

Project initiation at ACL

Prof. Narasimha Bolloju, BITS-Pilani Hyderabad Campus

Jan 8th, 2021

Madhav Kumar, the CEO of A2Z Cinemas Limited (ACL), was shocked to see the estimated cost received from Aruna Hegde, the CIO, about implementing the functionality to introduce loyalty cards for their customers. Aruna briefed him yesterday about the complexities and challenges associated with the implementation due to the existing information and communications technology (ICT) infrastructure. Madhav is in a dilemma in choosing between continuing with the status quo and taking up a major transformation of the infrastructure. The latter choice has the potential to not only deal with the current challenges but also provide necessary agility in realizing his longer-term expansion plans. Since all the cinemas are closed due to Covid-19 lockdown since late March 2020, he is confident that his staff, especially the IT staff, can be asked to devote their time and effort on this transformation. Madhav has been worried - since he took over the position from his father - about the existing ICT infrastructure as it is limiting planned expansion capabilities. He recollects how the company, founded by his father Shyam Kumar, has expanded over the last 15 years.

1.1 Historical background

ACL was incorporated in 2005 in central Mumbai. Shyam Kumar founded the company with a small theatre complex consisting of five screens showing national, international and regional language movies. By 2010, ACL expanded to five multiplexes at prominent locations in Mumbai by acquiring and rebranding other not so profitable theatres and multiplexes. Tasting the success from these acquisitions and rebranding, ACL had further expanded its operations in 12 other cities in India, with another 20 multiplexes having a number of screens varying between 5 and 10, through several acquisitions during the next decade (Exhibit 1.1).

ACL was successful in turning the loss-making multiplexes into profitable ventures. Operations at each multiplex were being supported through a mix of computerized systems and applications that existed at the multiplex at the time of acquisition. Shyam Kumar – in consultation with the then IT manager Ramakant Desai - felt that using existing IT infrastructure will not only be cost-effective and less risky but also the existing staff at those multiplexes can be effectively employed without any retraining. Following the online ticket sales trend in India, the company established multiple links – due to differences in underlying technologies - for each multiplex with external systems such as BookMyShow and PayTM for online ticket sales.

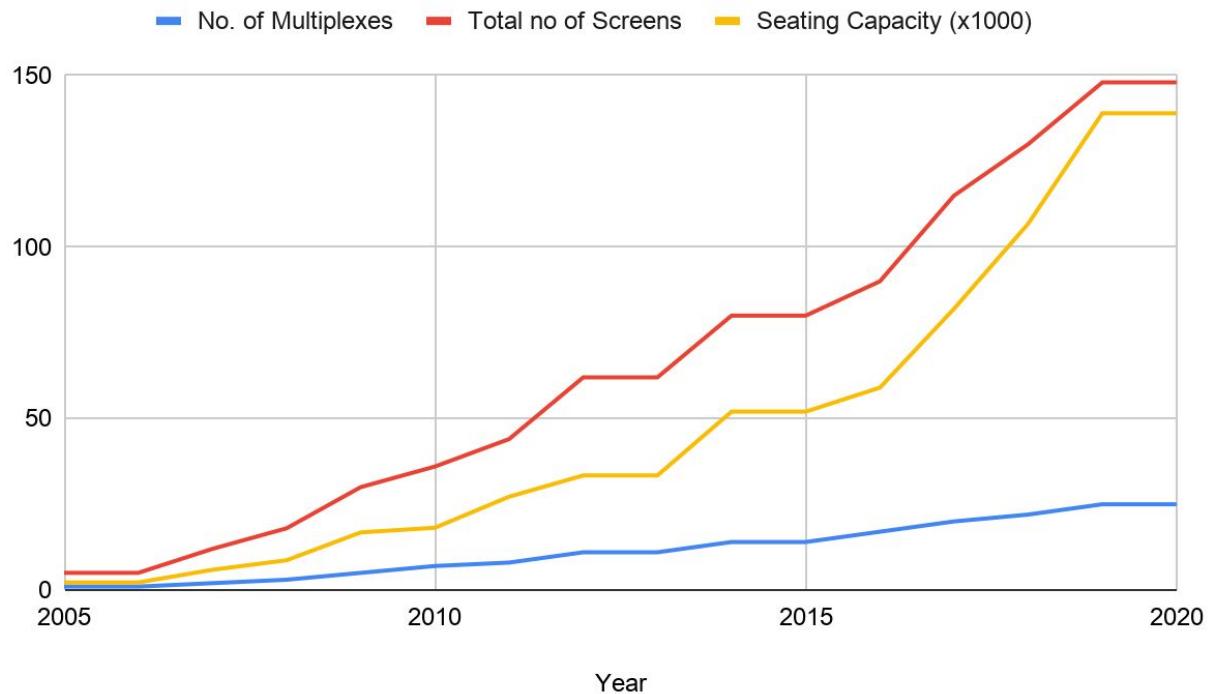


Exhibit 1.1 - ACL's growth since 2005

At the beginning of 2018, there was an anticipated change in top management. Madhav Kumar was given the position of CEO by his father who planned his retirement a few years ago. Madhav, having graduated with an MBA from a prestigious institution, has been planning on multiple initiatives to enhance efficiency and effectiveness of multiplex operations and decision-making activities throughout the company, and to increase revenues through improved customer service. He noticed that there are several drawbacks with respect to how information and communication technologies (ICT) are being utilized at various multiplexes of ACL. He is also aware of the inefficient or redundant processes, difficulties in obtaining and consolidating data from various multiplexes, and the high cost of maintaining the existing IT portfolio and its linkages with external systems.

Madhav, soon after taking the CEO position, reorganized the Head Office structure (see Exhibit 2). He started centralising several functions such as planning (identifying new movies and scheduling of shows), human resources, and finance & accounting functions. A key part of the operations related to screening of movies at all the digital screens of ACL was also centralised. Another part of the operations function is the sale of tickets and the online aspect of sales through partner websites is currently centralized. He has also created a CIO position to lead the 25 member IT group and to assist him in planning the ICT infrastructure required to support the long term plans and initiatives. Administration and operations at Individual multiplexes,

however, are mostly managed by local managers and supervisors. The support for the IT infrastructure at multiplexes is mostly managed remotely, by the IT group at the Head Office with occasional assistance from two to five part-time IT staff in each city having ACL multiplexes.

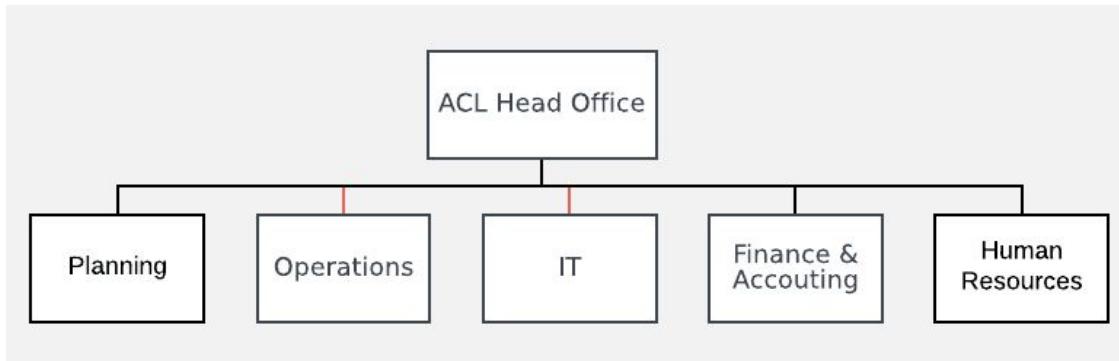


Exhibit 1.2 - Organization structure at ACL

As part of the centralization plan, ACL over the last couple of years has successfully implemented two important solutions related to movie booking & scheduling, and show management applications. These applications are primarily cloud-based solutions from popular international vendors. Madhav and his senior management have been quite happy with these implementations as they introduced state-of-the-art solutions for effective and efficient processes.

The situation, however, with respect to the administration and sales is quite the opposite. The applications that are being used are quite different not only in supporting the processes but also with respect to the underlying infrastructure (see Exhibit 1.3). In addition, due to the shift pattern of customers buying tickets online a good percentage of sales revenue was being lost because of the commissions paid to partners for online ticket sales since 2011 (Exhibit 1.4).

1.2 Large scale transformation

In mid-2018, Madhav - in consultation with the newly appointed CTO Aruna Hegde and other senior executives in the company - planned and implemented two centralized solutions for movie booking and scheduling and screen management. These solutions were purchased from an established vendor in this field and customized to meet the needs of ACL. The first of these targeted to select old and new movies from various distributors and schedule those movies across various multiplexes of ACL. The screen management solution takes care of the actual playing of the movies on various screens as per the prepared schedule. The managers at multiplexes can request schedule changes via email if necessary.

Multiplexes	System environment	Applications
M01, M02, M05	Windows-based	In-house developed application for admin and ticketing
M03, M04	Windows-based ticketing application	Local vendor developed application for ticketing; Vendor went out of business, but third party support is available in a limited form; Administration is primarily done using Excel sheets
M06, M07 and M10	Unix-based	Contracted development to a local software house
M08, M11 and M12	Unix-based	In-house developed application for admin and ticketing
M09, M13 to M19	Unix-based	In-house developed application for admin and ticketing
M20, M22 and M24	Unix-based and Windows-based	In-house developed application for admin and Window-based ticketing application
M21, M23 and M25	Windows-based	In-house developed application for admin and ticketing

Note: Although different multiplexes use similar system environments, different rows in the above table indicate different applications

Exhibit 1.3 - ACL's existing ICT infrastructure related administration and sales

Following the successful implementation, Madhav wanted to initiate a large-scale transformation program in early 2020 immediately after the hectic holiday season. He recollected the IT strategy course he studied and especially the effect of selecting an operating model in transforming the enterprise architecture of an organization (Ross and Taylor, 2004). Accordingly, Madhav has narrowed down to the unification and replication operating models which emphasize on implementing highly standardized processes across the organization. The difference however is with respect to the deployment of the standardized solutions as centralized in the unification model and or distributed in the replication model.

Between these two options, Madhav preferred - after a few rounds of discussions with Aruna - the unification model especially due to the flexibility and lower costs involved by taking advantage of a selective mix of centralized and decentralized operations supported by cloud-based software solutions. This, the large scale transformation plan included replacement of existing ICT with a set of standardized and integrated application systems for supporting standardized processes with the goal of achieving increased operational efficiency, effective decision making, and increased revenues through better customer service and online ticket sales.

Year	No. of Multiplexes	Total no of Screens	Seating Capacity	Seating Capacity (x1000)	Avg ticket price	Perc seats sold	Revenue (x1000)	Partner sales perc	Partner % comm	Comm paid
2005	1	5	2200	2.2	142	78	244	0	0	0
2006	1	5	2200	2.2	152	67	224	0	0	0
2007	2	12	5900	5.9	161	76	722	0	0	0
2008	3	18	8680	8.68	160	56	778	0	0	0
2009	5	30	16800	16.8	140	53	1247	0	0	0
2010	7	36	18160	18.16	132	58	1390	0	0	0
2011	8	44	27200	27.2	145	60	2366	6	10	14198
2012	11	62	33400	33.4	156	67	3491	7	9	21993
2013	11	62	33400	33.4	157	77	4038	9	8	29072
2014	14	80	52000	52	155	78	6287	12	8	60353
2015	14	80	52000	52	156	76	6165	15	8	73981
2016	17	90	59000	59	160	75	7080	18	8	101952
2017	20	115	82000	82	172	74	10437	25	8	208739
2018	22	130	106800	106.8	180	73	14034	33	8	370485
2019	25	148	139000	139	185	76	19543	36	8	562850
2020	25	148	139000	139	190	26	6867	31	8	170292

Exhibit 1.4 - Sales growth and commissions paid to partners for online tickets

As part of this transformation, the top management has identified several projects for implementation over the next five years under the operational efficiency improvement program. From those projects, they selected a high priority project named Mux-Core first to support other multiplex operations such as multiplex administration, ticket sales at its counters, and then to implement online (web and mobile) applications to facilitate online ticket sales to its customers. Their long term plans included the implementation of generic applications such as finance and human resources, and specialized applications such as marketing and promotion systems, and business analytics for decision making based on a company-wide data warehouse.

1.3 Mux-core project overview

The Mux-Core project aims at implementing standardized operations across all the multiplexes of ACL using a couple of integrated application systems for administration and sales:

Mux-Admin - This application system helps managers and supervisors in running the operations such as preparation of weekly duty roster for staff for ticket sales and housekeeping, and supporting other administration tasks such as admitting customers into the theaters and housekeeping activities. This application also facilitates the managers and supervisors with detailed reports such as staff productivity so that they can take appropriate actions by comparing the performance with other multiplexes within the state and the entire country.

Mux-Sales – This application system focuses on counter ticket sales and online sales (web and to the customers through their mobile and web applications directly competing with several partner sales channels such as BookMyShow and PayTM. Though the online sales operations are centrally managed from the head office, the managers at each multiplex are responsible for certain local operations such as blocking certain sections of shows for counter sales and setting promotional ticket prices for selected shows to attract more customers. This system also offers loyalty card functionality through which customers can accumulate points based on their purchases - both online and counter sales - that can be used towards buying tickets at any of the multiplexes of ACL. The managers and supervisors can also obtain reports on sales performance across different sales channels.

1.4 Establishing the Project Team

Aruna, after thoroughly assessing available resources in the company, selected Suresh Kumar as the project manager - with a team of ten software engineers in Hyderabad - for the development and implementation of Mux-Admin and Mux-Sales systems at ACL. Aruna was well aware of the extent of failures (had personal experience as well) of software development projects and wanted to make sure that this project is well-managed.

She discusses with Suresh the management decision about the project and its assignment and asks him to come up with a high-level plan including tentative release dates and resource requirements. Suresh has successfully completed a couple of software development and implementation projects recently. He has always been very enthusiastic about learning new trends and applying relevant ones in software development and project management. Exhibit 1.5 presents a summary of the experiences, skills, and personal details of his team members. Except for a new recruit, all the team members are experienced with agile methods (Scrum/XP) and they were good at JavaScript and experienced in either Java or C++.

	Experience/skills	Personal details
Suresh	PMP certified project manager with 15 years of experience in the IT industry. He has been managing projects for the last four years (less familiar with present development tools).	Married and has two young children attending a primary school near his apartment complex. Is a fitness enthusiast and works out daily in the morning.
Vijay	Good at UI/UX design; Highly experienced in frontend development; recently attended a 5-day training on React – Javascript Library	Engaged recently; to be married in six months; enjoys different cuisines; good team player
Krishna	Very good at database design (both SQL and NOSQL) and backend application development	Bachelor lives with parents; travel time between home and office can be up to two hours each way; plays tennis regularly on weekends; likes to work alone
Rahul	Experienced with MEAN stack (Mongodb, Express, Angular and Nodejs); Good at architecture and design	Bachelor lives with friends; extrovert; likes partying a lot; spends a couple of days every month on social service (teaching adults)
Rekha	Worked recently on a cloud-based software development project; good experience with testing and deployment on cloud environments	Twins born last year; husband frequently travels on work; frequently thinks out-of-box and comes up with new ideas
Madhu	A certified Scrum Master; good at connecting and/or integrating different part of development environments	Both his parents are aged and not that healthy; extremely caring and hardworking; rarely misses any deadlines
Vishal	Has excellent knowledge of business operations; Very good at requirements gathering, analysis and modeling	Pursuing a part-time MBA; may make a career move after graduation; does not like coding
Deepti	Worked on front-end application development in several projects; enthusiastic in learning the backend development as well	Recently married to one of her undergrad classmates who is working as a web application developer; loves watching movies
Manoj	Experienced with MERN stack; Good at architecture and design	Bachelor lives with friends; enjoys playing tennis during weekends
Aparna	Worked on UNIX-based software development project (Java); good experience with testing environments	Two young children; husband - also a software developer - works from home
Priya	Worked on a mobile ticketing project during her studies; has good experience with full-stack mobile application development	Recently graduated from a top institute; interested in pursuing higher studies abroad

Exhibit 1.5 - Project team profile

1.5 Planning of the next steps

Suresh and senior members of the project team analyzed the high-level system requirements and found that most of the requirements - related to ticketing - are well understood. They, however, felt that due to varying possibilities in providing staff scheduling and loyalty card functionality it would be better to employ the Scrum framework for the project. Furthermore, they have expressed that their experience with the Scrum framework can be an advantage.

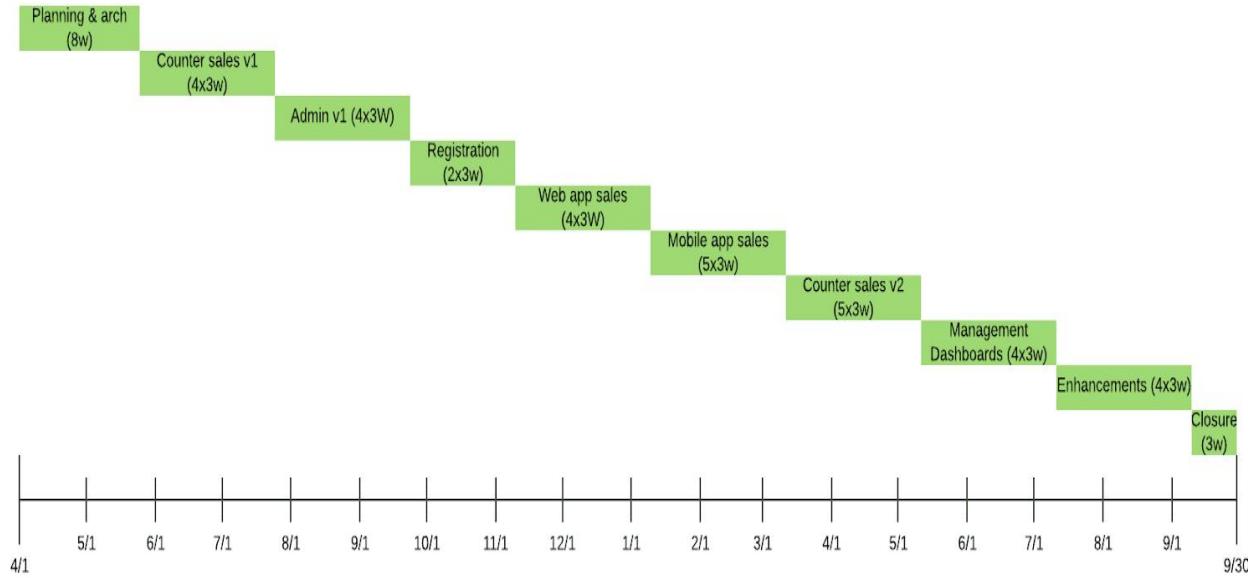


Exhibit 1.6 - Initial plan for development and implementation

Suresh, after discussing with his team, prepared an initial plan (Exhibit 1.6) for the development and implementation with major activities and duration in weeks. The first activity is expected to be completed before starting the work on the first sprint. This plan also indicates sprints of three-week duration and a closure activity of a three-week duration after the last sprint.

The overall approach proposed by the project team - based on the general directions set by the CIO - including use of the Unified Modeling Language (UML) for capturing and documenting key structural and behavioral aspects of the systems, and employing modern software practices for building and deploying cloud-based applications with greater emphasis on flexible design in addition to making use of appropriate devops tools. In addition, the team identified a UI/UX methodology as well to ensure that the developed applications match the user profiles and requirements. As part of the planning and architecture activity, the team planned to complete the work system snapshots, user profiles and personas, system specifications, and high-level architecture.



Software Project Management

SSZG622

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About the SPM course

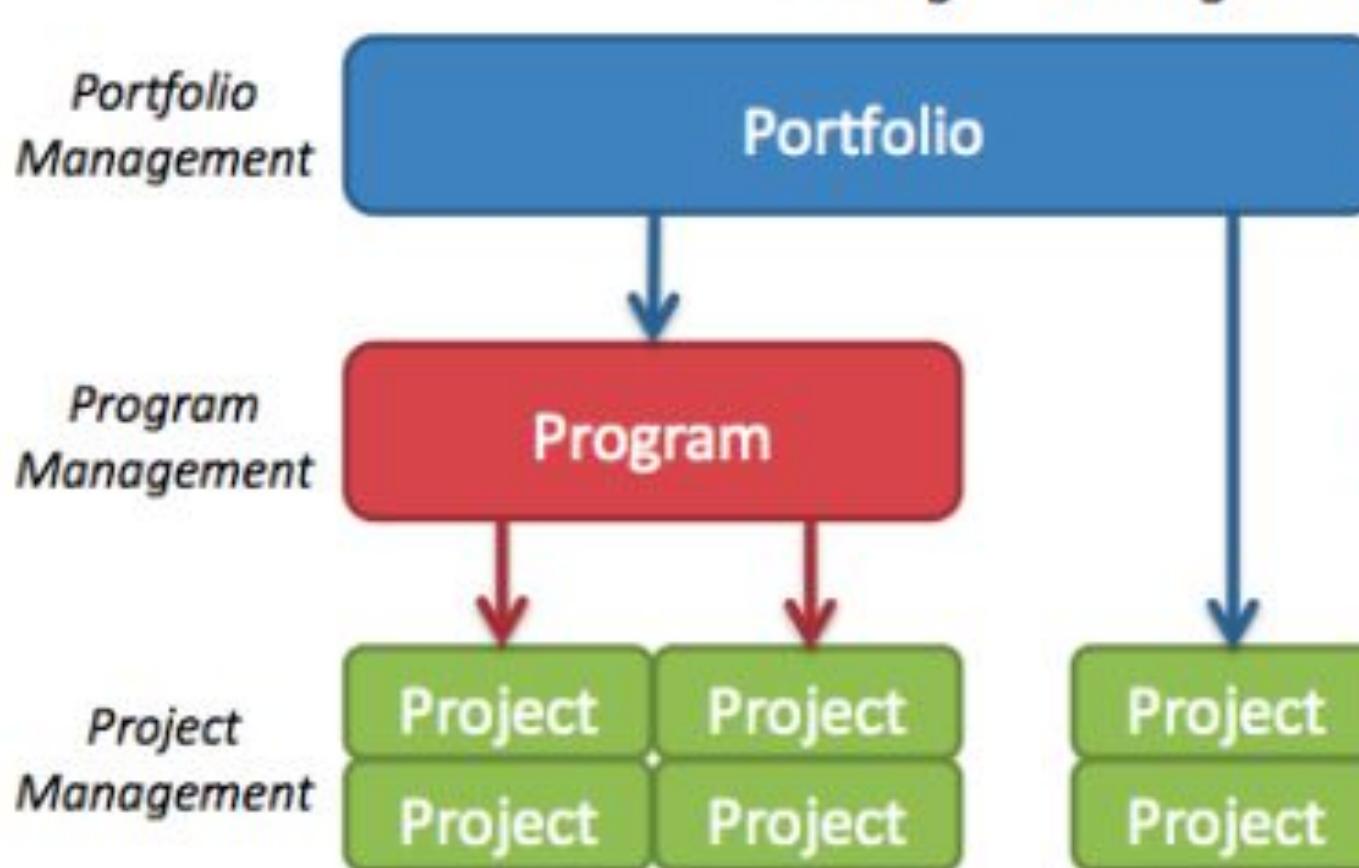
- Flipped mode with recorded lecture content on Taxila/elearn platform
- Small group work (on MS-Teams)
- ACL case study used in all contact sessions

Activity - CS01#1

- a)What do software project managers do or expected to do?
- b)What are the typical challenges associated with managing software development projects?

Topics

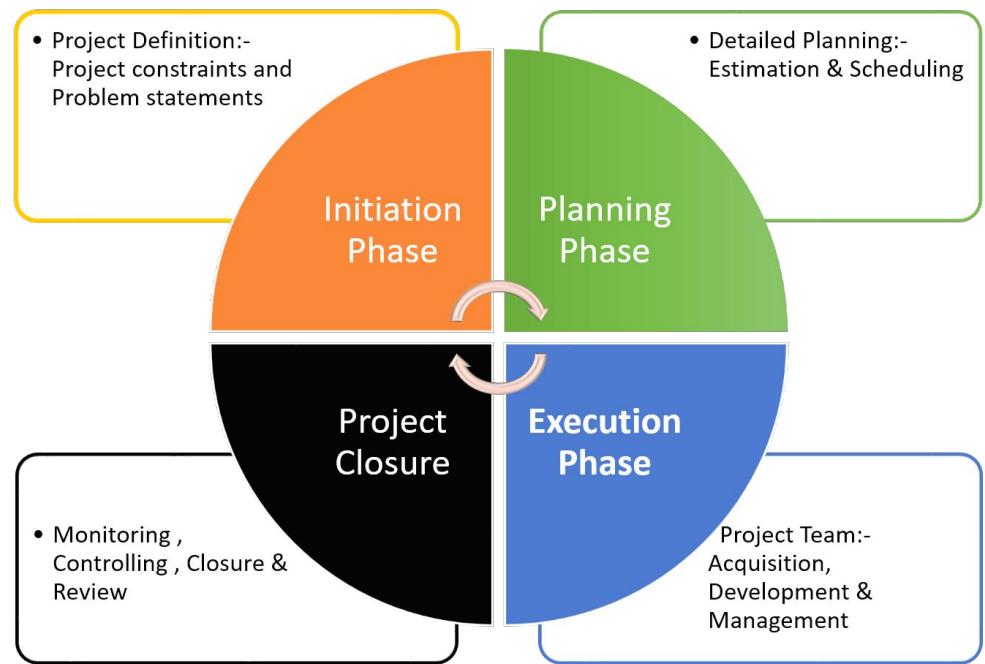
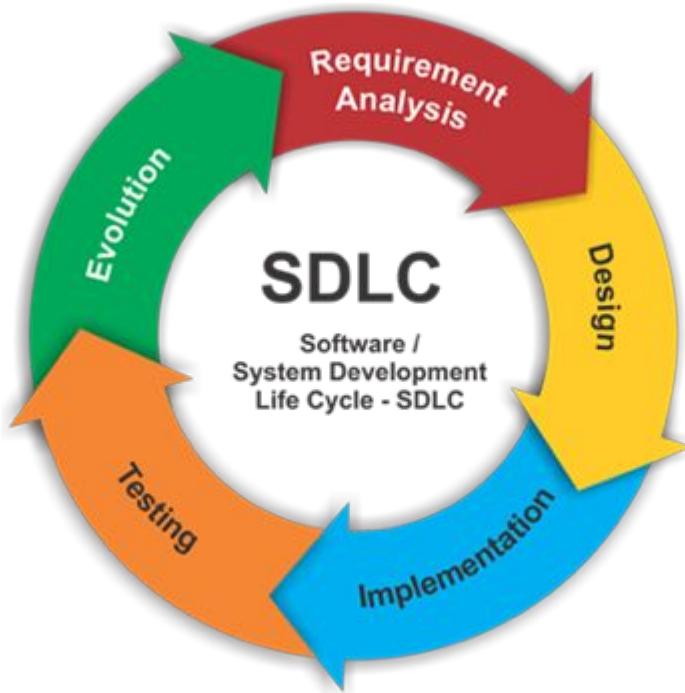
- Project vs. program vs. portfolio
- SDLC vs. project life cycle
- Why SPM is challenging?
- Evaluation scheme and assignment details
- Objectives for information system and project management



Activity - CS01#2

Why A2Z Cinemas Ltd (ACL) wanted to start Mux Core Project (especially when they have other systems providing the required functionality)?

SDLC vs project life cycle



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Software development projects – Success vs failure

MODERN RESOLUTION FOR ALL PROJECTS

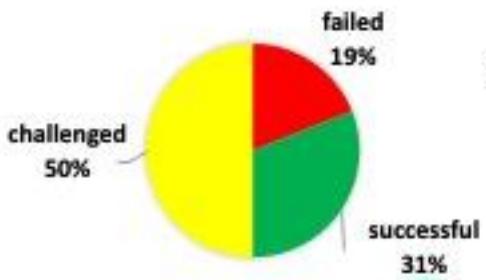
	2011	2012	2013	2014	2015
SUCCESSFUL	29%	27%	31%	28%	29%
CHALLENGED	49%	56%	50%	55%	52%
FAILED	22%	17%	19%	17%	19%

The Modern Resolution (OnTime, OnBudget, with a satisfactory result) of all software projects from FY2011–2015 within the new CHAOS database. Please note that for the rest of this report CHAOS Resolution will refer to the Modern Resolution definition not the Traditional Resolution definition.

<https://www.infoq.com/articles/standish-chaos-2015>

Project Success Quick Reference Card

Based on CHAOS 2020: Beyond Infinity Overview, January 2021, QRC by Henny Portman



Modern measurement (software projects)



Good Sponsor, Good Team, and Good Place are the only things we need to improve and build on to improve project performance.



The **Good Place** is where the sponsor and team work to create the product. It's made up of the people who support both sponsor and team. These people can be helpful or destructive. It's imperative that the organization work to improve their skills if a project is to succeed. This area is the hardest to mitigate, since each project is touched by so many people. Principles for a Good Place are:

- The Decision Latency Principle
- The Emotional Maturity Principle
- The Communication Principle
- The User Involvement Principle
- The Five Deadly Sins Principle
- The Negotiation Principle
- The Competency Principle
- The Optimization Principle
- The Rapid Execution Principle
- The Enterprise Architecture Principle



The **Good Team** is the project's workhorse. They do the heavy lifting. The sponsor breathes life into the project, but the team takes that breath and uses it to create a viable product that the organization can use and from which it derives value. Since we recommend small teams, this is the second easiest area to improve. Principles for a Good Team are:

- The Influential Principle
- The Mindfulness Principle
- The Five Deadly Sins Principle
- The Problem-Solver Principle
- The Communication Principle
- The Acceptance Principle
- The Respectfulness Principle
- The Confrontationist Principle
- The Civility Principle
- The Driven Principle



The **Good Sponsor** is the soul of the project. The sponsor breathes life into a project, and without the sponsor there is no project. Improving the skills of the project sponsor is the number-one factor of success – and also the easiest to improve upon, since each project has only one. Principles for a Good Sponsor are:

- The Decision Latency principle
- The Vision Principle
- The Work Smart Principle
- The Daydream Principle
- The Influence Principle
- The Passionate Principle
- The People Principle
- The Tension Principle
- The Torque Principle
- The Progress Principle



Successful project Resolution by Good Place Maturity Level:

highly mature	50%
mature	34%
moderately mature	23%
not mature	23%

Successful project Resolution by Good Team Maturity Level:

highly mature	66%
mature	46%
moderately mature	21%
not mature	1%

Successful project Resolution by Good Sponsor Maturity Level:

highly mature	67%
mature	33%
moderately mature	21%
not mature	18%

<https://hennyportman.wordpress.com/2021/01/06/review-standish-group-chaos-2020-beyond-infinity/>

Activity - CS01#3

What are the possible reasons for unsuccessful projects (i.e., failed or challenged projects)?

Evaluation scheme

No	Name	Type	Duration	Weight	Day, Date, Session, Time
EC-1	Quiz 1	Online	1 week	5%	Before mid-sem test
	Quiz 2	Online	1 week	5%	After mid-sem test
	Assignment	Report	~ 2 weeks	10%	About three weeks before the regular comprehensive exam
EC-2	Mid-Semester Test	Open Book	2 hours	30%	Refer to the semester calendar
EC-3	Comprehensive Exam	Open Book	2 hours	50%	Refer to the semester calendar

Individual assignment

- You will prepare and submit a report on a topic related to software project management
- You are expected to put in 12-15 hours of effort in study, collecting relevant information, and preparation of the report
- Final reports will be checked for plagiarism using Turnitin tool (no marks will be awarded for reports with similarity score above 25%)
- Details are provided in Assignment.doc and Report Template.docs (posted on elearn/taxila)

Sample topics for the assignment



Software effort estimation

Project initiation or planning

Project management life cycle

Project risk management

Techniques for quality improvement

Project scheduling

Build or buy decision making

Project evaluation

Activity - CS01#4

For the Mux-Core project of ACL, identify objectives for

- a) Mux-Core system and
- b) Mux-Core project management



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Contact Session # 2

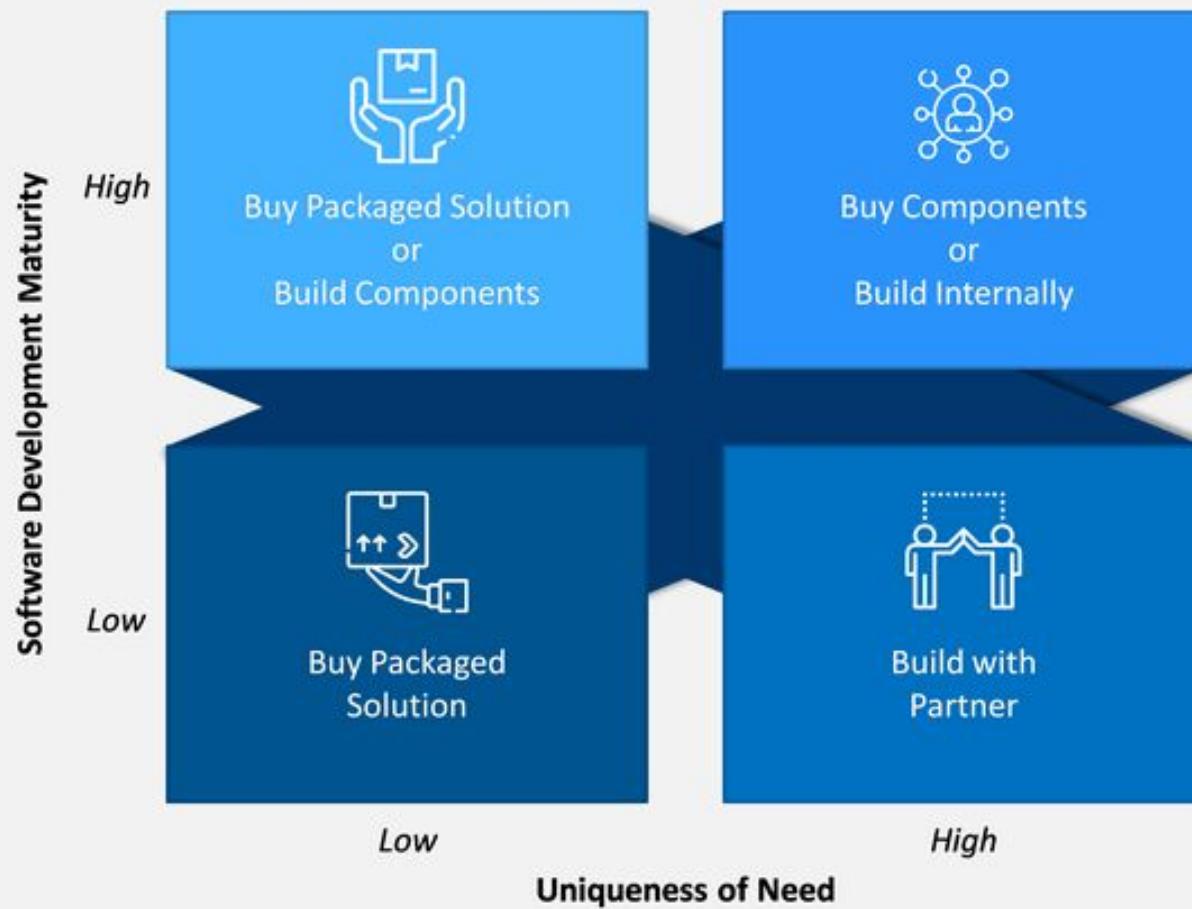
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Outline

- Buy vs. build decision
- Plan-driven and agile process models
 - Some popular models
 - Selection of right process model for a given project
- Agile paradigm shift
- Overview of Scrum and user stories

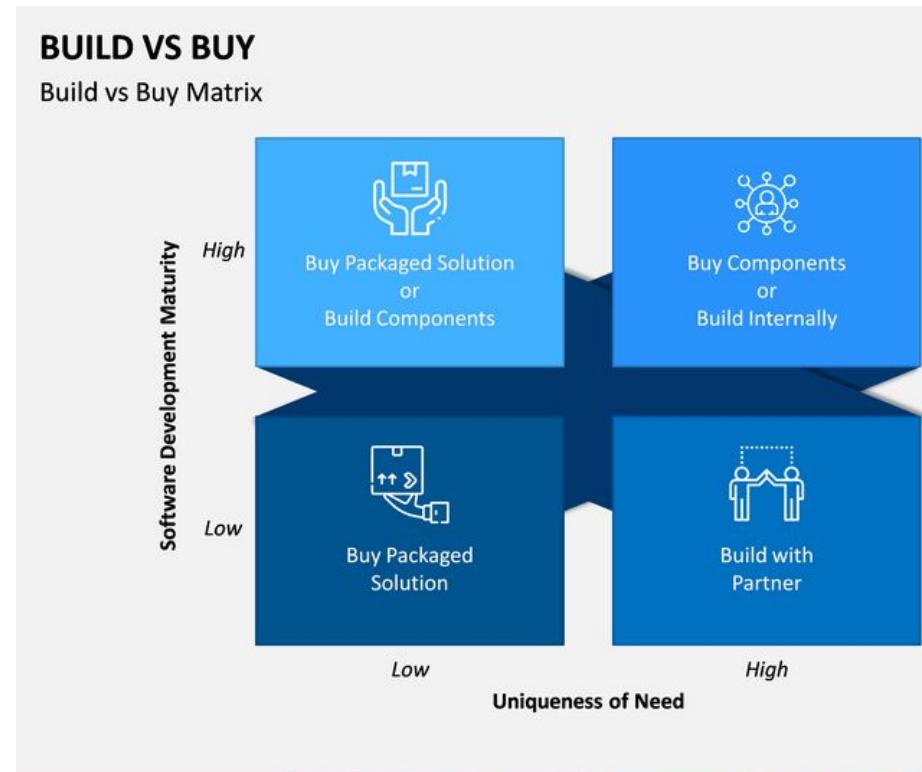
BUILD VS BUY

Build vs Buy Matrix



Activity CS2 #1

Which option is best suited for the Mux Core System(s) at ACL? And, why?

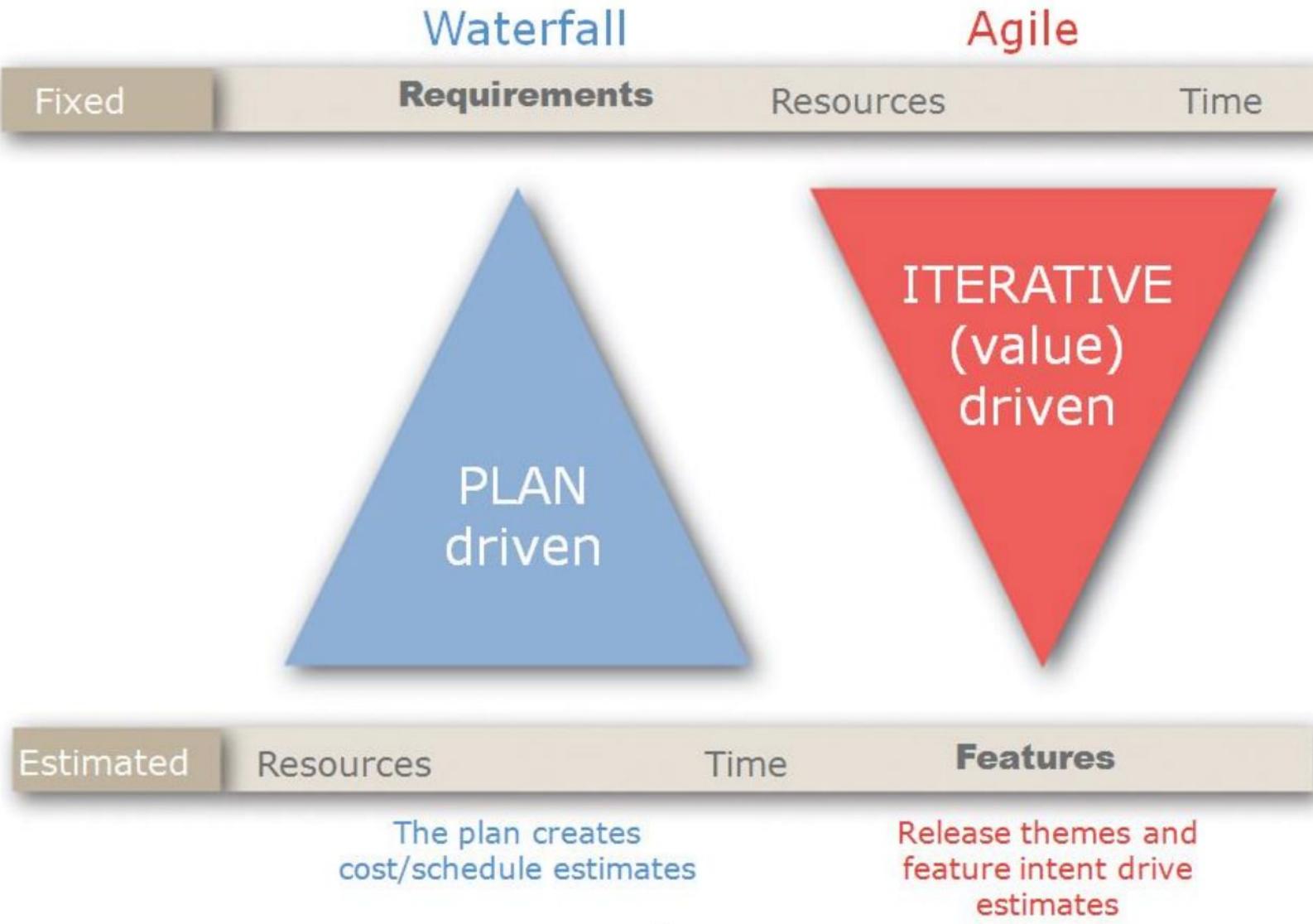


Plan-driven vs. agile process models



- In plan-driven process models, activities are planned in advance and progress is measured against the plan
- In agile process models, planning is incremental and it is easier to change the process to reflect changing requirements
- There is no right or wrong process model; most organizations/teams include elements from both in their process models

The Agile Paradigm Shift



Specific elements of the paradigm shift



- Customer-driven vs. customer-centric
- Change as an asset vs a risk
- Internally vs externally managed
- Teamwork vs. individual performance

<https://blog.planview.com/4-paradigm-shifts-that-traditional-project-management-teams-must-embrace-to-make-agile-work/>

Also, read <https://blog.planview.com/dos-and-donts-for-agile-team-success/>

Activity CS2 #2

Identify pros and cons of using the following process models for the Mux-Core Project

- waterfall
- iterative/incremental
- scrum (agile)

Agile method Scrum - Overview



<http://www.programmeronrails.com/2016/03/20/scrum-overview/>

Product Backlog written as User Stories



User Story Template

- As a **user/role**, I want to **functionality/feature** so that **benefit**

Example user stories in Library System

- As a **student**, I want to **reserve books** I want so that I can **borrow the books as soon as they are available**
- As a **faculty**, I want to **recommend books** for my **courses** so that **my students will be able to read those books**

Read <https://www.mountaingoatsoftware.com/agile/user-stories>

Activity - CS02#4

Write four or five user stories for the Sales system of Mux-Core project at ACL



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Contact Session # 3

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Outline

- Agile process - Scrum sprint planning
 - Product backlog (evolving system scope)
 - **Prioritizing and sprint backlog**
 - **Estimating story points**
 - Burndown charts for project management
 - Decomposition of complex user stories

Expected functionality

As a/an	I want to	So that
Supervisor	view daily sales performance of movies on dashboard	I can provide my feedback to my manager
Manager	view sales performance of various movies and screens	I can analyze sales performance
Manager	compare sales of movies with those at other multiplexes	I can analyze differences and take necessary actions
Manager	set discounts on specific shows	the multiplex can attract more customers
Manager	receive notifications about sales deviations	I can review the sales pattern and take necessary actions
Counter Staff	sign in for a sales duty session	I can sell tickets to customers
Counter Staff	sell movie tickets to customers	they can be admitted to watch movies
Counter Staff	sign out of sales duty session	my session details can be recorded and closed
Customer	search for movies and shows	I can select a movie show I am interested in
Customer	register for a loyalty card	I can buy tickets online and rate movies
Customer	buy tickets for a selected movie show	I/we can be admitted to watch that movie show
Customer	rate and review movies I have seen	other customers can read from my rating/review
Customer	view my loyalty card points balance	I can purchase tickets with those points

Product backlog prioritization by “value”



As a/an	I want to
Manager	view sales performance of various movies and screens
Manager	compare sales of movies with those at other multiplexes
Manager	set discounts on specific shows
Manager	receive notifications about sales deviations from targets
Counter Staff	sign in for a sales duty session
Counter Staff	sell movie tickets to customers
Counter Staff	sign out of sales duty session
Customer	search for movies and shows
Customer	register for a loyalty card
Customer	buy tickets for a selected movie show
Customer	rate and review movies I have seen
Customer	view my loyalty card points balance

Activity CS3#1

Prioritize the given user stories by
changing the order of the stories
(high value ones at the top)

<https://pollev.com/narsibolloju019>

Scrum - estimation

- Traditional software teams give estimates in a time format: days, weeks, months.
- Many agile teams, however, have transitioned to story points. Story points rate the relative effort of work using
 - Fibonacci-like format: 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, ...
 - Powers of 2: 1, 2, 4, 8, 16, 32, 64, ...
 - T-shirt sizes: XXS, XS, S, M, L, XL, XXL
 - ...



Planning Poker – estimation technique



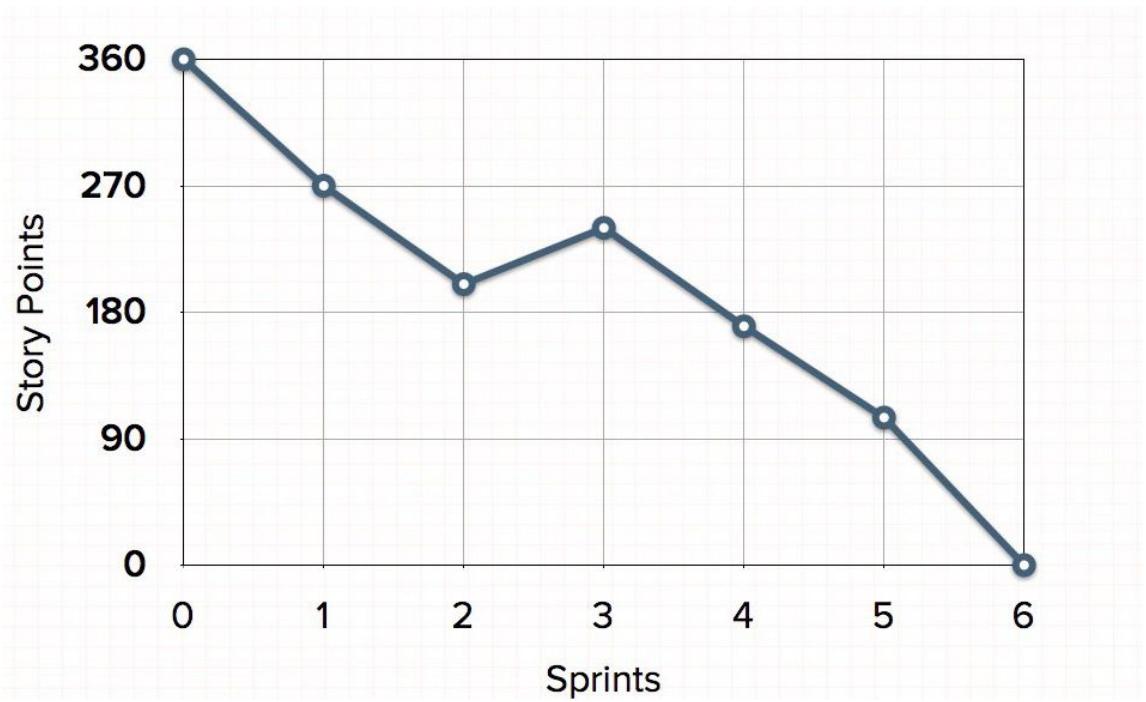
- All participants use numbered playing cards and estimate the items
- Individual estimates are done and discussion is raised when there are large differences
- This process is repeated till the whole team reached consensus about the agreed estimation (which is not an average of estimates!)

<https://technology.amis.nl/2016/03/23/8-agile-estimation-techniques-beyond-planning-poker/>

Activity CS3#2

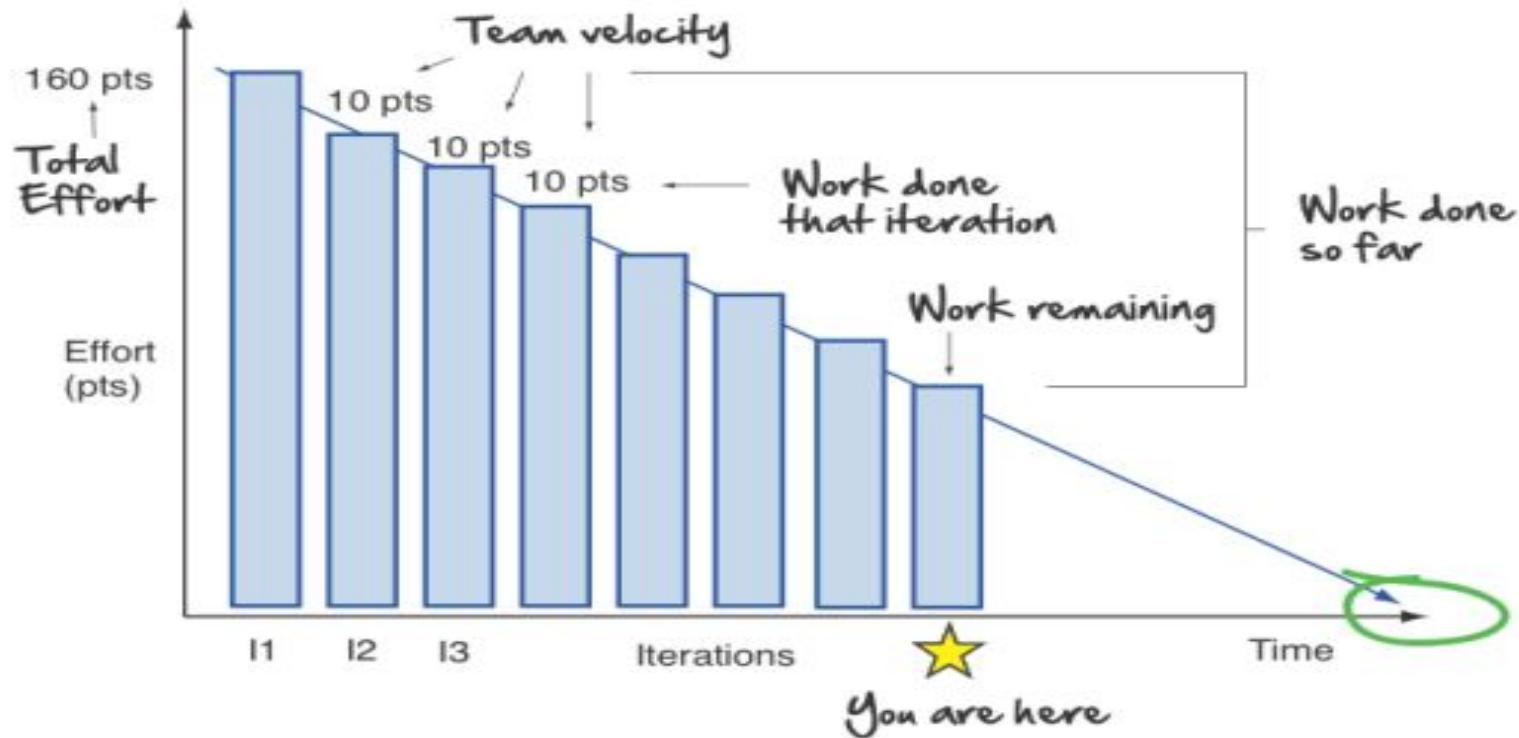
Estimation of “story points” for
“set discounts on specific shows”
using powers of 2: 1, 2, 4, 8, 16, 32, ...

Burndown Chart - example



*

Burndown Charts



Activity CS3#3

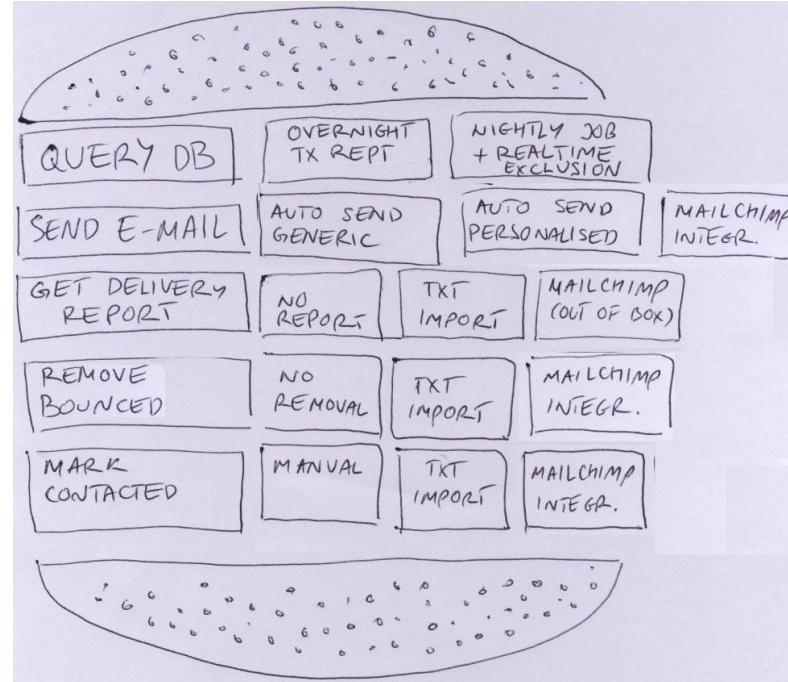
Decompose the user story
“sell movie tickets to customers”
into several simpler user stories

User story decomposition - vertical slicing



<https://gojko.net/2012/01/23/splitting-user-stories-the-hamburger-method/>

User story decomposition - vertical slicing



<https://gojko.net/2012/01/23/splitting-user-stories-the-hamburger-method/>



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Supervisor	view daily sales performance of movies on dashboard	I can provide my feedback to my manager
Manager	view sales performance of various movies and screens	I can analyze sales performance
Manager	compare sales of movies with those at other multiplexes	I can analyze differences and take necessary actions
Manager	set discounts on specific shows	the multiplex can attract more customers
Manager	receive notifications about sales deviations	I can review the sales pattern and take necessary actions
Counter Staff	sign in for a sales duty session	I can sell tickets to customers
Counter Staff	sell movie tickets to customers	they can be admitted to watch movies
Counter Staff	sign out of sales duty session	my session details can be recorded and closed
Customer	search for movies and shows	I can select a movie show I am interested in
Customer	register for a loyalty card	I can buy tickets online and rate movies
Customer	buy tickets for a selected movie show	I/we can be admitted to watch that movie show
Customer	rate and review movies I have seen	other customers can read from my rating/review
Customer	view my loyalty card points balance	I can purchase tickets with those points

Product backlog prioritization by “value”



As a/an	I want to
Manager	view sales performance of various movies and screens
Manager	compare sales of movies with those at other multiplexes
Manager	set discounts on specific shows
Manager	receive notifications about sales deviations from targets
Counter Staff	sign in for a sales duty session
Counter Staff	sell movie tickets to customers
Counter Staff	sign out of sales duty session
Customer	search for movies and shows
Customer	register for a loyalty card
Customer	buy tickets for a selected movie show
Customer	rate and review movies I have seen
Customer	view my loyalty card points balance

Activity CS3#1

Prioritize the given user stories by
changing the order of the stories
(high value ones at the top)

<https://pollev.com/narsibolloju019>

Scrum - estimation

- Traditional software teams give estimates in a time format: days, weeks, months.
- Many agile teams, however, have transitioned to story points. Story points rate the relative effort of work using
 - Fibonacci-like format: 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, ...
 - Powers of 2: 1, 2, 4, 8, 16, 32, 64, ...
 - T-shirt sizes: XXS, XS, S, M, L, XL, XXL
 - ...



Planning Poker – estimation technique



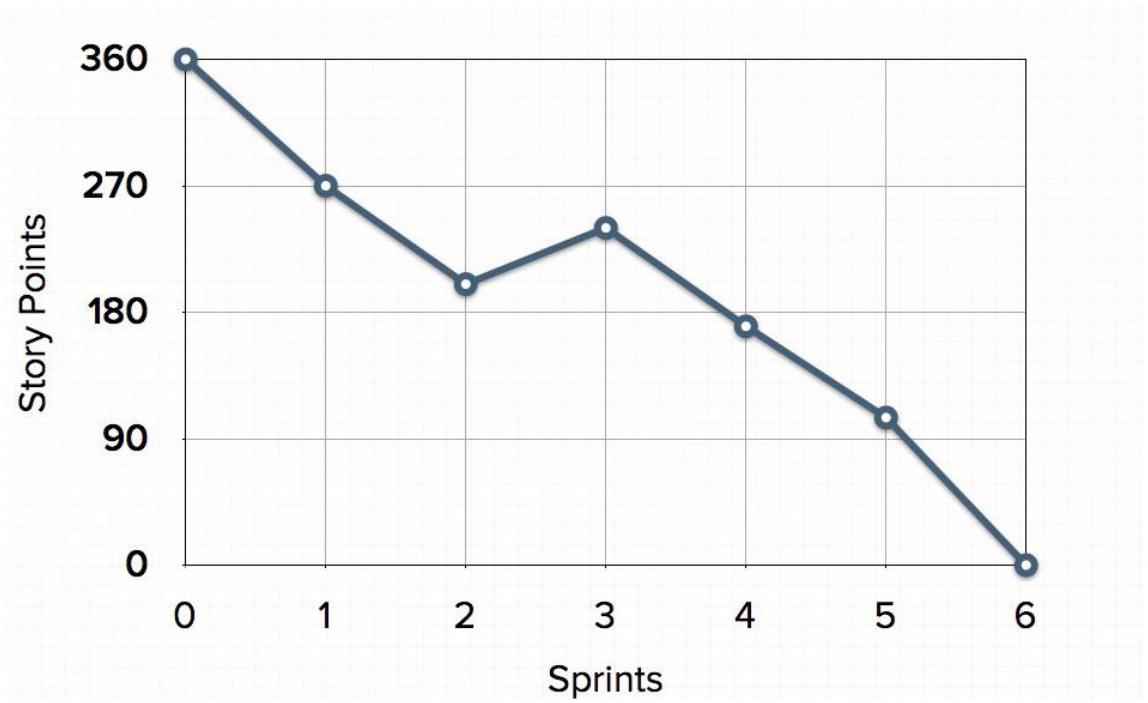
- All participants use numbered playing cards and estimate the items
- Individual estimates are done and discussion is raised when there are large differences
- This process is repeated till the whole team reached consensus about the agreed estimation (which is not an average of estimates!)

<https://technology.amis.nl/2016/03/23/8-agile-estimation-techniques-beyond-planning-poker/>

Activity CS3#2

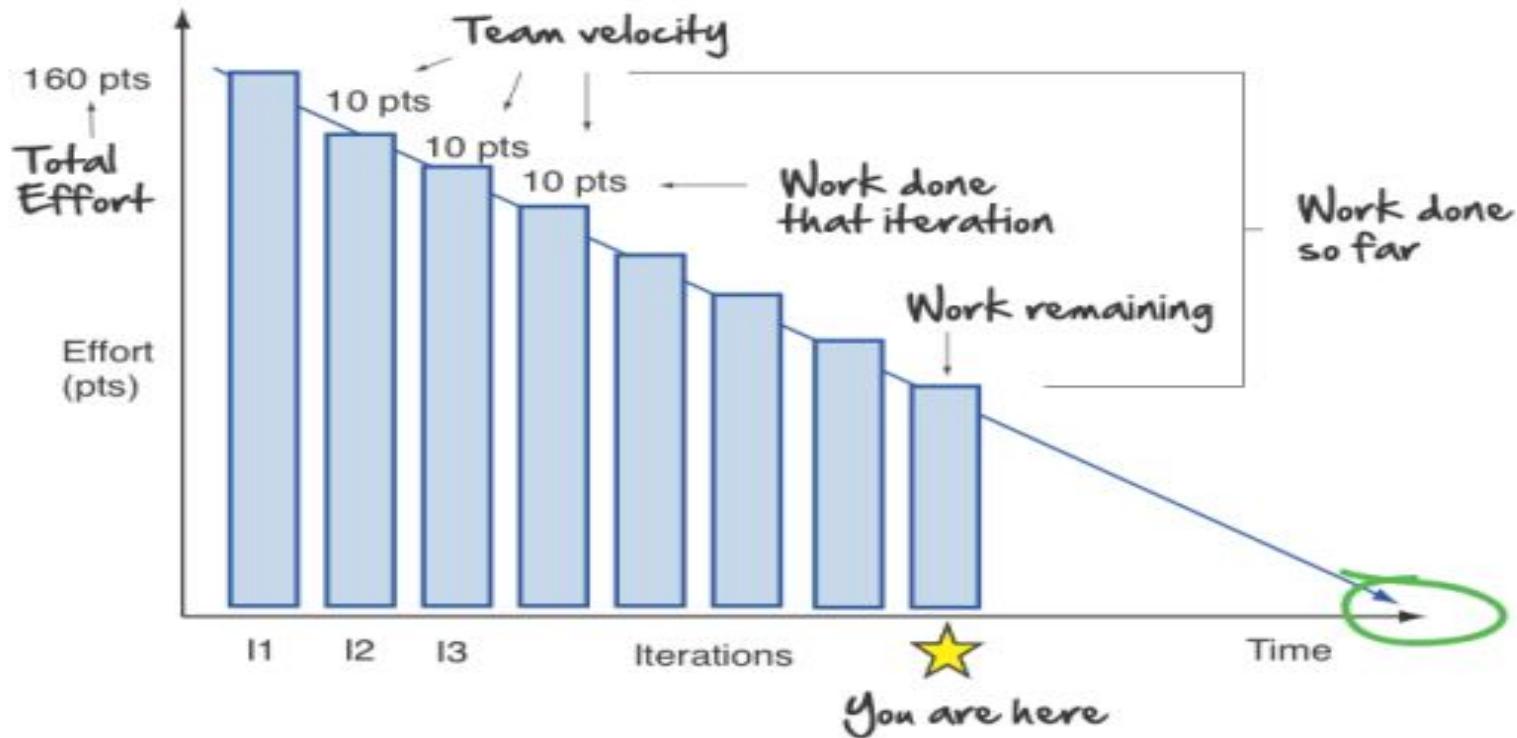
Estimation of “story points” for
“set discounts on specific shows”
using powers of 2: 1, 2, 4, 8, 16, 32, ...

Burndown Chart - example



*

Burndown Charts



Activity CS3#3

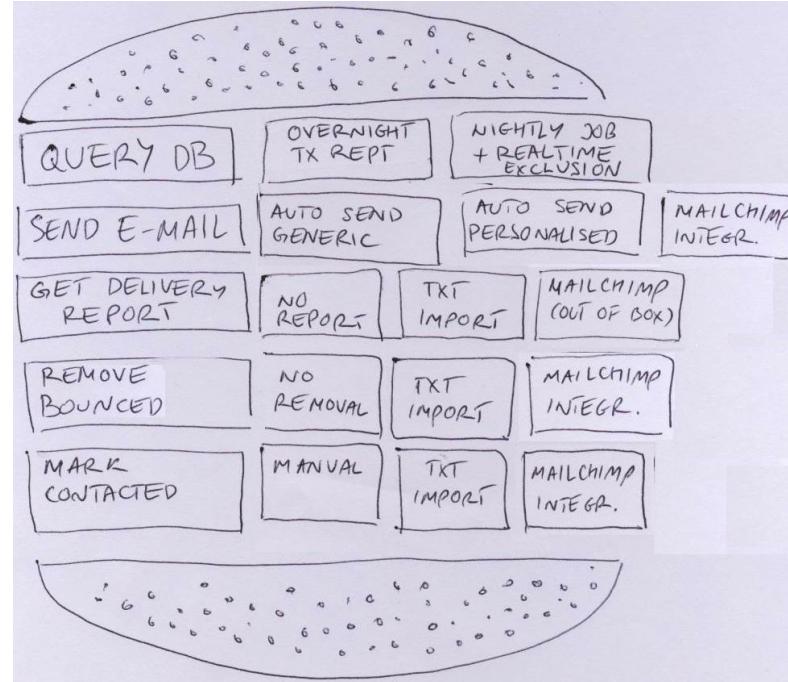
Decompose the user story
“sell movie tickets to customers”
into several simpler user stories

User story decomposition - vertical slicing



<https://gojko.net/2012/01/23/splitting-user-stories-the-hamburger-method/>

User story decomposition - vertical slicing



<https://gojko.net/2012/01/23/splitting-user-stories-the-hamburger-method/>



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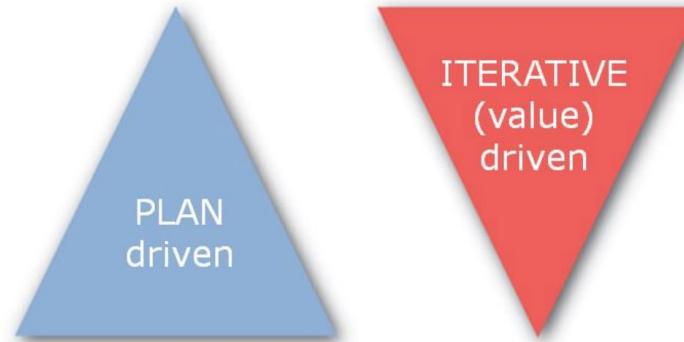
Outline

- Effort estimation in plan-driven processes
- Function point estimation method
- Function points to effort
- Function points to SLOC

The Agile Paradigm Shift



9



The plan creates
cost/schedule estimates

Release themes and
feature intent drive
estimates

Mux-Core Sales –

Expected functionality

As a/an	I want to	So that
Supervisor	view daily sales performance of movies on dashboard	I can provide my feedback to my manager
Manager	view sales performance of various movies and screens	I can analyze sales performance
Manager	compare sales of movies with those at other multiplexes	I can analyze differences and take necessary actions
Manager	set discounts on specific shows	the multiplex can attract more customers
Manager	receive notifications about sales deviations	I can review the sales pattern and take necessary actions
Counter Staff	sign in for a sales duty session	I can sell tickets to customers
Counter Staff	sell movie tickets to customers	they can be admitted to watch movies
Counter Staff	sign out of sales duty session	my session details can be recorded and closed
Customer	search for movies and shows	I can select a movie show I am interested in
Customer	register for a loyalty card	I can buy tickets online and rate movies
Customer	buy tickets for a selected movie show	I/we can be admitted to watch that movie show
Customer	rate and review movies I have seen	other customers can read from my rating/review
Customer	view my loyalty card points balance	I can purchase tickets with those points

Activity CS5 #1

Give a rough estimate of
the **total effort in person-months** for developing
the **Mux-Core sales system** with the
requirements listed on the previous slide
(pollev.com/narsibolloju019)

Overall effort estimation

- Based on specifications of a software application
- Typical approaches: function point method, SLOC/KLOC method, object points method, OR purely experience-based
- Combines programmer productivity (historical data), development and implementation technologies, and other application characteristics
- Often the effort is represented in terms of person-months

Activity CS5 #2

Give a rough estimate of
the **total effort in person-months** for developing
the **Mux-Core sales system** considering
individual functions/user stories

Use [this Google Sheet](#) first and then submit your
estimate in Chat

Function Points Calculation Sheet

Function Count

Item	Item Description	Complexity	Count	Weight	Weighted Count
1	Number of User Inputs	Simple	0	3	0
		Average	0	4	0
		Complex	0	6	0
2	Number of User Outputs	Simple	0	4	0
		Average	0	5	0
		Complex	0	7	0
3	Number of User Inquiries	Simple	0	3	0
		Average	0	4	0
		Complex	0	6	0
4	Number of Files	Simple	0	7	0
		Average	0	10	0
		Complex	0	15	0
5	Number of External Interfaces	Simple	0	5	0
		Average	0	7	0
		Complex	0	10	0
Total Weighted Function Count (FC)					0

Function point estimation

Factor	Description	Rating
		0=Irrelevant
		5=Essential
F1	Reliability and backup/recovery	
F2	Data communications	
F3	Distributed processing	
F4	Performance	
F5	Operate on existing system	
F6	On-line data entry	
F7	Data entry over multiple screens	
F8	Master files updated on-line	
F9	Complex inputs, outputs, files & inquiries	
F10	Complex internal processing	
F11	Code needs to be reusable	
F12	Need conversion and installation	
F13	Multiple installations of the system	
F14	Easy to change and use	
Complexity Factor (CF) = sum of ratings		0

Function Points

$$\text{Function Points (FP)} = \text{FC} \times (0.65 + 0.01 \times \text{CF}) \quad 0$$

Function point estimation - Complexity example



Number of views contained	Number and source of data tables		
	Total < 4 (<2 servers; <3 clients)	Total < 8 (<3 servers; 3 to 5 clients)	Total > 7 (>3 servers > 5 clients)
<3	simple	simple	average
3 to 7	simple	average	complex
>7	average	complex	complex

<https://www.gristprojectmanagement.us/software-2/albrecht-function-point-analysis.html>
<https://www.gristprojectmanagement.us/software/albrecht-function-point-analysis.html>

CS5 #3 - FP estimation



Estimate the function points for the specified functionality of Mux-Core system

Instructions:

- Make a copy of this document “[CS4 estimating function points](#)”
- Estimate function points for F2 to F6 (for F1 it is already estimated)
- Post the estimated function points into the chat window

FP productivity based on programming language (only an example)

Language	Hours per FP	FP per month
ASP*	06.1	28
Visual Basic	08.5	20
Java	10.6	16
SQL	10.8	16
C++	12.4	14
C	13.0	13
PL/1	14.2	12
C#	15.5	11
COBOL	16.8	10
ABAP	19.9	9

http://www.webratio.com/website/documentation/Case_Study_Productivity_with_WebRatio.pdf

SLOC for function point - programming languages

QSM SLOC/FP Data				
Language	Avg	Median	Low	High
ABAP (SAP) *	28	18	16	60
ASP*	51	54	15	69
Assembler *	119	98	25	320
Brio +	14	14	13	16
C *	97	99	39	333
C++ *	50	53	25	80
C# *	54	59	29	70
COBOL *	61	55	23	297
Cognos Impromptu Scripts +	47	42	30	100
Cross System Products (CSP) +	20	18	10	38
Cool:Gen/IEF *	32	24	10	82
Datastage	71	65	31	157
Excel *	209	191	131	315
Focus *	43	45	45	45
FoxPro	36	35	34	38
HTML *	34	40	14	48
J2EE *	46	49	15	67
Java *	53	53	14	134
JavaScript *	47	53	31	63



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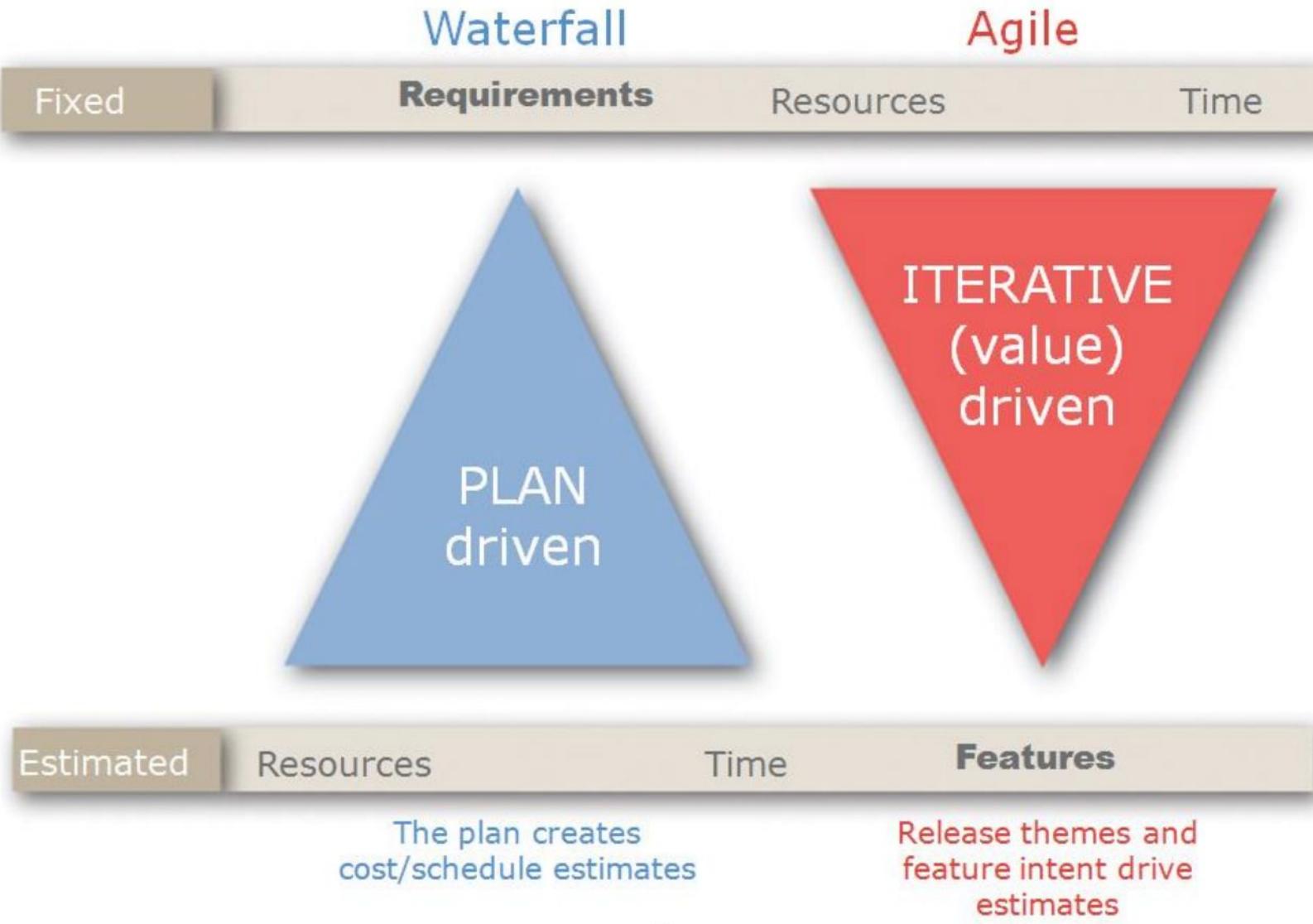
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Project planning - Topics

- Project planning in plan-driven methods
 - Mapping effort to duration (and schedule)
 - Example of effort distribution in waterfall methods
 - COCOMO II – overview and application
 - Work breakdown structure (WBS)
 - Gantt charts and critical path(s)
- Project planning in agile methods
 - Example of effort distribution in agile methods
 - Example tool - Pivotal Tracker (user stories, bugs, chores and milestones)

The Agile Paradigm Shift



Mapping effort to duration

- Effort in function points or KLOC (source lines of delivered code in thousands)
- Effort to duration
 - Experience-based and/or heuristics-based methods
 - Parametric methods like COCOMO81 and COCOMO II

CS6-#1 Estimate project duration



Assuming that the effort and productivity for the Mux-core project are as follows:

- Function points ~ 500
- Average productivity 10 function points per month per member

What should be the ideal project duration?

<https://www.ifpug.org/wp-content/uploads/2017/04/IYSM.-Thirty-years-of-IFPUG.-Software-Economics-and-Function-Point-Metrics-Capers-Jones.pdf>

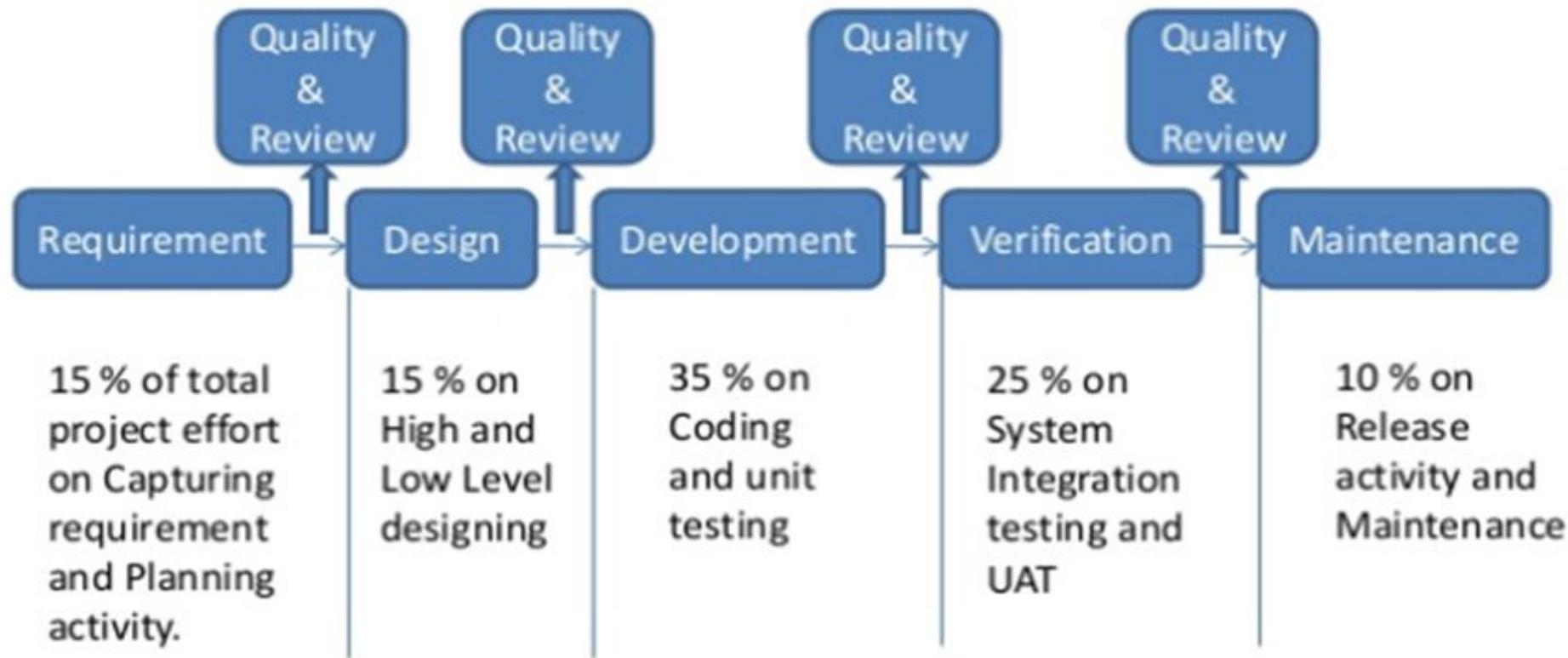
COCOMO formula for duration

COCOMO formula for duration calculation: $M = a \times E^b$
where E is the estimated effort and

Project Type	a	b
Organic	2.5	0.38
Semi-detached	2.5	0.35
Embedded	2.5	0.32

Assuming that Mux-Core is a semi-detached project type with 500 fp, the project duration should be 22 months

Example of effort distribution in waterfall process

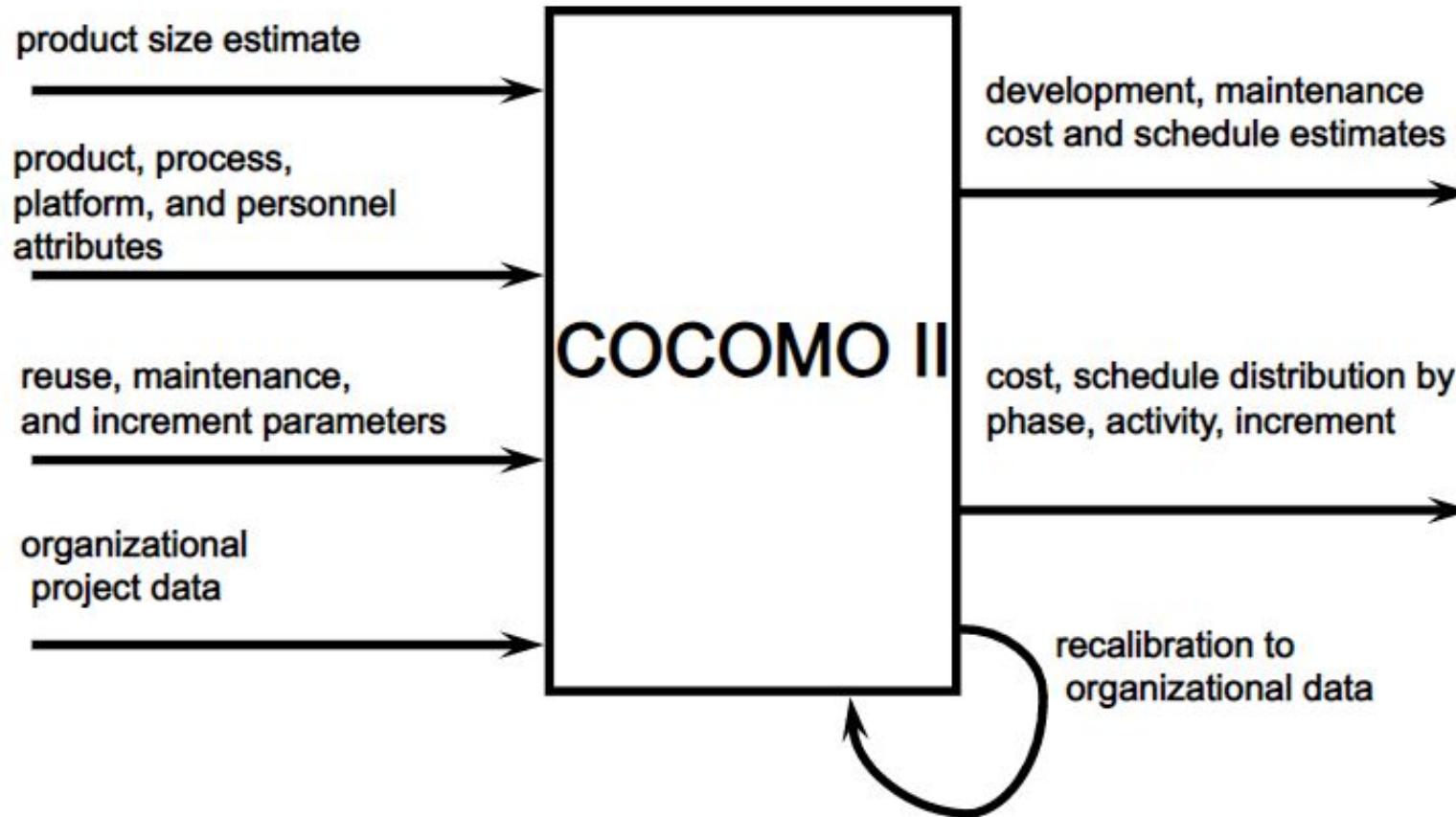


<https://www.slideshare.net/brickedestimation/effort-distributiononwaterfallandagile>

Software Cost Estimation Methods

- **Cost estimation** : prediction of both the person-effort and elapsed time of a project
- **Methods:**
 - Algorithmic
 - Expert judgement
 - Estimation by analogy
 - Parkinsonian
 - Price-to-win
 - Top-down
 - Bottom-up
- **Best approach is a combination of methods**
 - compare and iterate estimates, reconcile differences
- **COCOMO - the “COnstructive COst MOdel ”**
 - COCOMO II is the update to Dr. Barry Boehm 's COCOMO 1981
- **COCOMO is the most widely used, thoroughly documented and calibrated cost model**

COCOMO Black Box Model



©USC-CSSE

<https://slideplayer.com/slide/7947860/>

Brief introduction -
<https://www.geeksforgeeks.org/software-engineering-cocomo-ii-model/>

COCOMO II Calculator (read chap 5 of the text book for details)

Software Size Sizing Method Function Points

Unadjusted Function Points 440 Language Java

Software Scale Drivers

Precededness	Nominal	Architecture / Risk Resolution	Nominal	Process Maturity	Nominal
Development Flexibility	Nominal	Team Cohesion	Nominal		

Software Cost Drivers

Product	Personnel	Platform			
Required Software Reliability	Nominal	Analyst Capability	Nominal	Time Constraint	Nominal
Data Base Size	Nominal	Programmer Capability	Nominal	Storage Constraint	Nominal
Product Complexity	Nominal	Personnel Continuity	Nominal	Platform Volatility	Nominal
Developed for Reusability	Nominal	Application Experience	Nominal	Project	Nominal
Documentation Match to Lifecycle Needs	Nominal	Platform Experience	Nominal	Use of Software Tools	Nominal
		Language and Toolset Experience	Nominal	Multisite Development	Nominal
Maintenance	Off			Required Development Schedule	Nominal

<http://softwarecost.org/tools/COCOMO/>

COCOMO II Calculator (read chap 5 of the text book for details)



Results

Software Development (Elaboration and Construction)

Effort = 169.9 Person-months

Schedule = 20.0 Months

Cost = \$4246906

Total Equivalent Size = 40000 SLOC

Effort Adjustment Factor (EAF) = 1.00

... Home Back Forward Stop

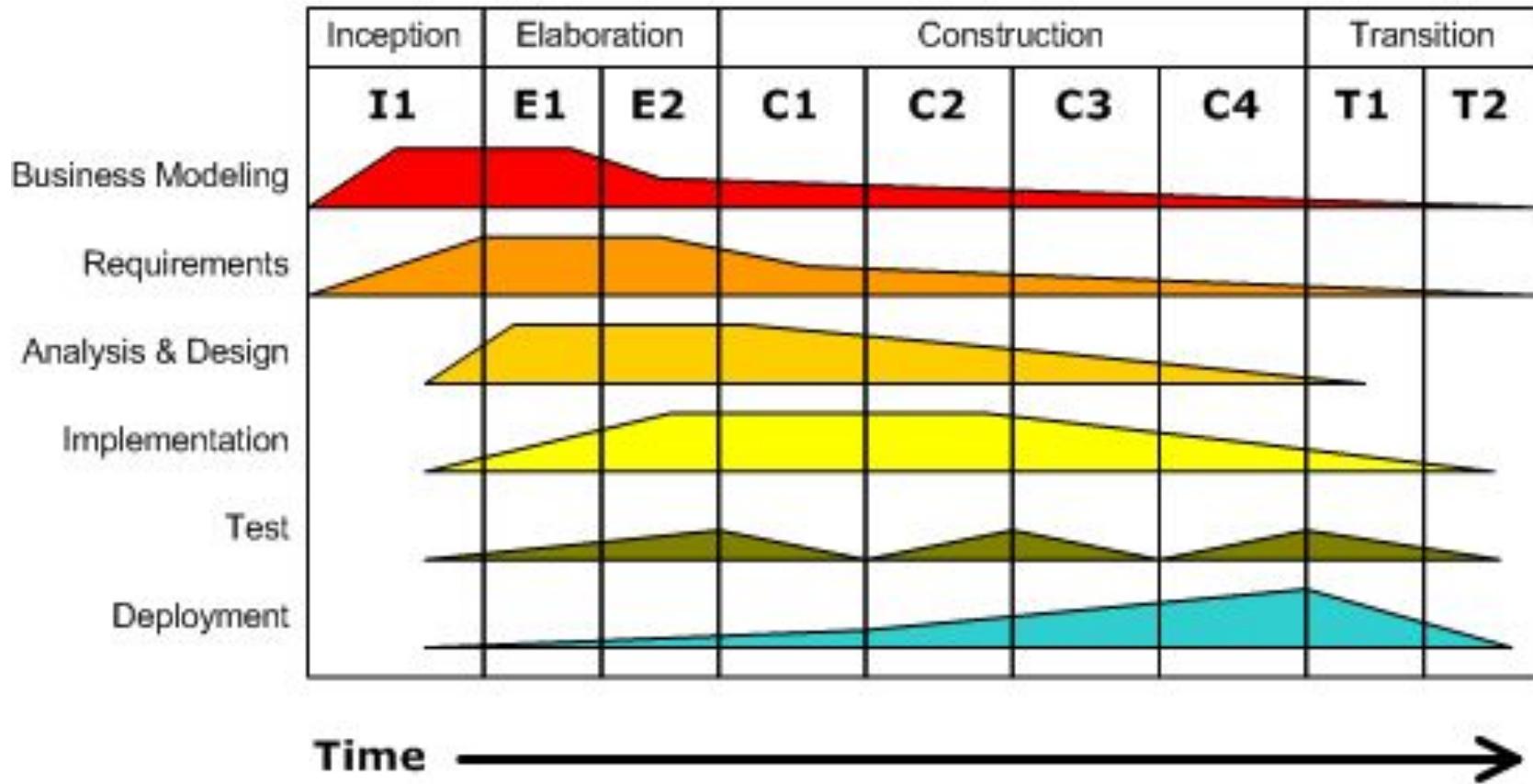
... Home Back Forward Stop

Note: Assume \$ = INR for interpretation of the inputs and results;; i.e., 25k rupees average salary per month

Unified Process (for explaining estimation results)

Iterative Development

Business value is delivered incrementally in time-boxed cross-discipline iterations.



COCOMO II Calculator

Results

Software Development (Elaboration and Construction)

Effort = 169.9 Person-months

Schedule = 20.0 Months

Cost = \$4246906

Total Equivalent Size = 40000 SLOC

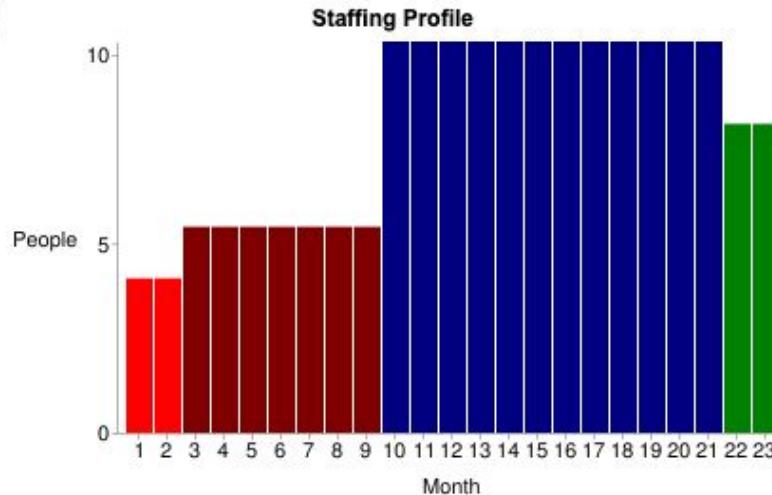
Effort Adjustment Factor (EAF) = 1.00

Acquisition Phase Distribution

Phase	Effort (Person-months)	Schedule (Months)	Average Staff	Cost (Dollars)
Inception	10.2	2.5	4.1	\$254814
Elaboration	40.8	7.5	5.4	\$1019258
Construction	129.1	12.5	10.3	\$3227649
Transition	20.4	2.5	8.2	\$509629

Software Effort Distribution for RUP/MBASE (Person-Months)

Phase/Activity	Inception	Elaboration	Construction	Transition
Management	1.4	4.9	12.9	2.9
Environment/CM	1.0	3.3	6.5	1.0
Requirements	3.9	7.3	10.3	0.8
Design	1.9	14.7	20.7	0.8
Implementation	0.8	5.3	43.9	3.9
Assessment	0.8	4.1	31.0	4.9
Deployment	0.3	1.2	3.9	6.1



<https://csse.usc.edu/tools/COCOMOII.php>

COCOMO II Calculator (read chap 5 of the text book for details)

Software Effort Distribution for RUP/MBASE (Person-Months)

Phase/Activity	Inception	Elaboration	Construction	Transition
Management	1.4	4.9	12.9	2.9
Environment/CM	1.0	3.3	6.5	1.0
Requirements	3.9	7.3	10.3	0.8
Design	1.9	14.7	20.7	0.8
Implementation	0.8	5.3	43.9	3.9
Assessment	0.8	4.1	31.0	4.9
Deployment	0.3	1.2	3.9	6.1

Note: Assume \$ = INR for interpretation of the inputs and results;; i.e., 25k rupees average salary per month

CS6-#2 COCOMO II Calculator

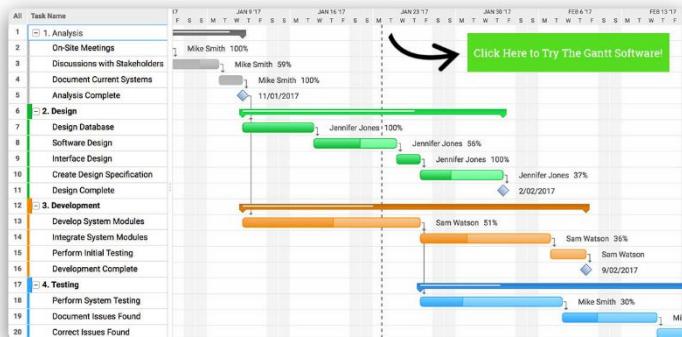
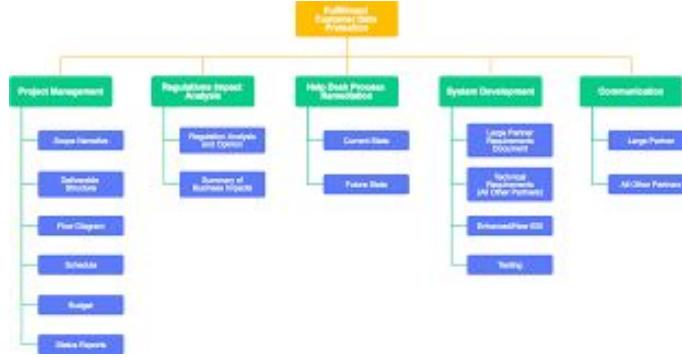


Keeping the function points as 500, observe the effect of software scale and cost drivers on the estimated effort, schedule and cost.

<http://softwarecost.org/tools/COCOMO/>

Project Planning involves

- Work Breakdown Structure (WBS):**
 Breaking down the work into parts and assign these to project team members, anticipate problems that might arise and prepare tentative solutions to those problems.
- Project Plan**, which is created at the start of a project, is used to communicate how the work will be done to the project team and customers, and to help assess progress on the project.



Example of WBS fragment

3 Physical Design

3.01 Design or specify physical database

- 3.01.01 Review logical database design
- 3.01.02 Determine access methods to be used
- 3.01.03 Normalize database
- 3.01.04 Design database architecture
- 3.01.05 Identify reusable database structures
- 3.01.06 Develop detailed database layout
- 3.01.07 Develop database file, record, and schema descriptions
- 3.01.08 Develop module calling sequences
- 3.01.09 Update data dictionary entries
- 3.01.10 Validate physical database design

See WBS waterfall.pdf on the course website for a complete decomposition

CS6-#3 Gantt Chart

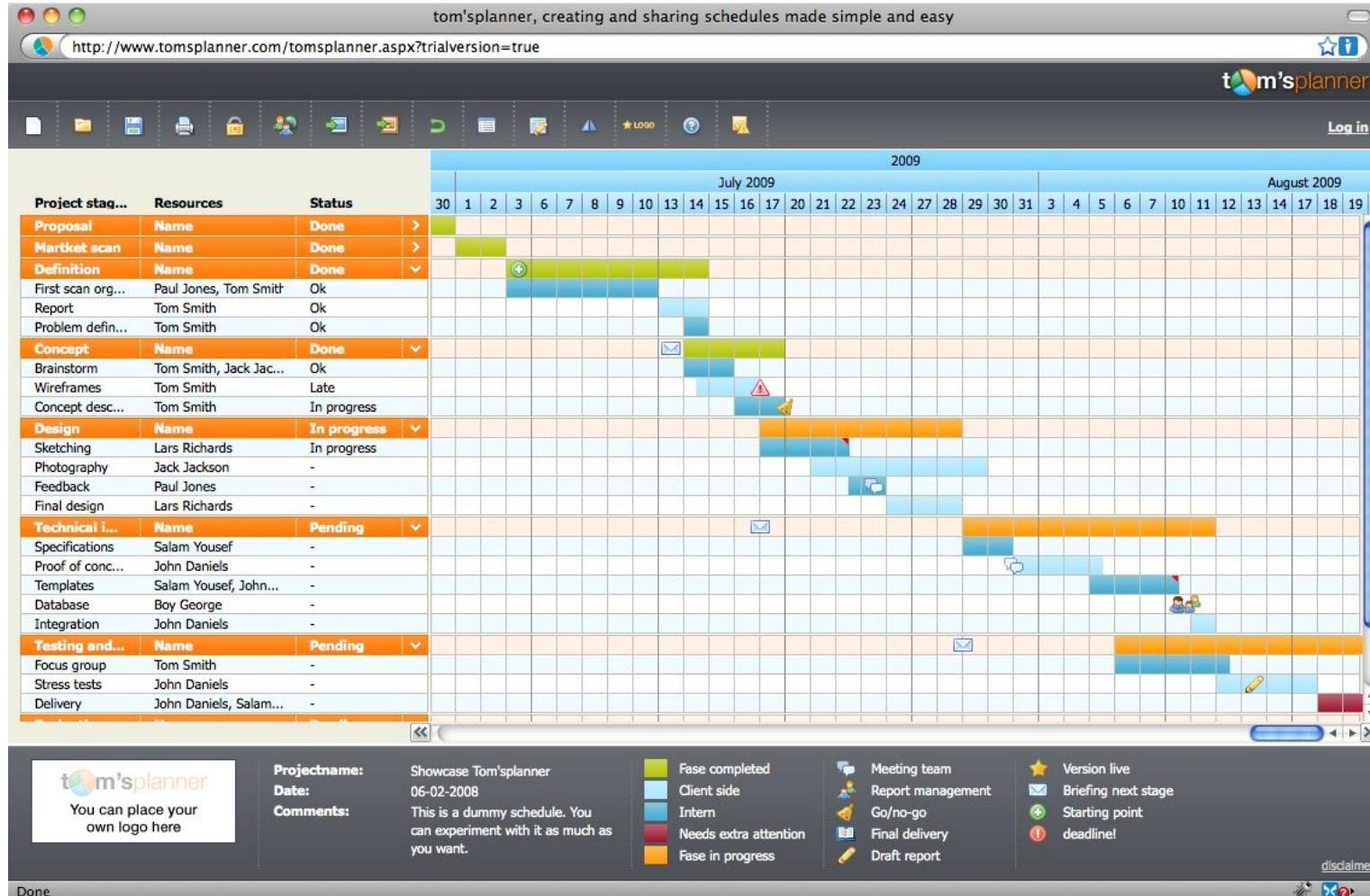
Activity	Duration (weeks)	Depends on	Resource
A	3		SA
B	1	A	SD1
C	2	A	SD2
D	4	A	SD2
E	3	B	CD1
F	3	C	CD1
G	6	D	CD2
H	3	E,F,G	SA

Prepare a Gantt Chart (on paper or any tool you can find) to find the critical path and project duration

Activity planning –

Sample Gantt Charting tool

Tomsplanner (login using your BITS email ID)



Example of effort distribution in agile process (Scrum)



10 % of total project effort spend on High Level Requirement and Planning

Sprint 1	Sprint2	Sprint n...	All Sprint Review
# Requirement Evolve....	# Requirement Evolve....	# Requirement Evolve....	
# Test Driven Development...	# Test Driven Development...	# Test Driven Development...	
# Delivery and feedback....	# Delivery and feedback....	# Delivery and feedback....	

20 % on Sprint1 15 % on Sprint2 50 % on Sprint n ... 5 % on Review

After high level Requirement and Planning, generally 85 % of effort distribute among different Sprints. Each Sprint contains separate effort, depending on its size.

<https://www.slideshare.net/brickedestimation/effort-distributiononwaterfallandagile>

Pivotal Tracker



https://www.pivotaltracker.com/help/articles/creating_a_project/

The screenshot shows the Pivotal Tracker interface with three main boards: Current/Backlog, Icebox, and My Work.

- Current/Backlog:** Contains stories for the "28 Mar - Current" sprint. One story is selected, showing details: "Shopper should be able to click on a product, and see all product details, including photos" (Priority: 8, Status: In Progress, Accept/Reject buttons). Other stories include: "Shopper should be able to add product to shopping cart", "Shopper should be able to view contents of shopping cart", "Shopper should be able to remove product from shopping cart", "Cart manipulation should be AJAXy", "Some product photos not scaled properly when browsing products", "Shopper should be able to recommend a product to a friend", and "configure solr for full text searching".
- Icebox:** Contains stories: "Product browsing pagination not working in IE6", "Integrate with automated order fulfillment system", "native iPhone app to allow product browsing and checkout", and "Facebook app, allowing users to share favorite products".
- My Work:** Contains stories: "Shopper should be able to view contents of shopping cart" (Priority: 6, Status: In Progress, Accept/Reject buttons) and "Shopper should be able to remove product from shopping cart".

Pivotal Tracker

- Epics
- Icebox
- My work
- Story types
 - Features
 - Chores
 - Bugs
 - Releases



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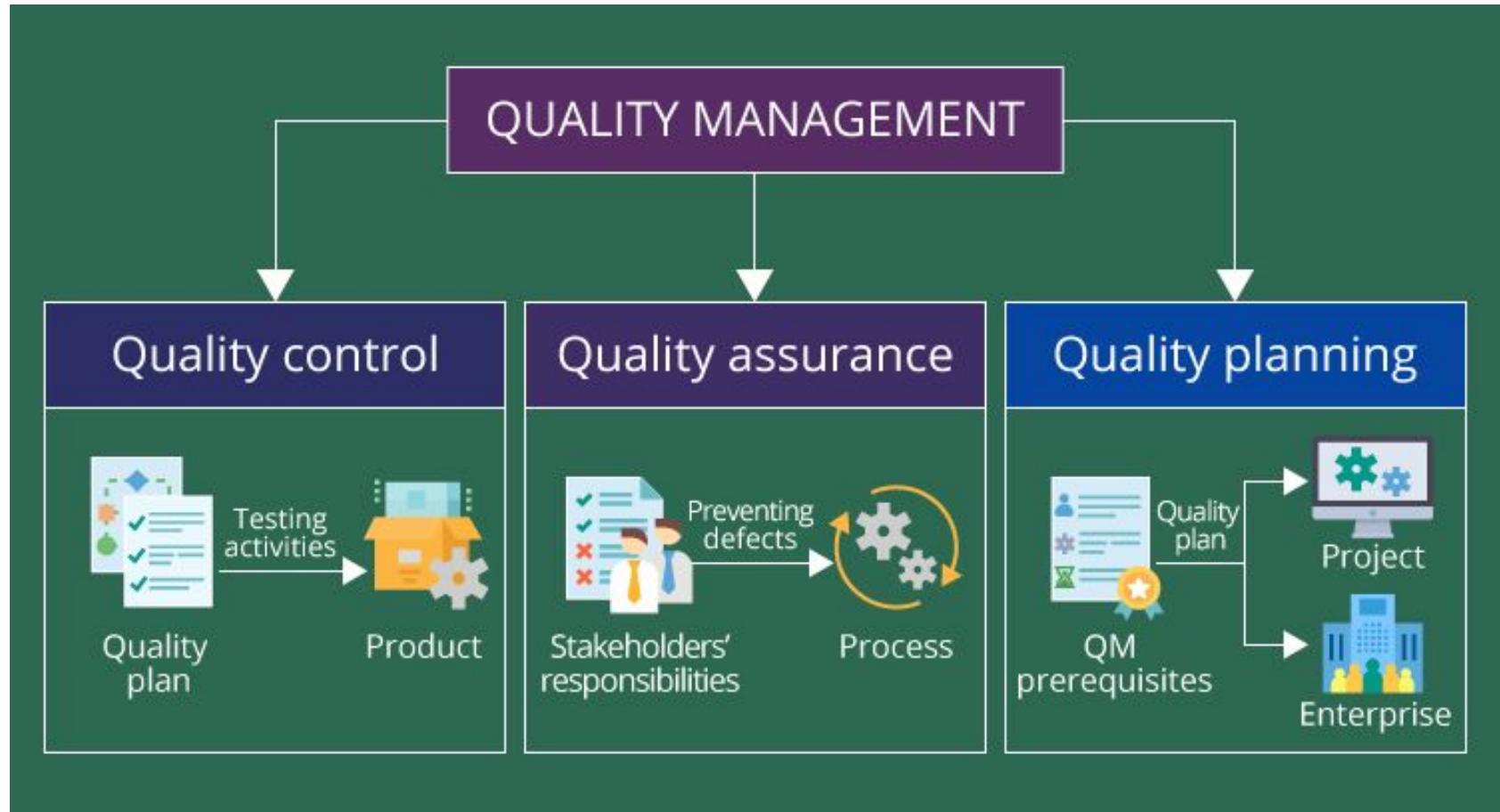
Topics

- Quality management
- Quality planning
 - Identification relevant quality attributes
 - Identification of associated measures
 - Setting up standards for the product and processes

Quality

- Quality, simplistically, means that a product should meet its specification
- The software product should deliver the required functionality (*functional requirements*) with the required **quality attributes** (*non-functional requirements*)

Quality management



<https://www.scnsoft.com/blog/quality-management-optimization>

Quality management

- Quality planning
 - setting quality standards and developing a plan to achieve them
- Quality assurance
 - ensuring that the development process is compliant with the quality plan
- Quality control
 - monitoring and evaluating the product to ensure that it meets the quality requirements

Further discussion on this topic is planned during the second half of this course

Quality plan

- Identifies the most significant quality attributes appropriate for the product
- Defines the assessment process in detail for each quality attribute (including goals or target values)
- Indicates which standards should be applied and defines new standards as necessary

A part of an example quality plan



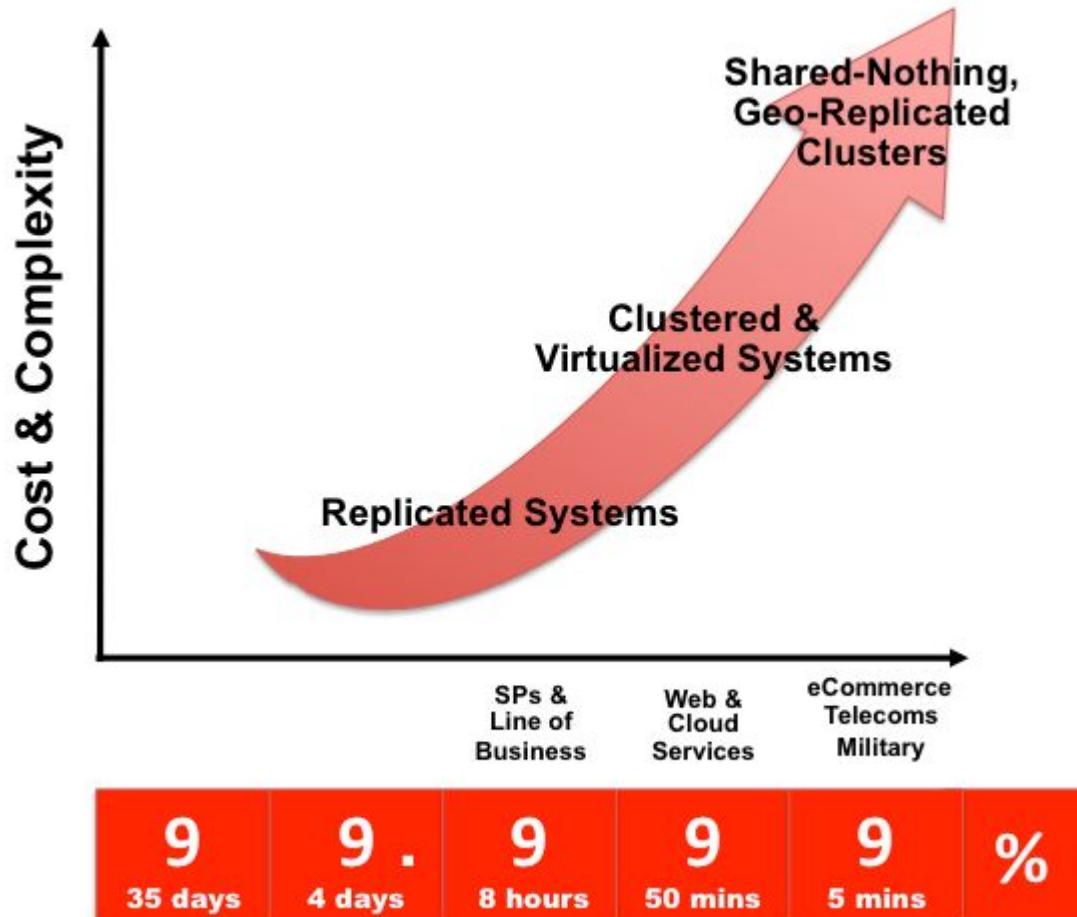
Process	Process quality standards & Stakeholder expectations	Quality assurance activity	Frequency/ interval	Who is responsible
Review software development practices of software application XYZ	Developers have completely and accurately captured application requirements.	Peer review of software requirements specification.	At regular intervals during the collection of requirements and a final review at the conclusion of requirements collection.	Lead developer in conjunction with other knowledgeable developers.

Source: www.acqnotes.com

Quality attribute example

- Reliability – probability of system working satisfactorily within a specific period of time
- Possible measures:
 - Availability: % of a time that a system is usable
 - Mean time between failures: total service time/number of failures
 - Failure on demand: probability that system will not available when needed
 - Support activity: number of fault reports generated and processed

Trade-offs: Cost & Complexity vs. Availability



https://docs.oracle.com/cd/E17952_01/mysql-5.5-en/ha-overview.html

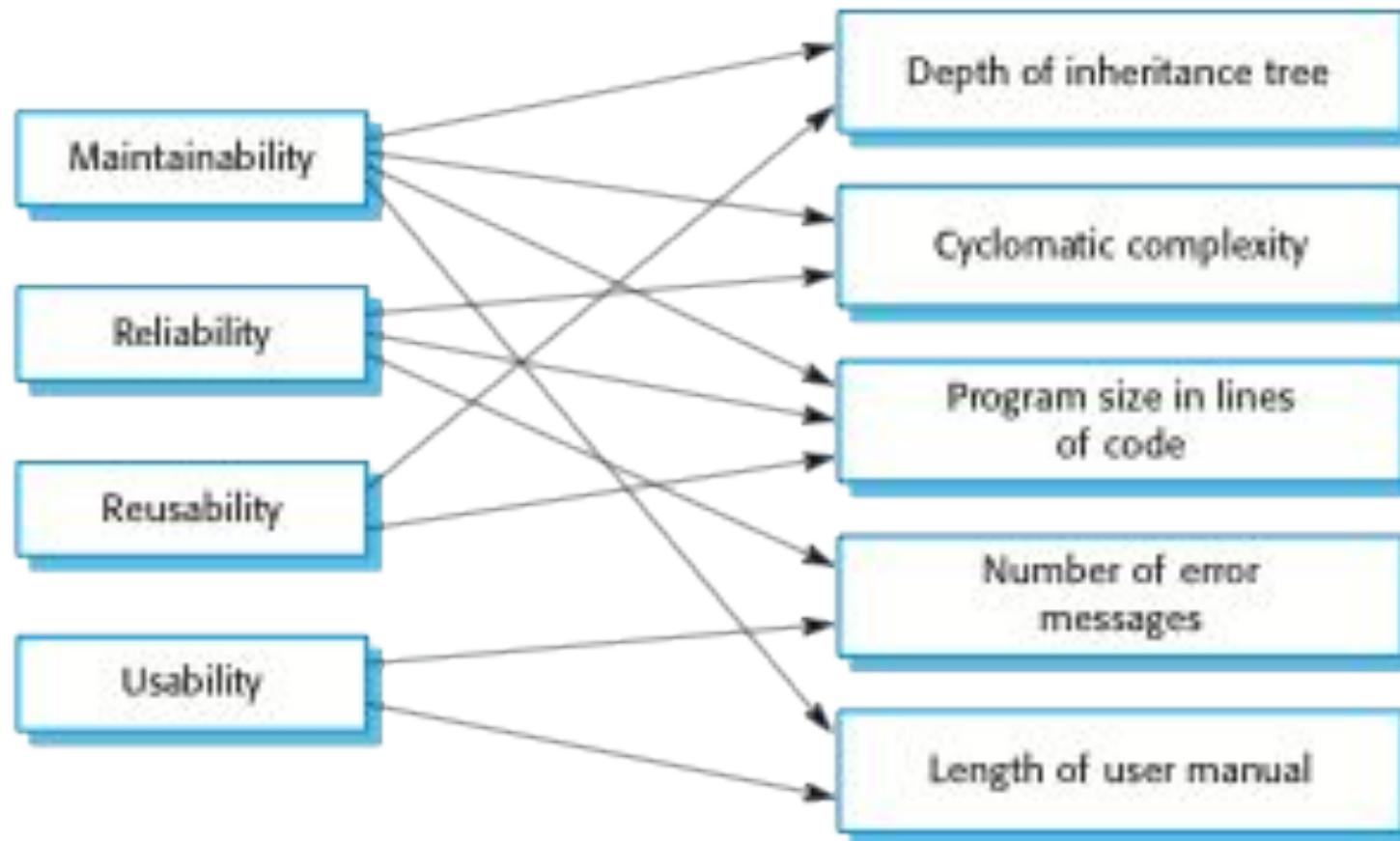
CS#7-1

Suggest and justify three quality attributes relevant for Mux-Core system

Software Quality Attributes

- Safety
- Security
- Reliability
- Resilience
- Robustness
- Understandability
- Testability
- Adaptability
- Modularity
- Complexity
- Portability
- Usability
- Reusability
- Efficiency
- Learnability

Quality attributes and some related measures/metrics



CS#7-2

Suggest measures for the selected quality attributes relevant for Mux-Core system

Ex: Reliability – availability, MTTF, MTTR,
prob. failure on demand



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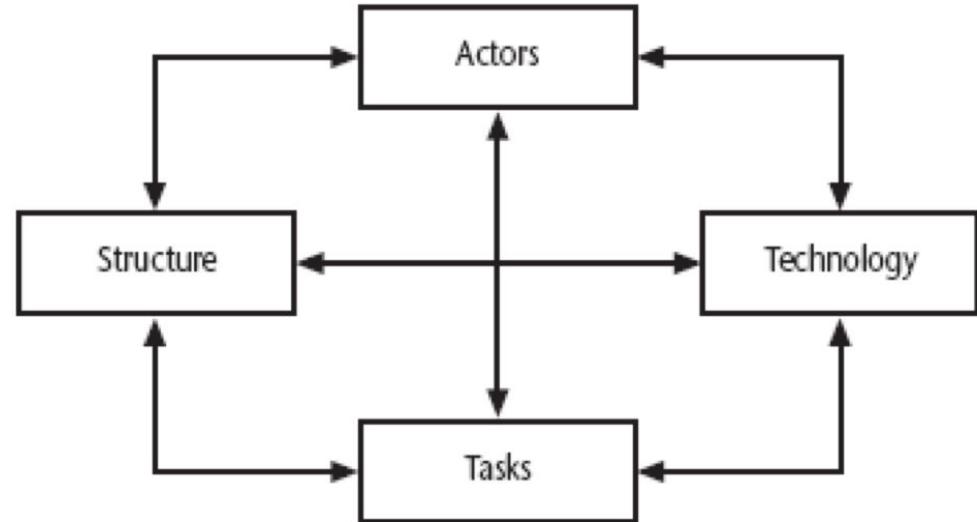
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Risk Management

Risk Management

- Risk identification – what are the risks to a project?
- Risk analysis – which ones are really serious?
- Risk planning – what shall we do?
- Risk monitoring – has the planning worked?



Activity CS8#1: Identify possible risks for the Mux-Core project



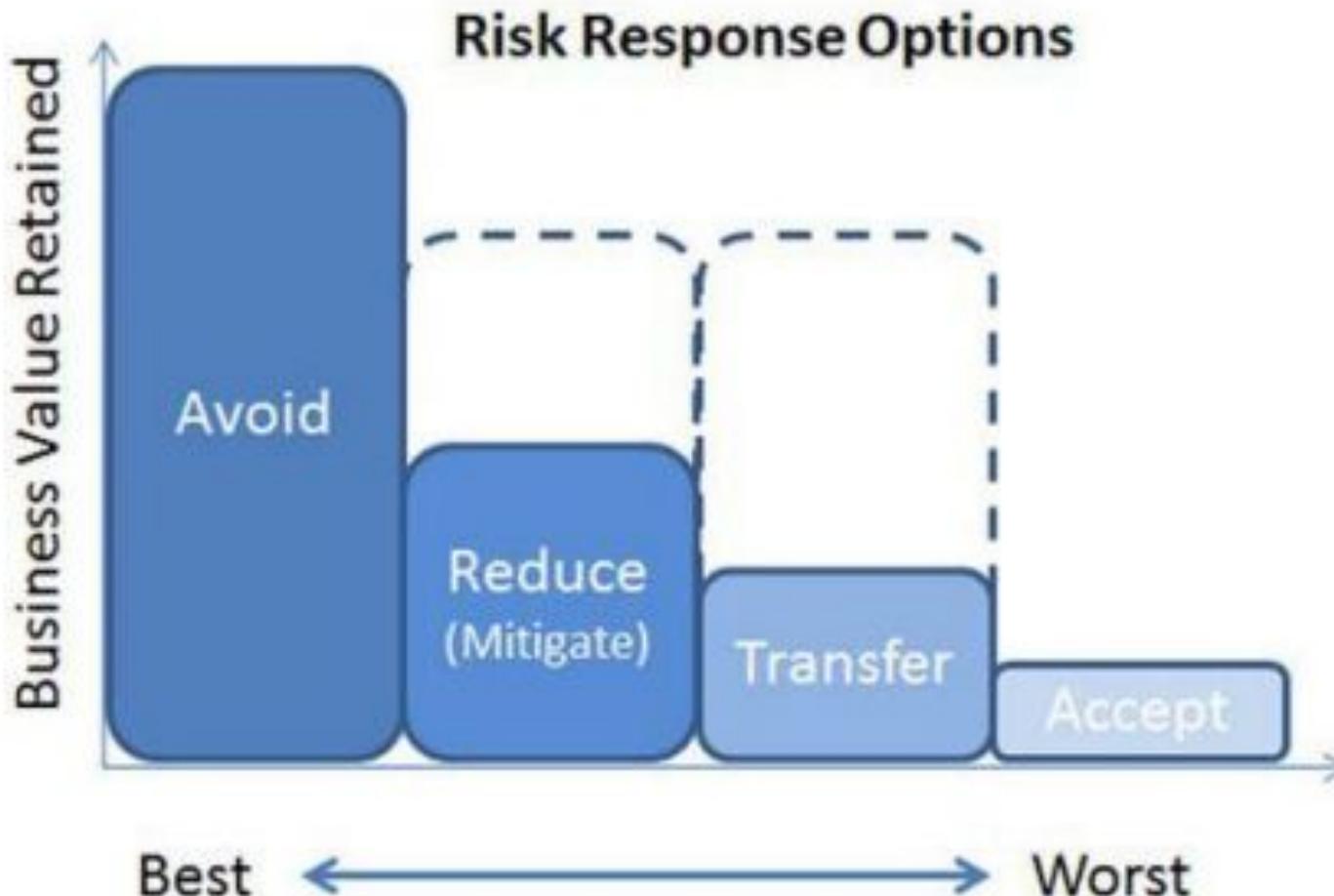
Visit <http://www.projectengineer.net/project-risk-checklist/> and identify five or six possible risks relevant for the Mux-Core project

Post your suggestions with justification with the probability of its occurrence high/medium/low and severity or impact (e.g., high > 0.8, medium > 0.4, low <= 0.4)

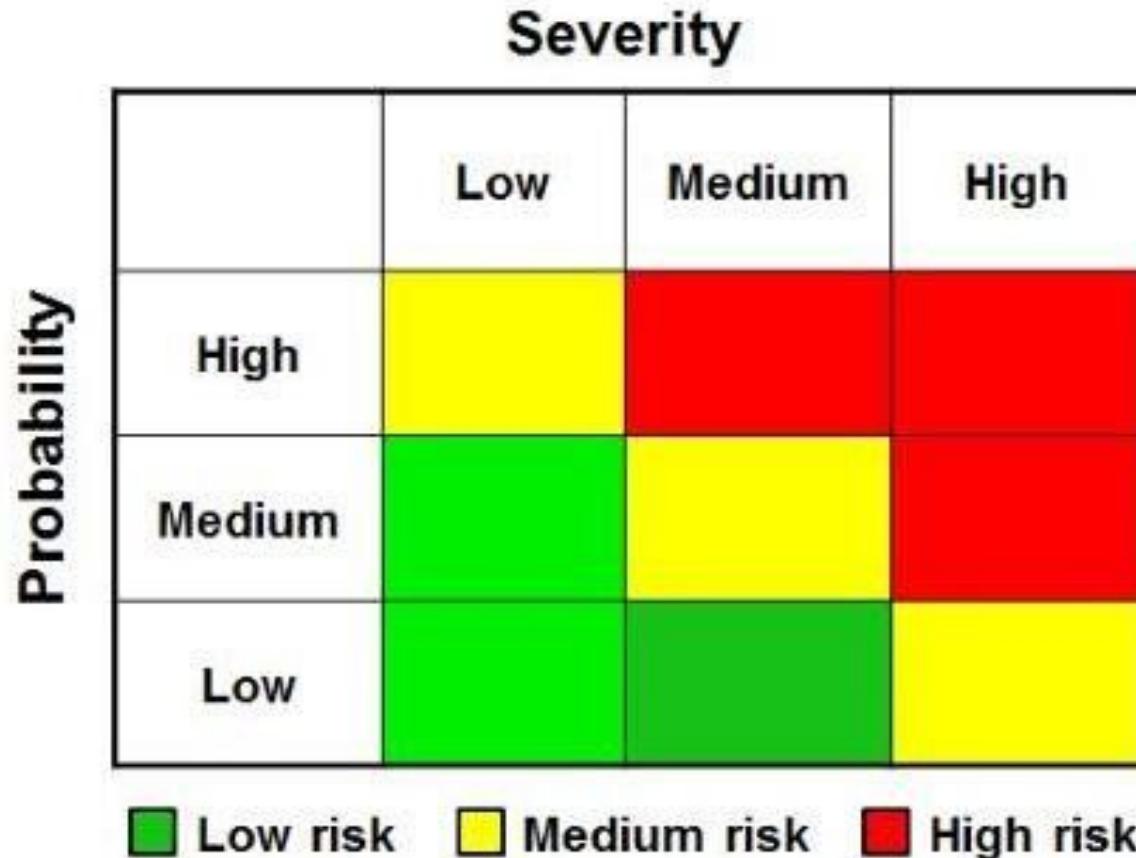
E.g., scope creep (medium) – many of the requirements related to administration and counter ticket sales are fairly well understood; but, the mobile/web for customers and management support need more clarity

(Try different risk categories; Do not repeat the entries posted by others; instead improve those entries)

Risk Management



Risk Probability and Severity



Activity CS8#2: Suggest how the following risks can be managed



R1 - scope creep

R2 – quality of product does not meet standards

R3 – project is running behind schedule

Suggest **reduce (mitigate)** and **transfer** types of risk management for the above risks (refer your suggestions using R1, R2 or R3)

Risk Management Tools

A video is available at

<https://www.softexpert.com/produto/risk-control-management/>



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Mid Semester Review

Introduction to SPM

- Characteristics of software projects and challenges in managing projects
- Software project failures
- Project life cycle vs SDLC – differences and common activities
- Portfolio vs program vs project

Project goals and metrics

- Business, program and project objectives
- Project management objectives vs. objectives for software system
- Integrating metrics within the software process

Software development models (process models)



- Plan-driven vs agile process models
- Requirements engineering process
- Managing requirements (scope creep)
- Choosing the right process model for a given software development project

Estimation techniques

- Challenges in effort estimation
- Bottom-up vs top-down estimation
- Function-point estimation
- Estimation in plan-driven vs agile processes (story points and Planning poker)
- Effort distribution in plan-driven vs agile processes

Project planning and scheduling



- Phases in plan-driven processes
- Iterations in agile processes (sprints in Scrum)
- Work breakdown structure
- Scheduling using Gantt charts and AoN diagrams
- Resource scheduling
- Effort distribution in plan-driven and agile processes

Quality planning

- Identification relevant (internal and external) quality attributes
- Selecting measures or metrics
- Defines the assessment process in detail for each quality attribute (including goals or target values)

Syllabus for mid-semester test

Contact Session	Topics	Ref Modules	Pre-contact Session prep	During Contact Session	CP# for Discussion
1,2	Introduction to SPM & Overview of Process Models	M1,M2	RL1.1, RL2.1, RL2.2, RL2.3	CS1.0, CS2.0	2,18,19,20
3	Project Initiation & Defining Project Goals	M2, M3	RL3.1, RL3.2	CS3.0	
4,5	Software Effort Estimation	M4	RL4.1 → RL4.5	CS4.0, CS5.0	1
6,7	Software Project Planning / Quality Planning	M5, M7	RL5.1 → RL5.4, RL7.1	CS6.0, CS7.0	16,17
8	(All topics covered till date)	M1 → M5 and M7	(All RLs in M1→M6)	Pre-Mid Review CS8.0	

Note: Risk management (RL6.1 and RL6.2) is not part of the mid-sem test syllabus



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Contact Session # 10

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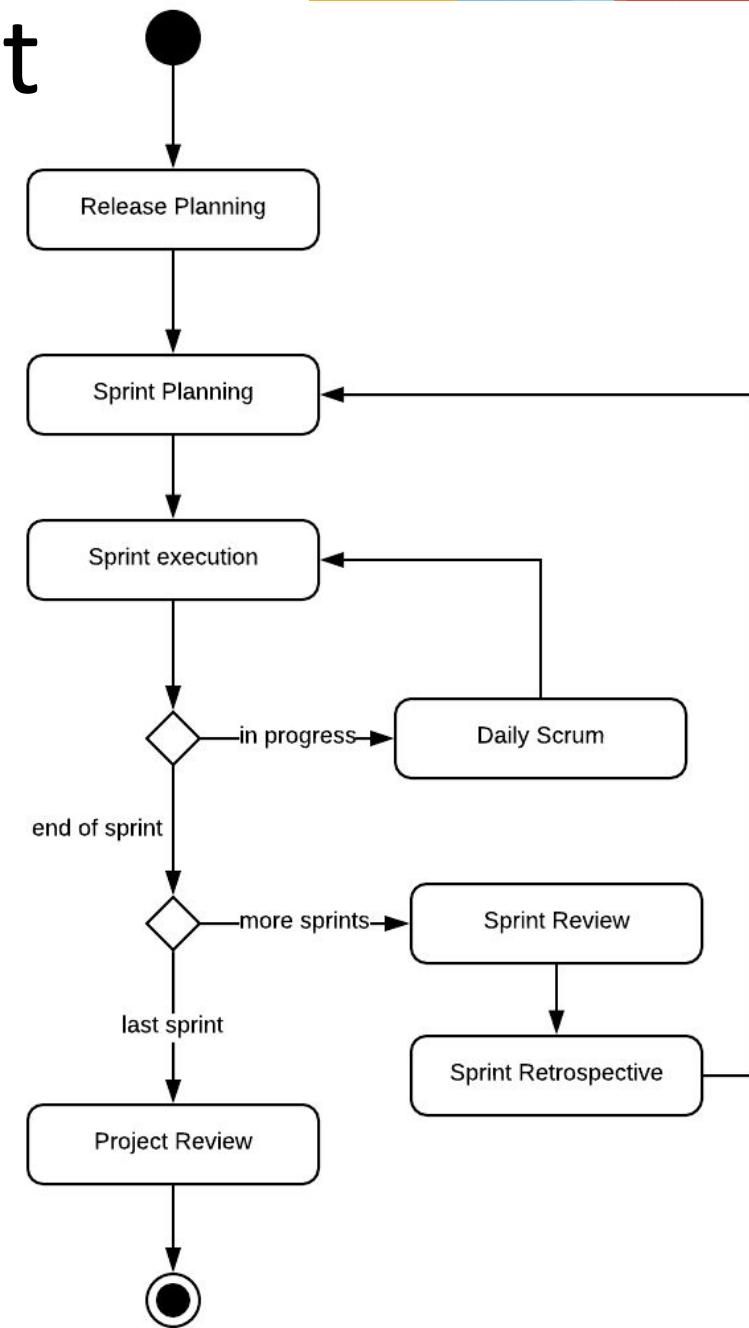
Project Monitoring and Control

Topics

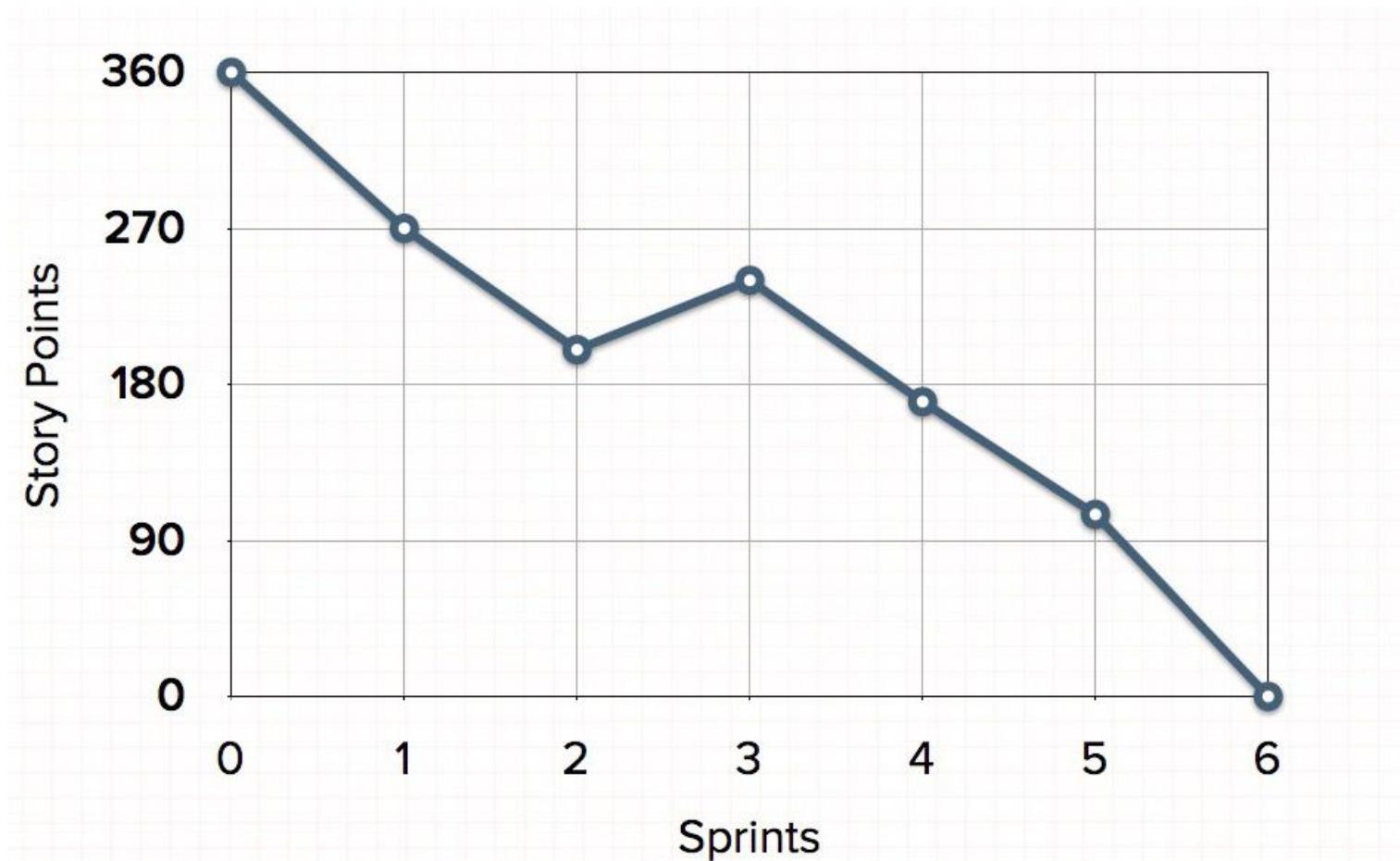
- Project status reporting in agile processes
- Earned value reports and their interpretation

Tracking scrum project progress

- Epic completion
- Velocity
- Burndown charts
- ...

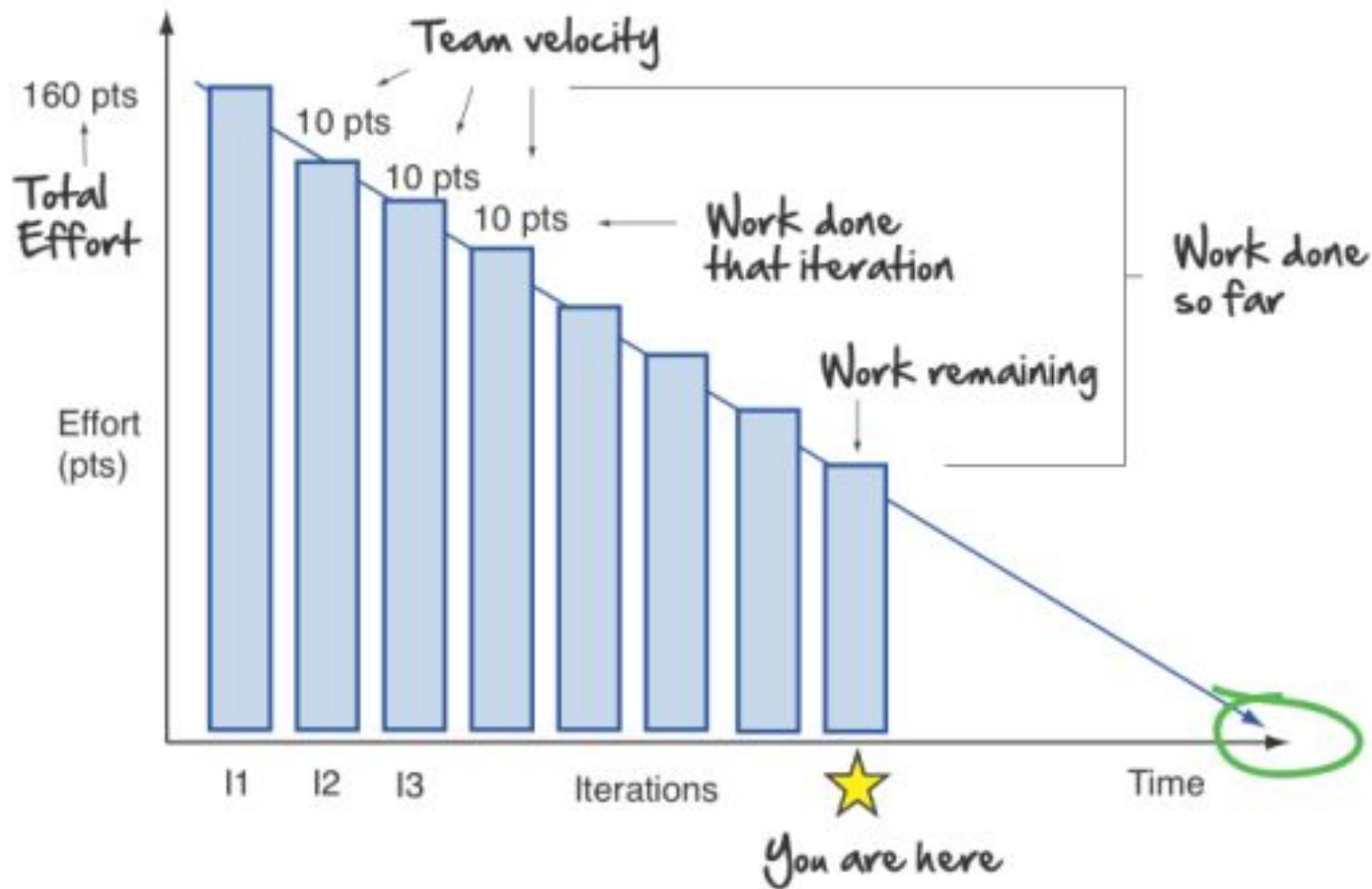


Burndown Charts

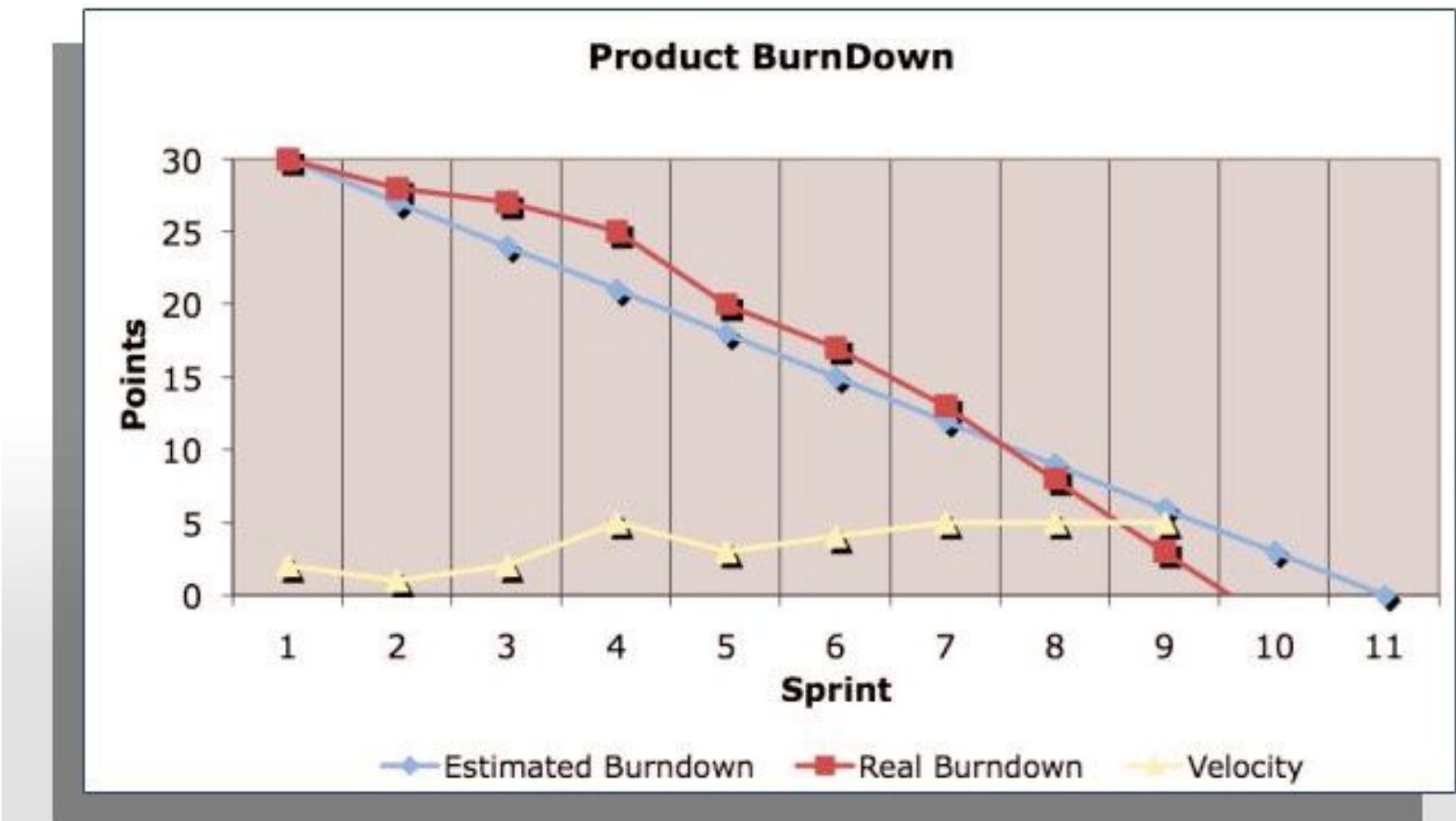


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Burndown Charts



Burndown Charts



<https://www.scrum.as/academy.php?show=0&chapter=13>

CS10#1 - Should we use gantt charts in agile project management?



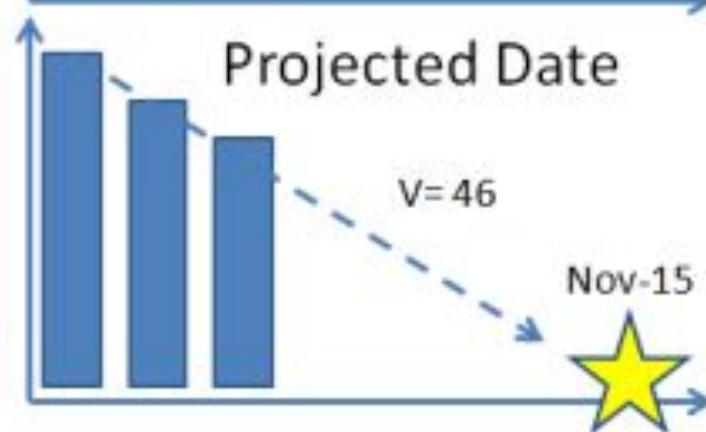
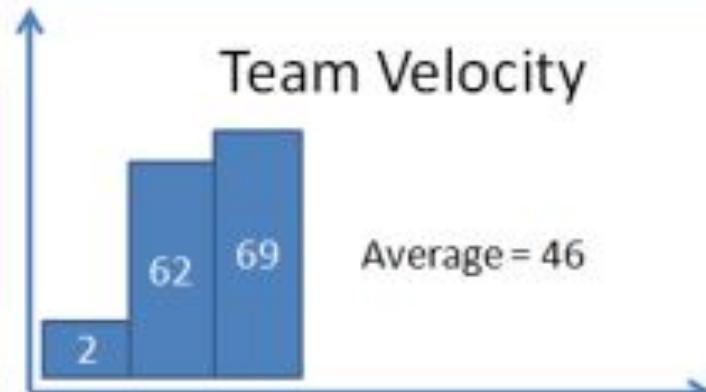
		Status
Budget spent	20%	Green
Scope delivered	30%	Yellow
Estimated date	Nov-1	Red

Summary
-Project is trending late
-Budget is on track
-QA bottle neck

Work done

<Story Epic #1>
 <Story Epic #2>
 <Story Epic #3>

Risk	Mitigation
- Bottleneck in QA	-Alex pulled in from Prod Support - New hire: Neil due to start Tuesday - Geddy to perform UAT part time
<Thing going bad #2>	<Plan to fix if possible>



Pivotal Tracker reports

Tracker KB Content Overview

Project trends

Velocity and points accepted



Burnup

Stories accepted



Cumulative flow

Story cycle time

Typical time between Start and Accept

23 hrs per story

5-iteration avg: 844 hrs



Rejection rate

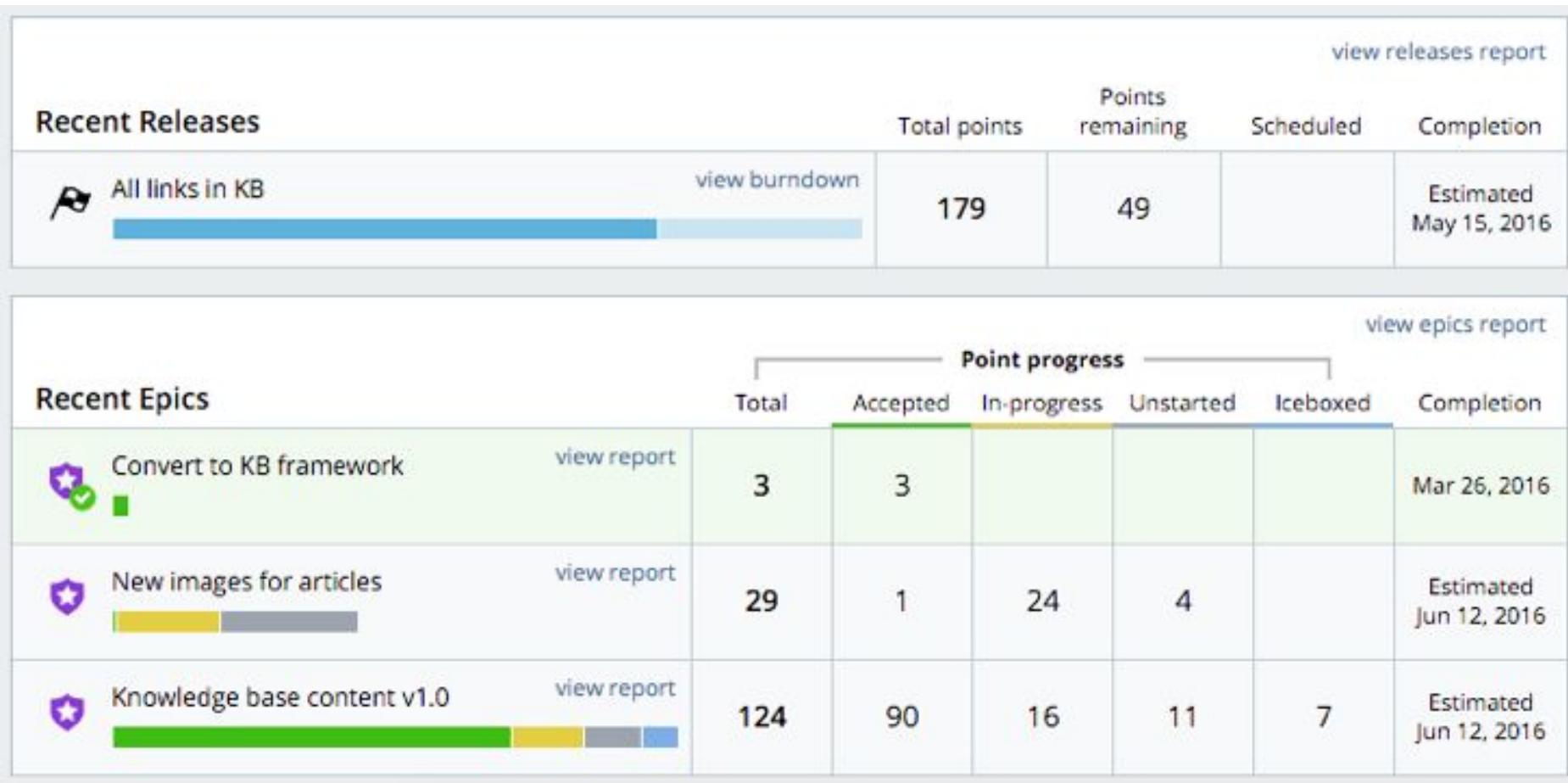
Percentage of rejections vs. acceptances and rejections

5.7%

5-iteration avg: 22%



Pivotal Tracker reports



Pivotal Tracker reports



CS10#2a - Identify how risk management and project monitoring & control are related to each other

CS10#2b - When you notice that a project is running behind schedule, how will you handle such a situation

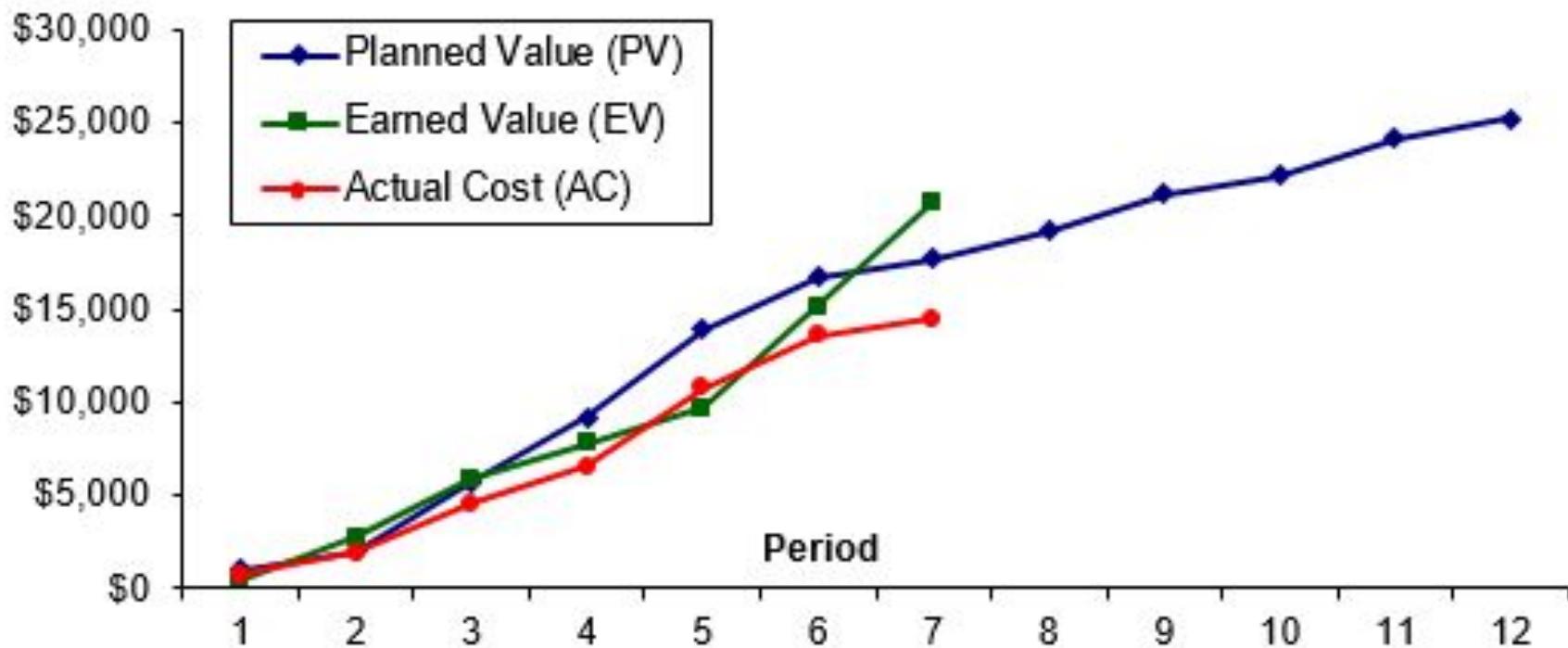
Earned value reporting

Earned value reporting

Work Package	BCWS	ACWP	%Progress	BCWP
	Planned Value	Actual Cost		Earned Value
1	\$1,00,000.00	\$1,20,000.00	100%	\$1,00,000.00
2	\$1,00,000.00	\$1,10,000.00	100%	\$1,00,000.00
3	\$1,00,000.00	\$80,000.00	90%	\$90,000.00
4	\$1,00,000.00	\$1,25,000.00	80%	\$80,000.00
5	\$1,00,000.00	\$75,000.00	50%	\$50,000.00
6	\$1,00,000.00	\$0.00	0%	\$0.00
7	\$1,00,000.00	\$0.00	0%	\$0.00
8	\$1,00,000.00	\$0.00	0%	\$0.00
9	\$1,00,000.00	\$0.00	0%	\$0.00
10	\$1,00,000.00	\$0.00	0%	\$0.00
BAC	\$10,00,000.00	\$5,10,000.00		\$4,20,000.00

BCWS – budgeted cost of work scheduled; ACWP – actual cost of work performed;
 BCWP – budgeted cost of work performed; BAC – budget at completion

Activity CS10#3: Interpreting earned value reports



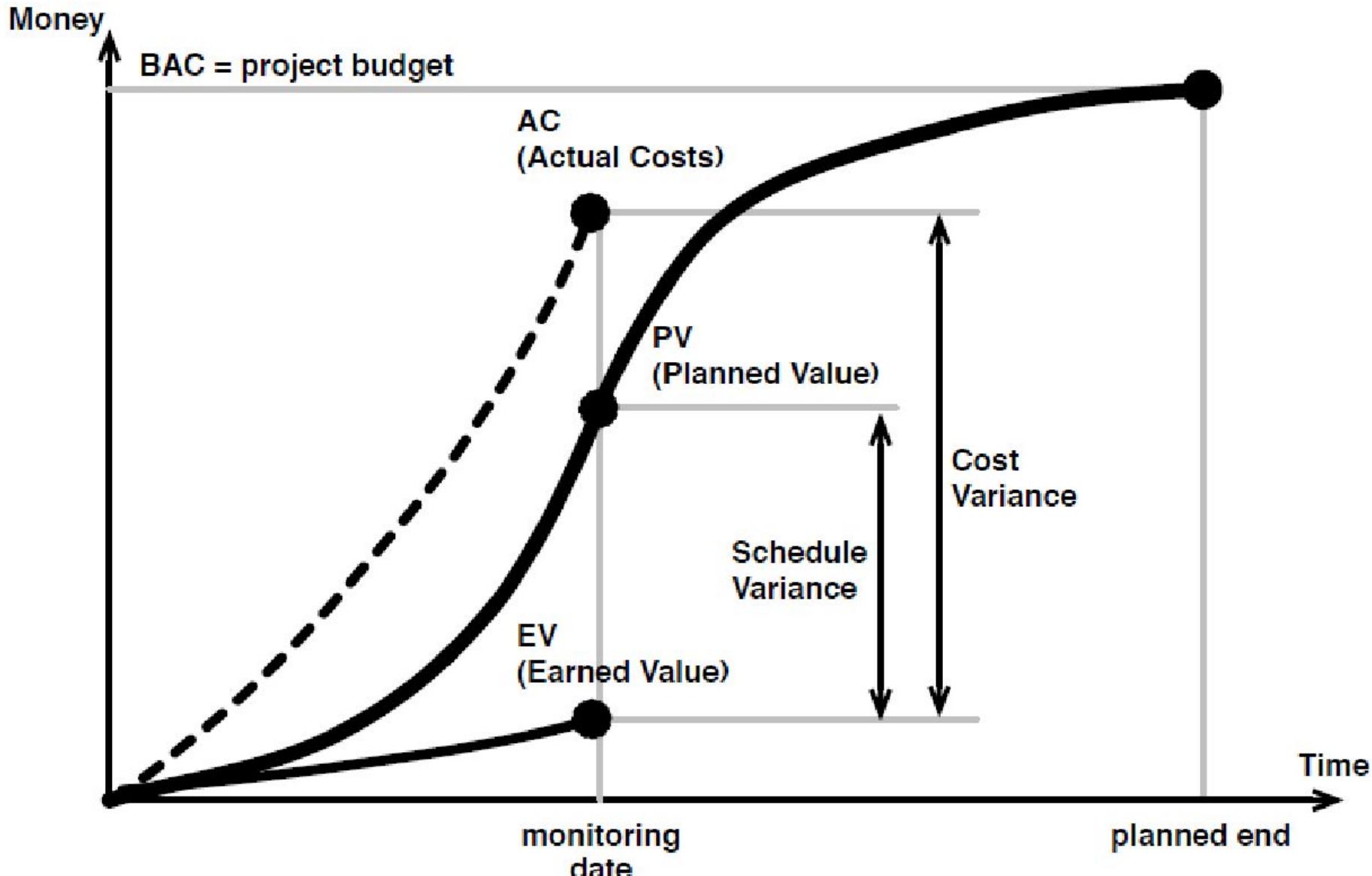
What does the above chart indicate?

Activity CS10#4 : Interpreting earned value reports

PV	\$5,00,000.00
AC	\$5,10,000.00
EV	\$4,20,000.00

How will you interpret and use these variances and indices?

Cost Variance (CV = EV - AC)	-\$90,000.00
Cost Performance Index (CPI = EV/AC)	0.82
Schedule Variance (SV = EV - PV)	-\$80,000.00
Schedule Performance Index (SPI = EV/PV)	0.84



Interpreting CPI and SPI

Performance Measures		Schedule		
		SV > 0 & SPI > 1.0	SV = 0 & SPI = 1.0	SV < 0 & SPI < 1.0
Cost	CV > 0 & CPI > 1.0	Ahead of Schedule Under Budget	On Schedule Under Budget	Behind Schedule Under Budget
	CV = 0 & CPI = 1.0	Ahead of Schedule On Budget	On Schedule On Budget	Behind Schedule On Budget
	CV < 0 & CPI < 1.0	Ahead of Schedule Over Budget	On Schedule Over Budget	Behind Schedule Over Budget

https://mosaicprojects.com.au/WhitePapers/WP1081_Earned_Value.pdf

CS10#5 - Earned value reporting exercise

Month #	Planned Value	Actual Cost	%Progress	Earned Value
1	Rs. 2,00,000	Rs. 2,20,000	100%	
2	Rs. 1,50,000	Rs. 1,10,000	100%	
3	Rs. 1,00,000	Rs. 80,000	90%	
4	Rs. 1,50,000	Rs. 1,20,000	80%	
5	Rs. 1,50,000	Rs. 75,000	50%	
6	Rs. 1,50,000	Rs. 0	0%	
7	Rs. 1,50,000	Rs. 0	0%	
8	Rs. 1,00,000	Rs. 0	0%	
9	Rs. 1,00,000	Rs. 0	0%	
10	Rs. 1,00,000	Rs. 0	0%	
Budget at completion				

- a) Compute the earned values for the first five months of this project.
- b) Calculate the cost and schedule variances and performance indices.
- c) Explain your interpretation of project status based on the indices calculated in (b).
- d) Based on the schedule performance indices, by when the project is expected to be completed.



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Contact Session # 11

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Organizing and managing teams



- Team organization
- Motivating teams
- Stress management
- Managing attrition

	Experience/skills	Personal details
Suresh	PMP certified project manager with 15 years of experience in the IT industry. He has been managing projects for the last four years (less familiar with present development tools).	Married and has two young children attending a primary school near his apartment complex. Is a fitness enthusiast and works out daily in the morning.
Vijay	Good at UI/UX design; Highly experienced in frontend development; recently attended a 5-day training on React – Javascript Library	Engaged recently; to be married in six months; enjoys different cuisines; good team player
Krishna	Very good at database design (both SQL and NOSQL) and backend application development	Bachelor lives with parents; travel time between home and office can be up to two hours each way; plays tennis regularly on weekends; likes to work alone
Rahul	Experienced with MEAN stack (Mongodb, Express, Angular and Nodejs); Good at architecture and design	Bachelor lives with friends; extrovert; likes partying a lot; spends a couple of days every month on social service (teaching adults)
Rekha	Worked recently on a cloud-based software development project; good experience with testing and deployment on cloud environments	Twins born last year; husband frequently travels on work; frequently thinks out-of-box and comes up with new ideas
Madhu	A certified Scrum Master; good at connecting and/or integrating different part of development environments	Both his parents are aged and not that healthy; extremely caring and hardworking; rarely misses any deadlines
Vishal	Has excellent knowledge of business operations; Very good at requirements gathering, analysis and modeling	Pursuing a part-time MBA; may make a career move after graduation; does not like coding
Deepti	Worked on front-end application development in several projects; enthusiastic in learning the backend development as well	Recently married to one of her undergrad classmates who is working as a web application developer; loves watching movies
Manoj	Experienced with MERN stack; Good at architecture and design	Bachelor lives with friends; enjoys playing tennis during weekends
Aparna	Worked on UNIX-based software development project (Java); good experience with testing environments	Two young children; husband - also a software developer - works from home
Priya	Worked on a mobile ticketing project during her studies; has good experience with full-stack mobile application development	Recently graduated from a top institute; interested in pursuing higher studies abroad

Activity 8#1: MuxCore Project



Team Organization

Assuming the role of Suresh (project manager), which one of the following options for structuring your team you would choose? And, why?

- Option 1 – one Scrum team
- Option 2 – two Scrum teams (front end, and backend & support)
- Option 3 – two Scrum teams for Admin and Sales

Activity 8#2: MuxCore Project



Team Organization

Assuming that you have selected the two teams option #3 with you as the PO and Madhu as the SM for both the teams, assign the remaining nine members to the these teams:

- Mux-Admin team
- Mux-Sales team

Activity 8#3: Managing Motivation



After three sprints, you noticed that motivation in both the teams is below expectation (resulting in reduced sprint velocities). How will you address this issue?

Activity 8#4: Managing Stress

After six sprints, you noticed that Madhu, Rekha and Priya are stressed out. How will you handle this issue?

Activity 8#5: Managing Attrition



As the project manager, you were successful in addressing the motivation problem (resulting in very good sprint velocities) and the stress situation. However, during the 9th sprint you started to feel that Vishal and Priya are quite likely to leave the company. How will you address this issue?



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Contact Session # 12b

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Types of change management

- Managing process changes in organization
- Managing change from existing to new software system
- Managing changes to the software system as it is being developed
- Managing changes to an existing software system
- Managing transition to agile software development (process model change)*

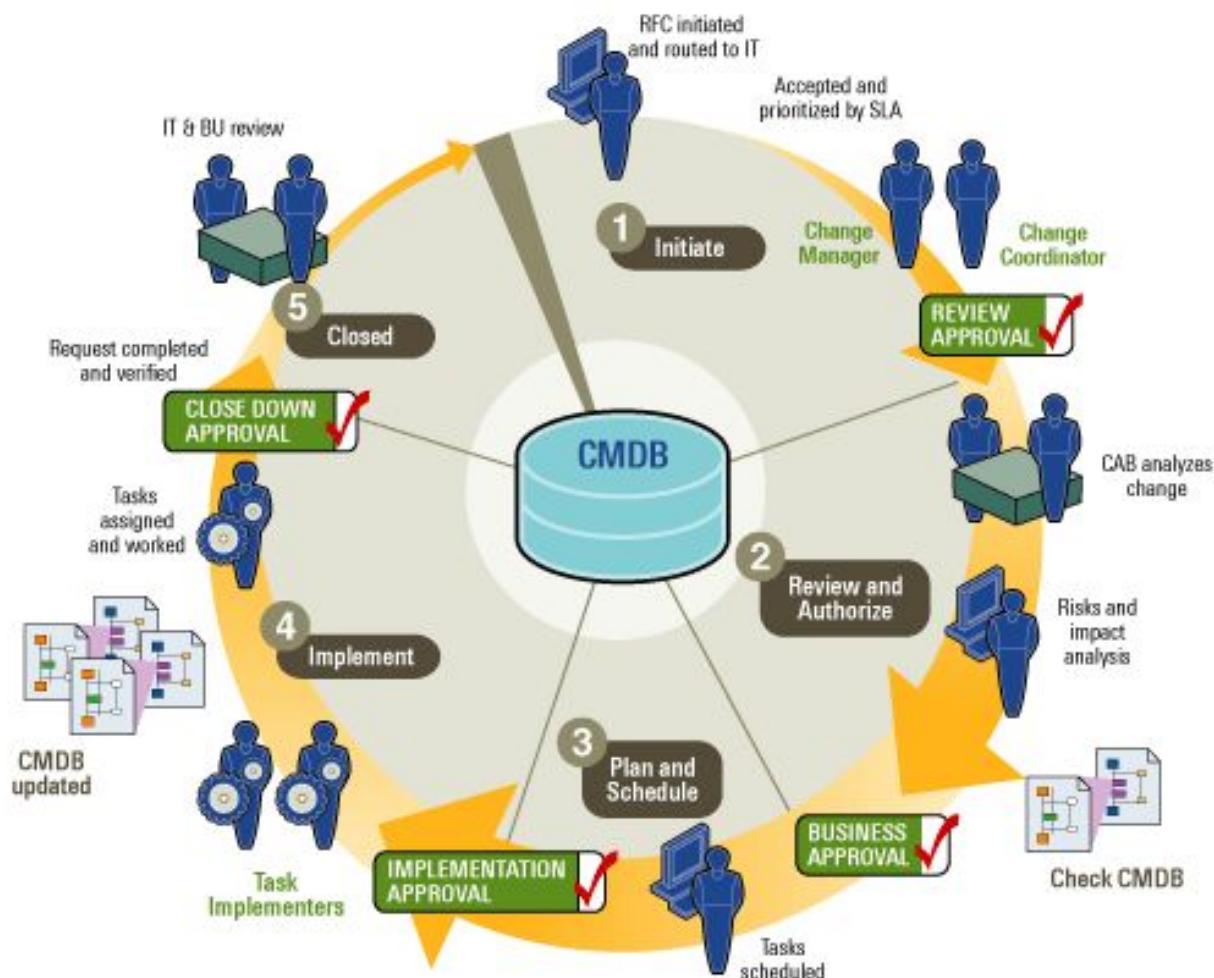
Topics

- Configuration management
 - **Change management**
 - *Version management*
 - *System building*
 - *Release management*
- Change management
 - Change management process
 - Change request form (example)
 - Change control board
 - Continuous integration

Change management process - an overview

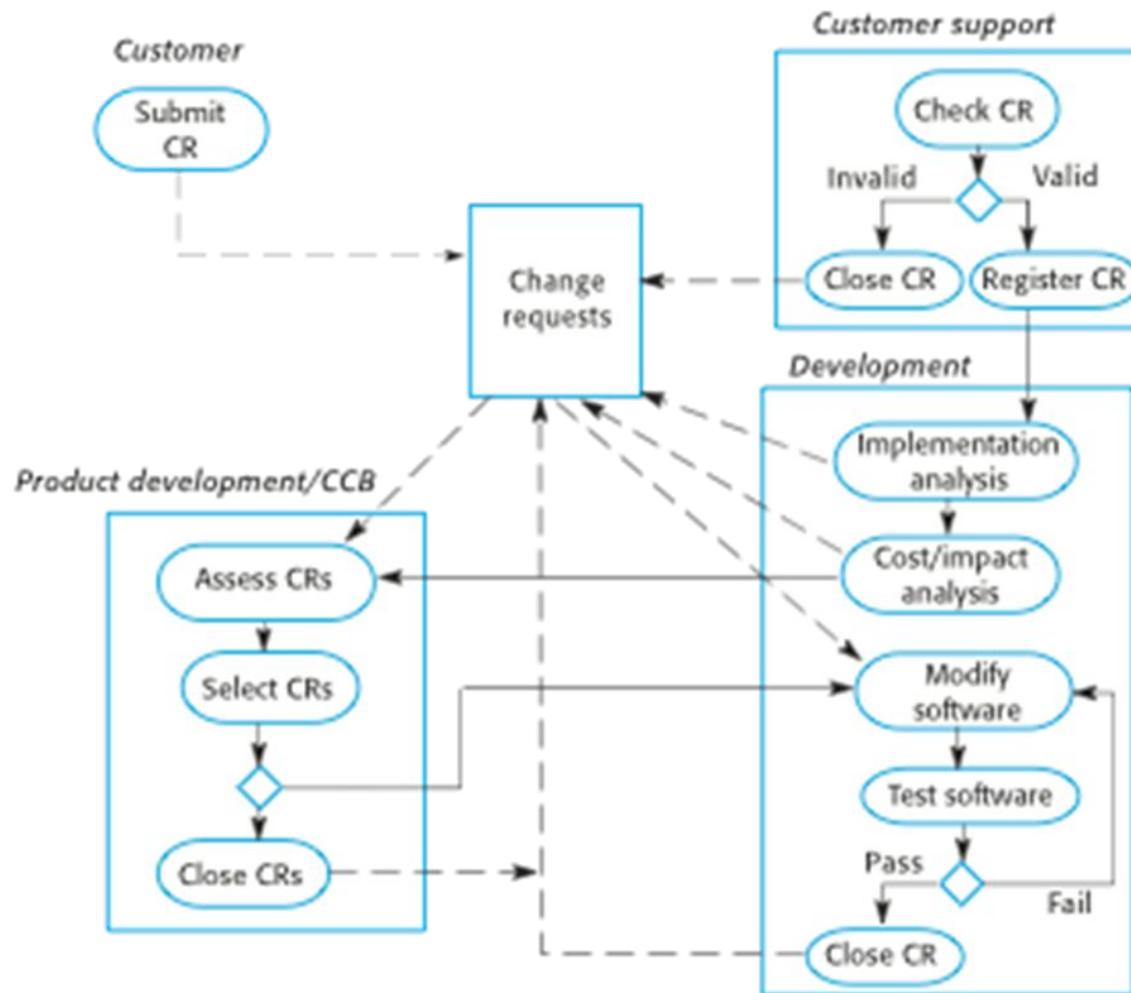


Change management process in detail



<https://docs.bmc.com/docs/smartit16/learning-about-change-management-677785119.html>

Change management process in detail



Chapter 25, Somerville, I. (2007). *Software engineering*. Addison-Wesley.

Typical Change Request Form

Change Request Form Template

Project Name	<i>Name Of Project</i>		
Requested By	<i>Name Of Requestor</i>	Date	
Request No	<i>Request Number</i>	Name Of Request	
Change Description	<i>This slide is 100% editable. Adapt it to your needs and capture your audience's attention.</i>		
Change Reason	<i>This slide is 100% editable. Adapt it to your needs and capture your audience's attention.</i>		
Impact Of Change	<i>This slide is 100% editable. Adapt it to your needs and capture your audience's attention.</i>		
Proposed Action	<i>This slide is 100% editable. Adapt it to your needs and capture your audience's attention.</i>		
Status	In Review	Approved	Rejected
Approval Date	<i>This slide is 100% editable. Adapt it to your needs and capture your audience's attention.</i>		
Approved By	<i>This slide is 100% editable. Adapt it to your needs and capture your audience's attention.</i>		

for Mux-Core system

- Example of a Change Request (brief – change to an existing functionality)

Sales report columns (change) – The daily sales report includes only the total sales of each movies on each day of screening. This report should also contain a split of the total sales across screens. Such a report will help the manager in deciding on the number of shows for a given movie.

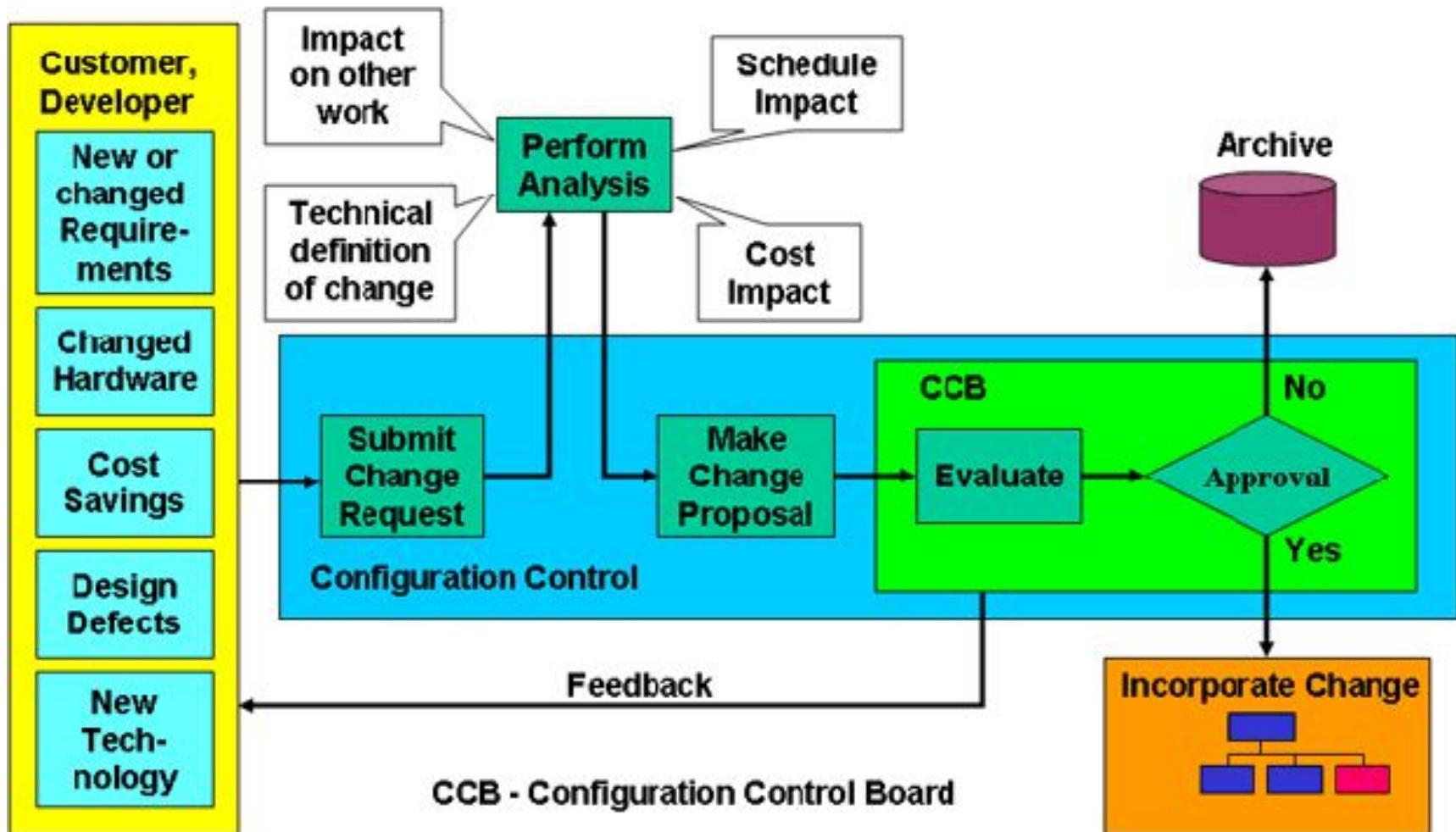
Activity CS13-#1: Functionality in



the current Mux-Core system

User	Functionality
Admin	Add details of new movies
Admin	Add details of new counter staff
Supervisor	Schedule the counter staff
Supervisor	Prepare daily sales report
Manager	Schedule and set prices for new movies
Manager	Get sales reports of various movies and screens
Manager	Give occasional discounts to people
Customer	Register and access the system
Customer	Buy one or more tickets for a movie show
Customer	Rate and review movies I have seen
Customer	Search/Sort (by rating)/filter(by date, location) for movies and shows
Counter Staff	Sign in and sign out of duty session
Counter Staff	Sell movie tickets to customer
Theater Assistant	validate customer ticket(s)

Configuration or Change Control Board



http://www.chambers.com.au/glossary/configuration_control_board.php

Change Control Board

- Responsible for:
 - Evaluating and approving or disapproving proposed changes to a system
 - Prioritizing the incorporation of approved changes
 - Scheduling the changes for forthcoming releases.
- In some projects the CCB may also be responsible for verifying that approved changes are implemented.

Change Control Board

- Medium to large projects may have more than one CCB.
 - an external CCB comprising users, developers and marketing people is formed to deal with changes that will impact the customer.
 - An internal CCB comprising developers and technical managers is formed to deal with changes to the software system, or impact costs and delivery dates.

Activity CS12b-#2: Analyze CRs

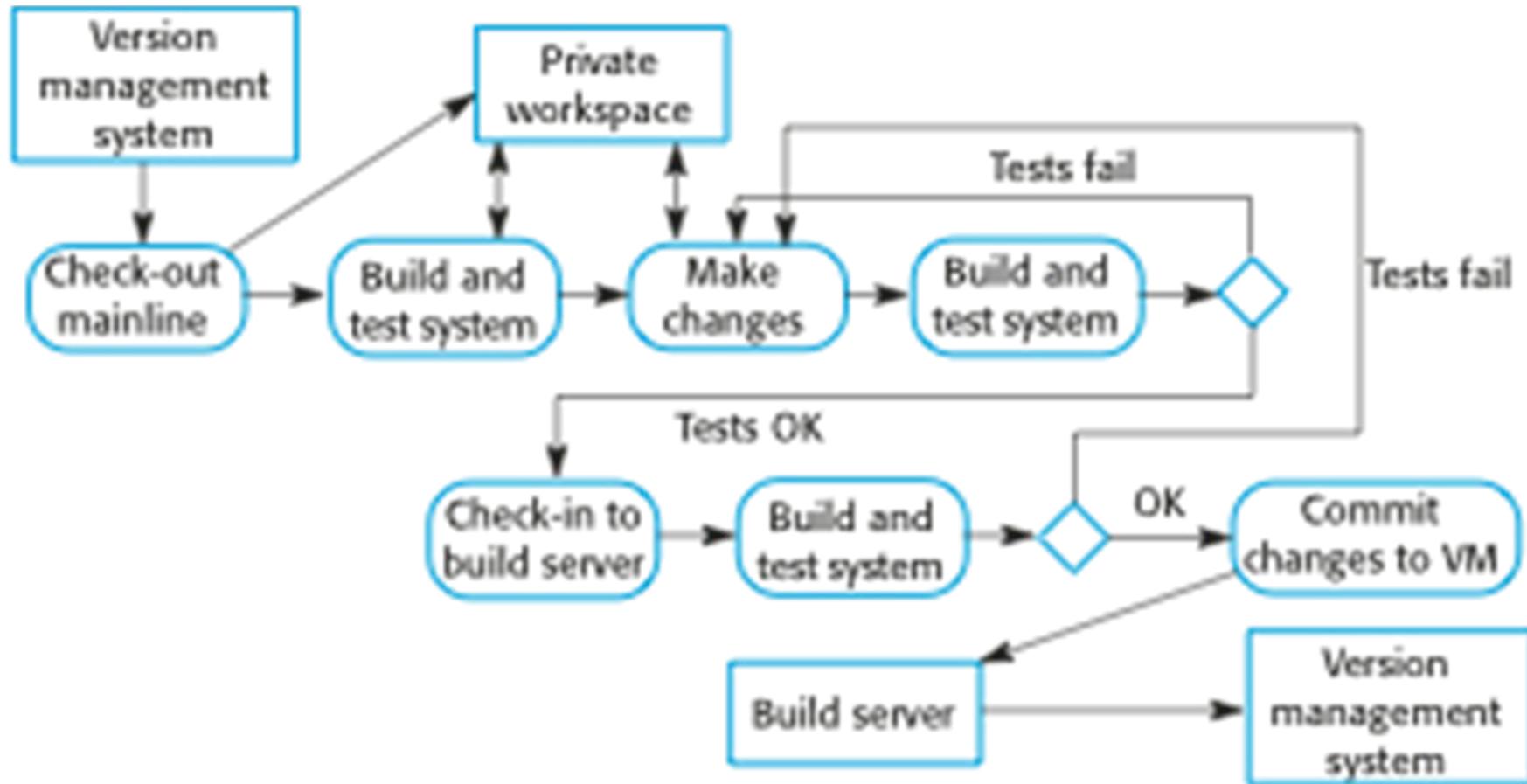


and Approve/Deny

- CR1: Sales report columns (change) – The daily sales report includes only the total sales of each movies on each day of screening. This report should also contain a spit of the total sales across screens. Such a report will help the manager in deciding on the number of shows for a given movie.
- CR2: Counter staff scheduling (bug) – The draft schedules suggested by the system is infeasible because some staff are assigned to more than one counter for certain durations and it does not take into account the maximum hours per day and/or week. This must be fixed asap.
- CR3: Loyalty card for customers (new) – We need to implement loyalty functionality (registration, issue of electronic card, point scheme, discounted prices, priority seating, etc.) to improve our customer service.

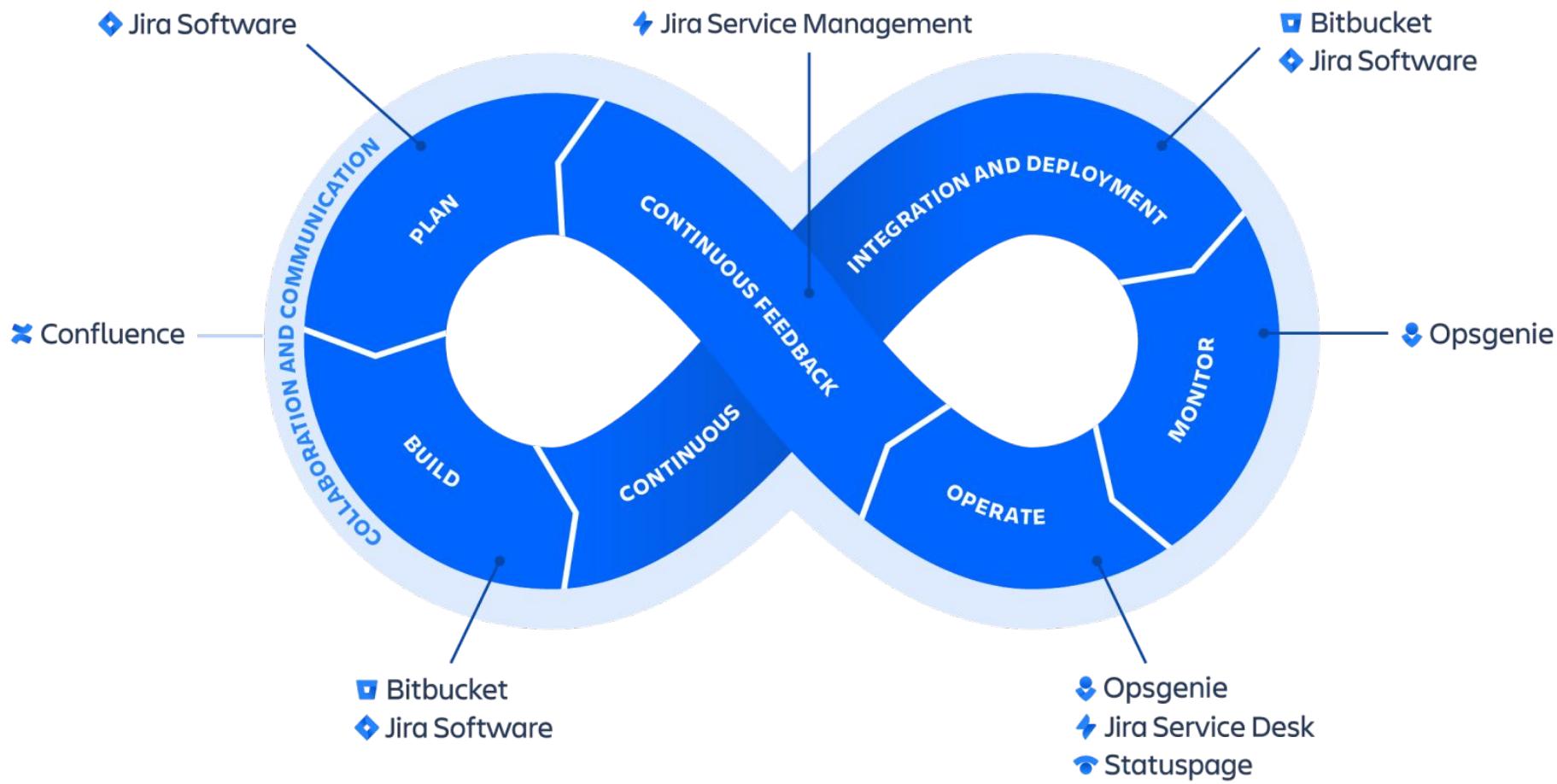
Estimate the effort required (in person-days), possible impact(s) of the change on the system (specific parts), and whether you approve or deny the CR.

Continuous Integration



Chapter 25, Somerville, I. (2007). *Software engineering*. Addison-Wesley.

Continuous Integration and Continuous Deployment



<https://www.atlassian.com/devops>



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Contact Session # 13a

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Topics

- Contract management
 - Managing outsourcing projects
 - Vendor evaluation
 - Contacting options
 - Keys to success
 - Contract management systems

Steps for successfully managing outsourcing projects



1. Specify requirements in detail
2. Make an explicit decision to outsource
3. Obtain adequate resources
4. **Select a qualified vendor**
5. **Write a contract**
6. Build an in-house management team to monitor the project to completion

<http://www.andrew.cmu.edu/course/67-325/OutsourcingHB.pdf>

Proposal evaluation criteria - example

Criteria	Max Points	Vendors			
		V1	V2	V3	V4
Project management capability	10	3	8	5	3
Application-area experience	10	1	5	3	10
Technical-area experience	10	8	10	3	10
General technical capability	10	5	10	10	7
Organizational strength	10	5	9	10	3
Technical design approach	10	5	8	8	10
Technical methodologies	10	5	8	7	8
Requirements management approach	10	4	10	7	9
Technical documentation	5	3	5	4	5
Engineering data management	5	1	5	4	5
Configuration management approach	5	2	5	3	5
Quality assurance approach	5	1	5	4	4
Total points	100	43	88	68	79
Overall ranking	-	4	1	3	2

CS13 - Activity #1: Vendor evaluation criteria



Assuming that ACL management has decided to outsource the Mux-Core project instead of developing in-house as planned earlier, identify FOUR or FIVE elements or components of the evaluation criteria to be used for ranking the proposals received from different vendors for Mux-Core software development.

Contracting options

- **Time and materials contracts** – hourly billing rate; risk of cost overrun; used when requirements cannot be precisely defined and/or client needs flexibility
- **Cost plus contracts** – a fixed amount + hourly billing rate (or function point rate); incentives/penalties can be included
- **Fixed price contracts** – used when requirements are clear (based on function point estimate); less risk for client

<http://www.andrew.cmu.edu/course/67-325/OutsourcingHB.pdf>

Two-phase acquisition

- Phase 1: requirements development and planning work (10-20% resources; 15-30% time)
- Phase 2: detailed development work
- Benefit: more control over vendor selection
- Used when
 - Requirements are not well-defined/expected to change
 - Client wants a formal checkpoint
 - Client wishes to share risk with the vendor

Keys to success

- Understand company goals and objectives; is outsourcing the right solution?
- Create an outsourcing plan
- Define the software requirements in detail
- Create a Request for Proposal (RFP)
- Estimate your project's cost and schedule before finalizing your RFP
- Obtain sufficient budget and management resources to assure success

<http://www.andrew.cmu.edu/course/67-325/OutsourcingHB.pdf>

Keys to success (contd.)

- Select a qualified vendor
- If no vendor appears qualified, switch to a two-phase acquisition model or bring the project in-house
- Create the outsourcing contract with care, and have it reviewed
- Actively manage the outsourced project
- Use outside experts when needed

<http://www.andrew.cmu.edu/course/67-325/OutsourcingHB.pdf>

Contract option

Assuming that ACL's management has decided to outsource the Mux-Core project instead of developing in-house as planned earlier, and then selected a vendor, suggest a suitable contract option.

project risk management

Suggest some risk management options for outsourced projects.

Contract Management Systems



Demo of Icertis Contract Management System

<https://www.icertis.com/demo/>

See <https://www.softwareadvice.com/contract-management/> for a list of top contract management systems from different vendors



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Contact Session # 14b

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Transitioning to agile methodologies

- Challenges associated with transition
- Managing and/or dealing with the challenges

Activity 14b#1:

What are the possible challenges in transitioning to agile methodologies in large organizations with distributed teams?

Transitioning to agile methodologies

- Other functions unwilling to change (mentioned by 31% of the reported cases)
- Lack of guidance from the literature (21%)
- Reverting to the old way of working (19%)
- Misunderstanding agile concepts (19%).

Dikert K, Paasivaara M, Lassenius C (2016) Challenges and success factors in large-scale agile transformations: A systematic literature review. *J Sys Softw*

Activity 14b#2:

How to overcome the challenges identified above?

Tips for large scale agile transformation



- Consistent process and practices (mentioned by 43% of respondents),
- Implementation of a common tool across teams (40%),
- Agile consultants or trainers (40%),
- Executive sponsorship (37%), and
- Internal agile support team (35%).

VersionOne Inc (2016) 10th annual “state of agile development” survey.

<https://versionone.com/pdf/VersionOne-10th-Annual-State-of-Agile-Report.pdf>



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Contact Session # 15

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Topics

- Project closeout
 - Reasons for project closure
 - Project closure process
 - Performing a financial closure
 - Project closeout report

Checklist to Close a Project



Deliverables are handed off and signed off by stakeholders



All documents are organized and signed by the appropriate person



Financials: pay off all invoices and close out all project-related contracts



Finalize all project reports and archive them for future reference



Assign a transition support person to shepherd the project after completion



Release or reassign project resources, which includes people and equipment



Don't neglect to celebrate the a successful project, everyone deserves it



With project management software, project closure is more efficient

Project closure

- Successful completion of project
- or
- Prematurely terminating a project
 - Lack of resources
 - Changed business need
 - Perceived benefits no longer valid
 - Changes to regulatory policies
 - Technology became obsolete
 - Risk is unacceptable

https://www.smartsheet.com/sites/default/files/2021-04/IC-Software-Project-Closure-Report-11064_PDF.pdf

Why projects are not properly closed?



- Lack of interest by the project team
- Underestimation of know-how and implicit knowledge
- Emotional factors
- Indecision regarding project closure

Project closure process

- Getting client acceptance
- Archiving project deliverables
- Preserving project know-how
- Performing a financial closure
- Performing post-implementation project review
- Preparing post-implementation review report
- Releasing staff

Project closure checklist

1. Start at the beginning with the **project scope document** you created and make sure that you've met all the requirements listed there.
2. Make sure that all deliverables have been handed off and signed by stakeholders, getting their approval and satisfaction.
3. Other project documents must also be signed by the appropriate person, this includes any outstanding contracts and agreements with vendors and other contractors.
4. Once documents are signed off on, then process them and pay off all invoices and close out any project-related contracts.
5. Add all documents together, including finalizing all project reports, then organize and archive them as historical data to be used for future reference.
6. Use collected paperwork to identify and document the lessons learned over the course of the project, including any feedback from stakeholders, so you don't make the same mistakes in future projects.
7. Assign a transition support person to shepherd the project after completion so that the project closure is thorough.
8. Release or reassign the project resources, which includes your team and other project personnel and any equipment or site rentals used for the project.
9. If you've not used a **project management software**, get one, as it helps control not only the life cycle of the project but also the process of closing the project thoroughly.
10. Finally, but perhaps most importantly, celebrate with your project team. They did the work and deserve credit and an opportunity to blow off steam until the next project is started.



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SS ZG622:
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Contact Session # 16

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Topics

- Course review
 - Major topics covered
- Comprehensive exam
 - About the Exam
 - How to prepare for the exam
- Q&A

Major topics covered

- Projects and programs; characteristics of projects; project life cycle management; challenges in managing software development projects
- Project goals vs. program/business goals; project metrics; techniques for effort estimation; distribution of effort across project phases
- Plan-driven and agile processes; selecting a suitable (or the right) process for software development

Major topics covered

- Project planning; project scheduling; AoN diagrams; resource scheduling; critical path
- Types of risks and their management alternatives
- Software product and process quality; quality attributes; quality planning
- Software change management; process and CCB

Major topics covered

- Project monitoring and control; managing teams/stakeholders; managing attrition and distributed teams
- Contracts and their management
- Project evaluation and program/IT-portfolio evaluation; Migration to agile process
- Project closure activities

Comprehensive exam

About the exam

- Open-book, 2 ½ hours duration and most of the questions are specific to some case or some problem domain
- Covers **all course topics** but more emphasis on topics covered after the mid semester test
- Test your broader understanding of SPM and application of specific techniques/methods covered in the course (recorded lectures and contact sessions)

<http://www.andrew.cmu.edu/course/67-325/OutsourcingHB.pdf>

How to prepare for the exam



- Before the exam
 - Understand various concepts/methods; their importance, application and limitations; what is common and what is different between alternative concepts/methods
 - Practice solving problems such as Gantt charts, activity diagrams, estimation, planning, earned value management, burndown charts, ...
 - Understand how various challenges in project management are addressed by different methods or approaches

How to prepare for the exam



- During the exam
 - Do not over-answer by giving lengthy and unrelated answers to fill space
 - Read the questions carefully and understand what is expected
 - Prepare draft answers or points (rough work at the bottom of each page of your answer book)
 - Give concise answers synthesizing, reflecting and connecting your understanding of SPM

Q&A