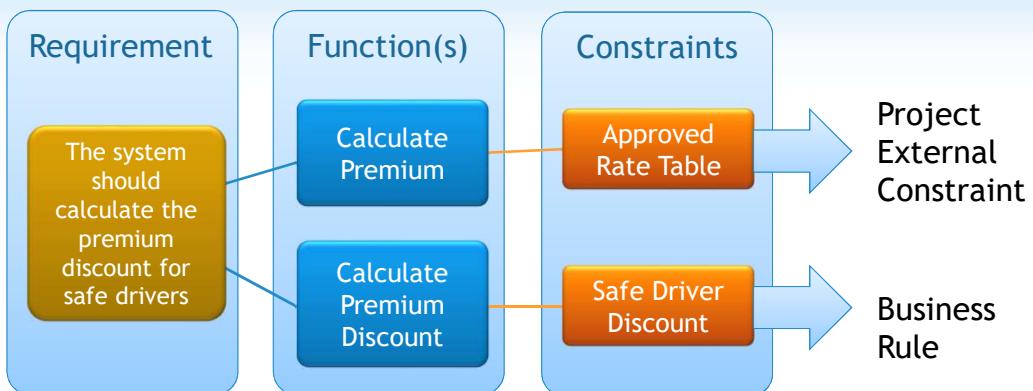
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Non-Functional Requirements via Critical Questions

Performance	
Frequency	How often will the function be used? Cycle vs. Ad Hoc (Peak time and volume)
Urgency	A. Response: How long after a person needs to know must the data be returned? B. Input: How long can the system wait for new data to be entered by a person?
Volume	For each output, how much information (pages, screens, etc.) is produced?
Accuracy	How precise and current does the output have to be? What errors can the user tolerate?
Constraints	
Natural Limits	Enforced by nature (space, size, speed)
Laws & Regulations	Enforced by governing agencies (legal)
Policies & Rules	Enforced by the organization
People	Enforced by users (ability, location, training, security, culture)

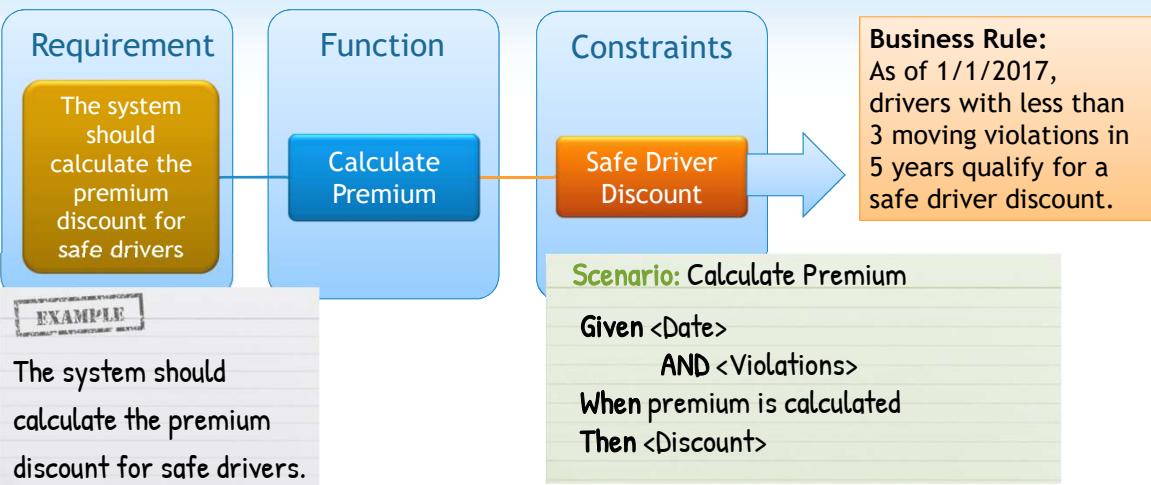
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Discovering Constraining Requirements



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Test Cases for Constraining Requirements



EXAMPLE
The system should calculate the premium discount for safe drivers.

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Internal and External Constraints

Internal Constraint



External Constraint



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Quantified Non-Functional Requirements



End-user experience

Learning curve

Time to adapt

Operating times

Acceptable failures

Links should be consistently recognizable to the end-user.

Experienced underwriters should require no more than a one-day introductory seminar to process Internet applications.

The system will not require modifications to accommodate a 10-fold increase in visitor traffic.

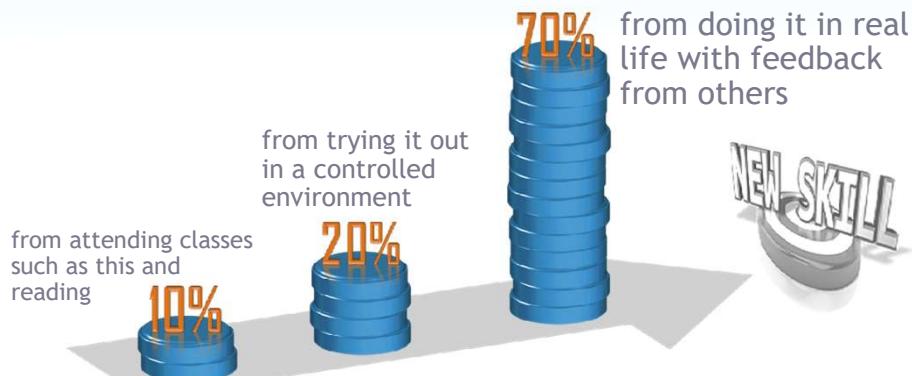
Customer Service will be available for live chats 6am - 10pm EST Mon - Fri.

The nuclear power plant radiation level monitor has to be available 24/7/365.

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Understanding the Learning Curve

YOU ACQUIRE ANY NEW SKILL . . .



Bottom line:

Attending this class was just the beginning . . .

4

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