

SE 329 – Software Project Management

Time and Cost Planning

Lotfi ben Othmane

Recall - Questions

- How much does it cost to develop the system?
- How long does it take to develop the system?

Project goal: The goal of the project is to develop a low-cost fleet monitoring system. It includes a device installed in a bus collects data from their in-vehicle networks and sends them to a remote server along with the the locations.

Deliverables

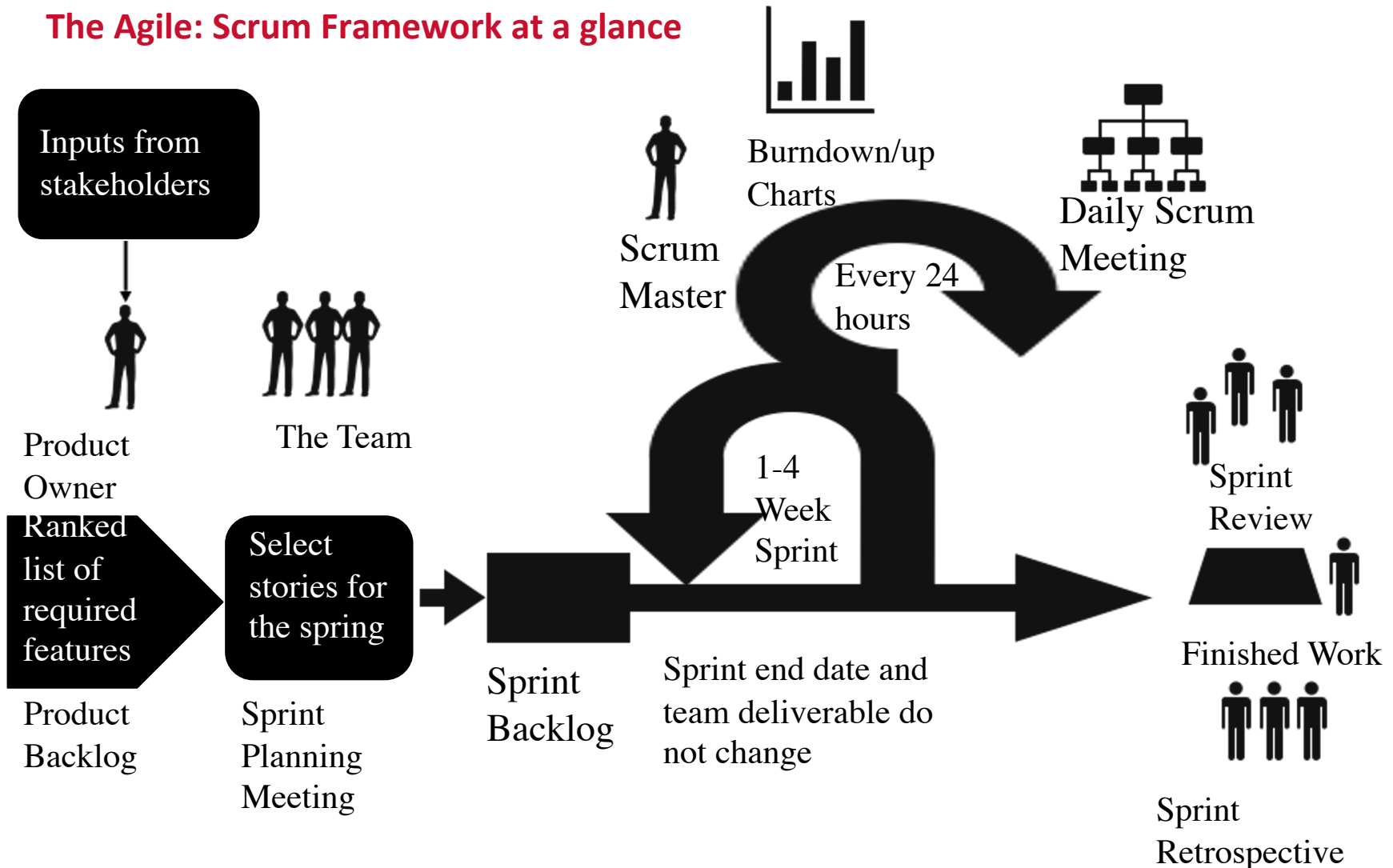
1. Data collection component: A device that collects data from the car and sends it to a remote server along with the location of the vehicle
2. Data visualization: A web application that visualizes the position of each vehicles along with information collected from its network
3. Data analysis: A web application to run ad-hoc statistics using the data

Lecture Plan

1. Identify project activities
2. Estimate activity resources
3. Sequence activities
4. Estimate project cost

Estimating Project Duration vs Development Process

The Agile: Scrum Framework at a glance



What is Activity Estimate?

- **Activity estimate** is an approximation of the type and quantity of material and human resources required to perform an activity.
- Estimates quantify the cost required to complete a given work
- The accuracy of estimates depends on the level of details of the description of the work to be done.
- Classes of estimate
 - **High level – low accuracy**
 - **Low-level -- high accuracy**

Uses of Activity Estimates

- It includes
 - Evaluate the viability of a project
 - Provide details for scheduling
 - Provide a basis for bidding
 -

Techniques for Estimating Activity Duration

The common ones are:

1. Experts judgement
2. Analogous estimating
3. Parametric estimating
4. Three point estimating
5. Group decision-making estimating

Analogous estimating

- We have previous experience with similar projects
- The new estimate needs to consider the context of the new project such as complexity and size.

Parametric estimating

- Parametric estimating uses an relationships between project parameters as identified from historical data.
- Example of parameters
 - Language
 - Frameworks
 - Experience of developers

Parametric estimating

Case of fixing security bugs: See Table in Appendix A

https://link.springer.com/chapter/10.1007/978-3-319-23318-5_6

Three-points Estimation

- Consider estimation uncertainty
- Provided (Three estimates)
 - “o” - Optimistic
 - “p” - Pessimistic
 - “m” - Most Likely
- Derived
 - “e” - Expected Value (time) for each activity
 - “ σ ” - Standard Deviation for the project
 - The expected variability
 - (“ σ^2 ” –we’ll work with variance, so we can task variances)

Three-points Estimation

Expected (e)

$$= (o + 4m + p)/6$$

Activity	o	m	p	e	variance
A	1	2	3	2	
B	2	3	4		
C					
D					
E	1	4	7		
F	1	2	9		
G	3	4	11		
H	1	2	3		

$$e_A = (1 + (4)*2 + 3)/6$$
$$e_A = 2$$

Three-points Estimation

Compute the variance of estimates

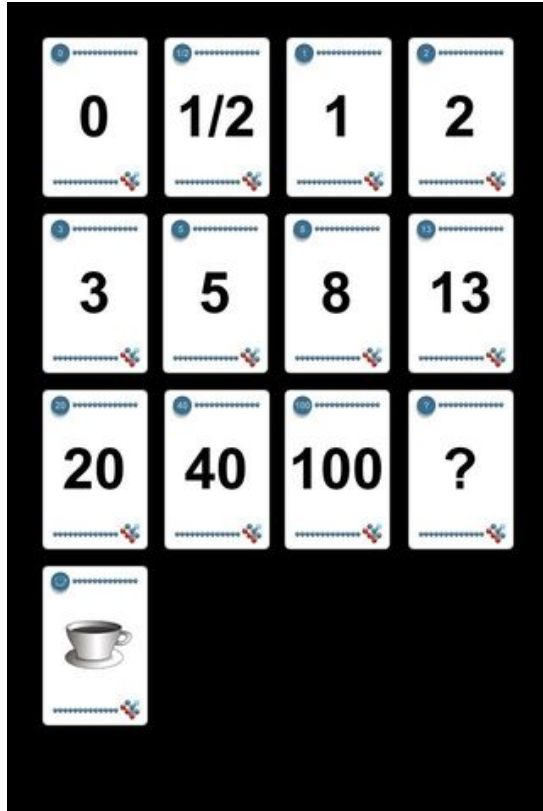
Activity	o	m	p	e	variance
A	1	2	3	2	0.11
B	2	3	4	3	0.11
C	1	2	3	2	0.11
D	2	4	6	4	0.44
E	1	4	7	4	1.00
F	1	2	9	3	1.78
G	3	4	11	5	1.78
H	1	2	3	2	0.11

$\sigma_p^2 = 3.11$

Techniques for Estimating Activity Duration

1. Experts judgement
2. Analogous estimating
3. Parametric estimating
4. Three-points Estimation
5. Group decision-making estimating

Group Estimation– Poker Game



Discussion – Estimation Using the Poker Game

	Activity	Duration
1.0	Acquire hardware	
2.0	Setup the development environment	
3.0	Setup the libraries on the Arduino	
4.0	Prepare the server with required libraries	
5.0	Develop the acquisition component	
5.1	Send a request to the CAN and get the response	
5.2	Format the response and send it to the server	
6.0	Develop the server application	
6.1	Receive CAN data	
6.2	Store data in database	
7.0	Test the solution	

<https://github.com/lbenothmane/FleetManagement>

Divergence of Estimation

Why do the estimates diverge?

Gantt Chart

- Visualizes the durations of the tasks and assignments
- Easy to understand
- Does not support explicitly the dependencies between tasks

Activity	Owner	Week										
		1	2	3	4	5	6	7	8	9	10	11
Build Phase												
Order Parts and Materials	Karen	█	█	█								
Machine Frame Parts	Matt		█	█			█	█				
Weld Frame Parts	Matt			█	█	█		█	█			
Build Frame Structure Prototype	Matt				█	█		█	█			
Build Frame Structure	Matt						█	█	█	█		
Assemble Foam	Karen			█	█	█		█	█			
Change Dampers on VIS	Rob		█	█	█			█	█			
Set-Up Arduino and Accelerometers	Rob			█	█	█						
Test Phase												
Create Final Test Plan	Karen	█	█	█	█							
Vibration Testing	Rob			█	█	█	█	█				
Impact Testing	Matt / Karen					█	█	█	█			
Interface Testing	Matt					█	█	█	█			
Total System Specs Testing	Matt							█	█			
Presentation												
Technical Paper Draft	All							█	█	█		
Technical Paper Final	All								█	█	█	
MSD Poster	Karen								█	█	█	
Presentation for Imagine RIT	Karen								█	█	█	
Final Project Review	Karen									█	█	█
EDGE Website	Karen	█	█	█	█	█	█	█	█	█	█	█
Miscellaneous												
Create Meeting Schedule		█	█									
Regular Updates with Guide		█	█	█	█	█	█	█	█	█	█	█

Contingency Reserve - Buffers

- Buffers are used to account for uncertainty
- The buffer is adjusted as the project progresses and detailed information are available

Thank you