SOFTWARE PROJECT MANAGEMENT: BITP 3223

By: Prof. Dr. Mohd Khanapi Abd Ghani

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He is a Professor at the Department of Software Engineering, Faculty of Information and Communication Technology, Universiti Teknikal Malaysia Melaka (UTeM). He had 17 years of experience in managing, developing and implementing commercial and national ICT projects before changing his career path from industry to academia in 2003. He has been with industry in commercial systems development since 1988 including the Institute of Language and Literature Malaysia, Nasional Saving Bank (BSN), Permodalan Nasional Berhad (PNB), PNBIT, Heitech Padu Berhad and Medical Online Bhd. He started his carrier as a programmer and progressed to system analyst, project leader, project manager and software development manager.

He earned his Diploma in Computer Science, from MARA Institute of Technology Malaysia, He then received his Bachelor Degree in Computer Science and Master of Science in Real Time Software Engineering from Universiti Teknologi Malaysia. He then pursues a third degree on **Biomedical Computing** and earned a Doctor of Philosophy (PhD) from Coventry University, United Kingdom in 2009. His research areas of interest include **Health Informatics/Biomedical Computing** (electronic healthcare systems, telemedicine, healthcare knowledge management, AI in Healthcare, Big Data in Healthcare) and **Software Engineering** (system development, system design & architecture, database design and software reuse). He has appointed as Telehealth Associate Consultant for AIH Group (Malaysia) Sdn Bhd for developing telehealth/electronic healthcare application nationally and internationally. He holds several management positions such as Deputy Director of Centre for Research and Innovation Management, Deputy Dean Research and Post-Graduate and, Dean Faculty of Information and Communication Technologies of Universiti Teknikal Malaysia Melaka (UTeM). He is also a founder of Biomedical Computing and Engineering Technologies (BIOCORE Malaysia) Research Group and lead several research projects in healthcare system and commercial software projects. Due to his invaluable experience and knowledge in real software development while working in industry before, he taught related software engineering subject included Advance Software Engineering, Software Analysis and Design using UML, Software Testing and Quality Assurance and, Software Project Management.

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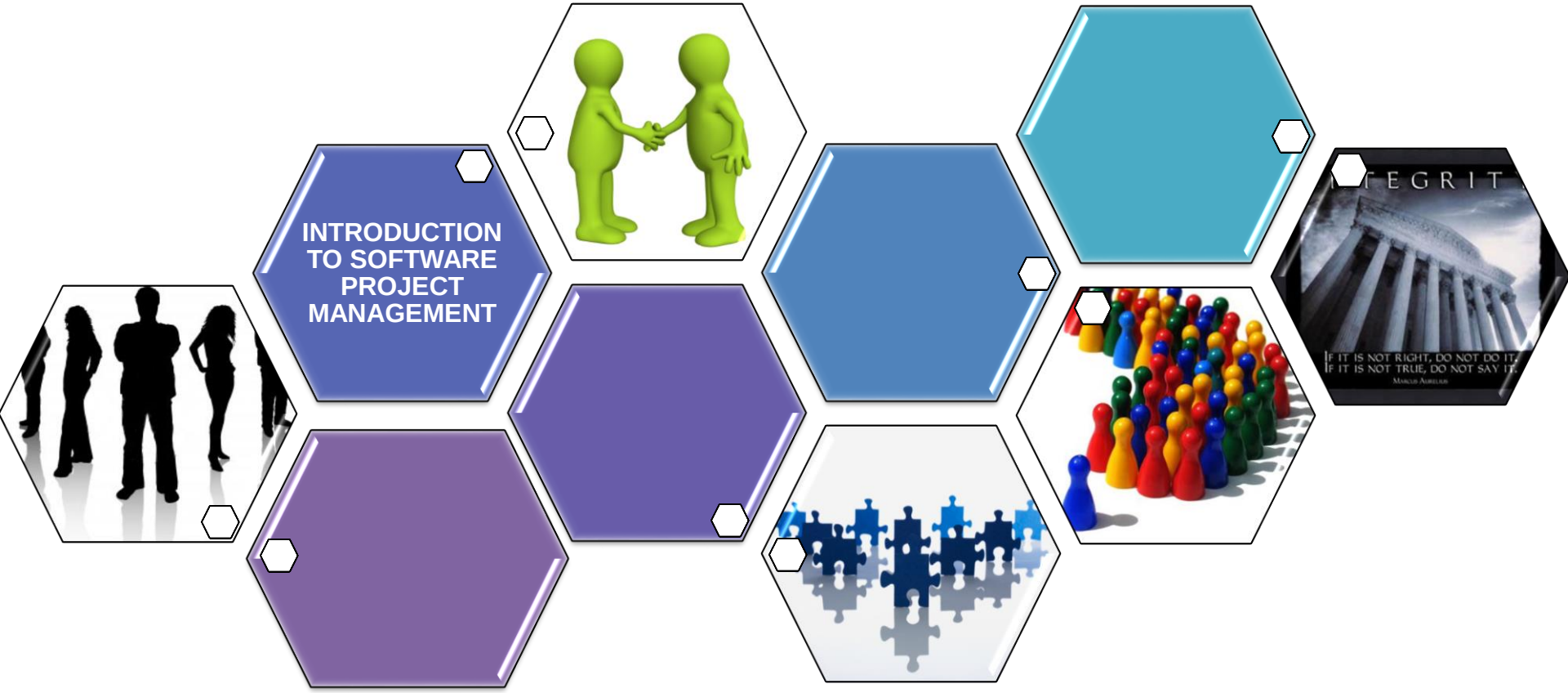
Course Outline

- Teaching Plan
- Project Assignment

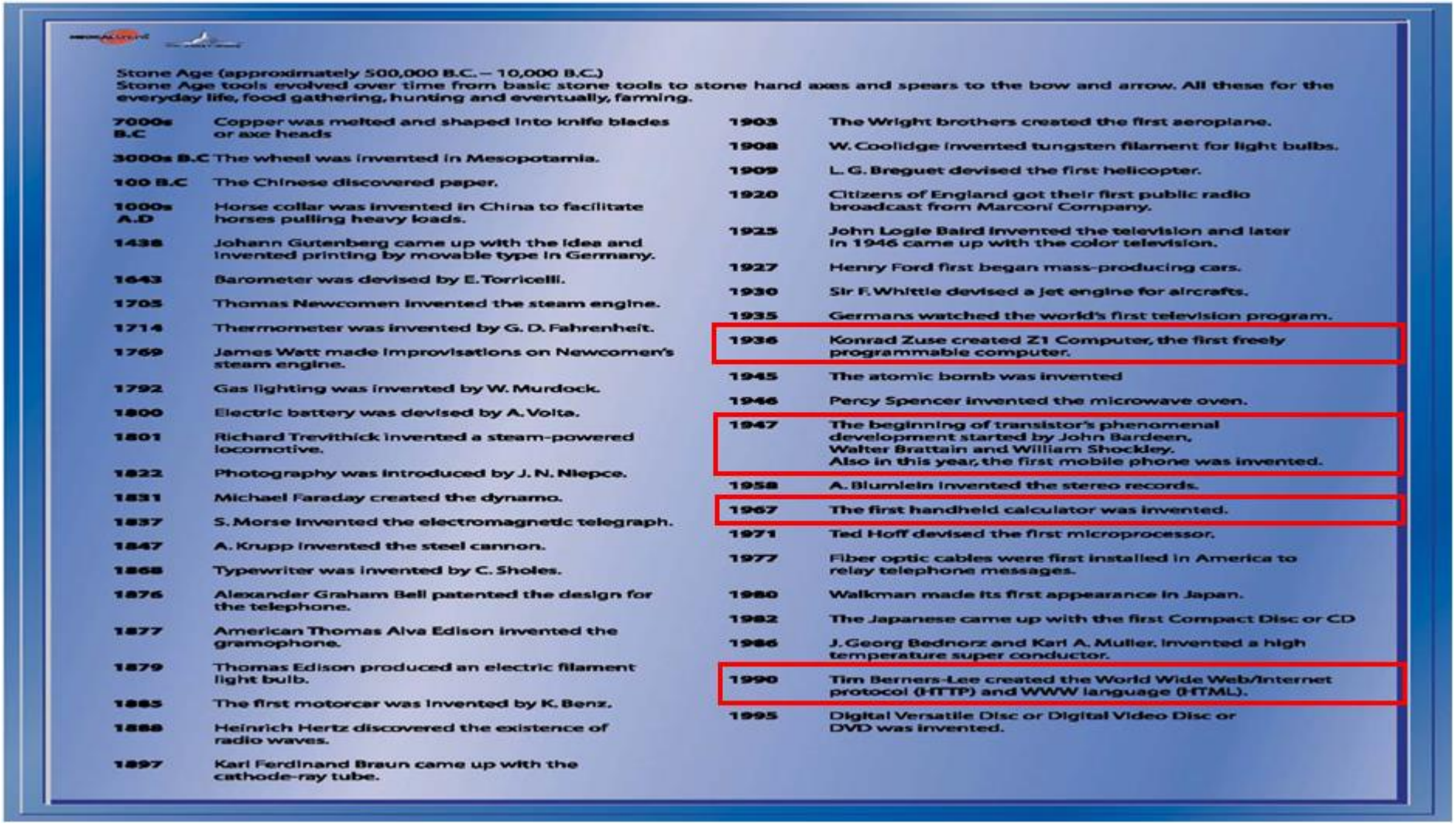
Chapter 1



Definition

- What is Project?
  - Temporary effort (one-time effort limited by time)
  - Complex
  - Nonroutine job (not like office work to run daily business)
  - A project is a planned activity.
  - E.g. construction of building & computerisation of business process
- **Character of a project**
  - Has specific objectives to be completed within certain specifications
  - Has defined start and end dates
  - Is perform by human and nonhuman resources (people, money, material)
  - Is planned, executed and controlled
  - Is constrained by limited resources (budget,people,equipment)
- What is Project Management?
  - The use of knowledge,skills,tools & techniques to achieve proj objective within specified scope, time & budget
  - Project activities normally involved several stages including i) initiation ii) planning iii) executing iv) controlling v) closing.

Choronological timeline of revolutionary technologies through the different Ages

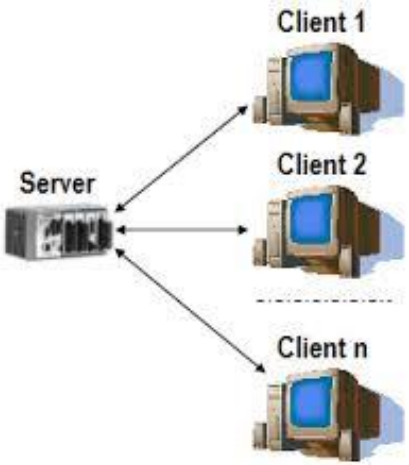


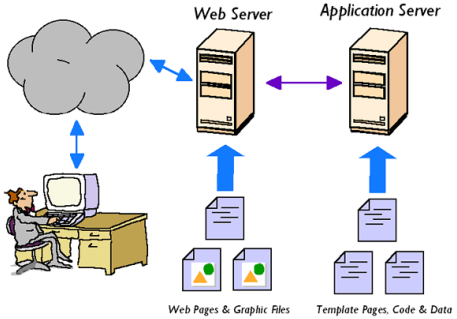
Stone Age (approximately 500,000 B.C. – 10,000 B.C.)
Stone Age tools evolved over time from basic stone tools to stone hand axes and spears to the bow and arrow. All these for the everyday life, food gathering, hunting and eventually, farming.

7000s B.C	Copper was melted and shaped into knife blades or axe heads
3000s B.C	The wheel was invented in Mesopotamia.
100 B.C	The Chinese discovered paper.
1000s A.D	Horse collar was invented in China to facilitate horses pulling heavy loads.
1438	Johann Gutenberg came up with the idea and invented printing by movable type in Germany.
1643	Barometer was devised by E. Torricelli.
1705	Thomas Newcomen invented the steam engine.
1714	Thermometer was invented by G. D. Fahrenheit.
1769	James Watt made improvisations on Newcomen's steam engine.
1792	Gas lighting was invented by W. Murdock.
1800	Electric battery was devised by A. Volta.
1801	Richard Trevithick invented a steam-powered locomotive.
1822	Photography was introduced by J. N. Niepce.
1831	Michael Faraday created the dynamo.
1837	S. Morse invented the electromagnetic telegraph.
1847	A. Krupp invented the steel cannon.
1868	Typewriter was invented by C. Sholes.
1876	Alexander Graham Bell patented the design for the telephone.
1877	American Thomas Alva Edison invented the gramophone.
1879	Thomas Edison produced an electric filament light bulb.
1885	The first motorcar was invented by K. Benz.
1888	Heinrich Hertz discovered the existence of radio waves.
1897	Karl Ferdinand Braun came up with the cathode-ray tube.
1903	The Wright brothers created the first aeroplane.
1908	W. Coolidge invented tungsten filament for light bulbs.
1909	L. G. Breguet devised the first helicopter.
1920	Citizens of England got their first public radio broadcast from Marconi Company.
1925	John Logie Baird invented the television and later in 1946 came up with the color television.
1927	Henry Ford first began mass-producing cars.
1930	Sir F. Whittle devised a jet engine for aircrafts.
1935	Germans watched the world's first television program.
1936	Konrad Zuse created Z1 Computer, the first freely programmable computer.
1945	The atomic bomb was invented
1946	Percy Spencer invented the microwave oven.
1947	The beginning of transistor's phenomenal development started by John Bardeen, Walter Brattain and William Shockley. Also in this year, the first mobile phone was invented.
1958	A. Blumlein invented the stereo records.
1967	The first handheld calculator was invented.
1971	Ted Hoff devised the first microprocessor.
1977	Fiber optic cables were first installed in America to relay telephone messages.
1980	Walkman made its first appearance in Japan.
1982	The Japanese came up with the first Compact Disc or CD
1986	J. Georg Bednorz and Karl A. Muller, invented a high temperature super conductor.
1990	Tim Berners-Lee created the World Wide Web/Internet protocol (HTTP) and WWW language (HTML).
1995	Digital Versatile Disc or Digital Video Disc or DVD was invented.

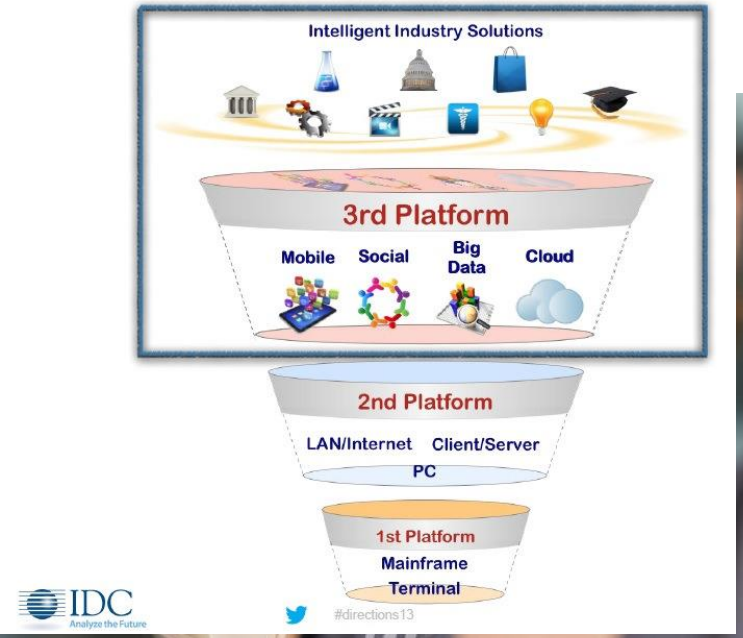
ICT Platform Evolution

- The 1980’ – 1990’ : Mainframe
- The 1990’ – 2000’: Client Server
- The 2000’ – 2010’: Web Application
- The 2010’ – now’: Apps or 3rd platform





What's 3rd Platform?



- Apps built on mobile devices, cloud services, mobile broadband networks, big data analytics social technologies and IOT.

Overview of ICT Project

- **The ICT industry** is in the midst of a once every 20-25 years shift to a new technology platform for growth and innovation.
- We call it the 3rd Platform, built on mobile devices and apps, cloud services, mobile broadband networks, big data analytics and social technologies.

Source: IDC, 2013

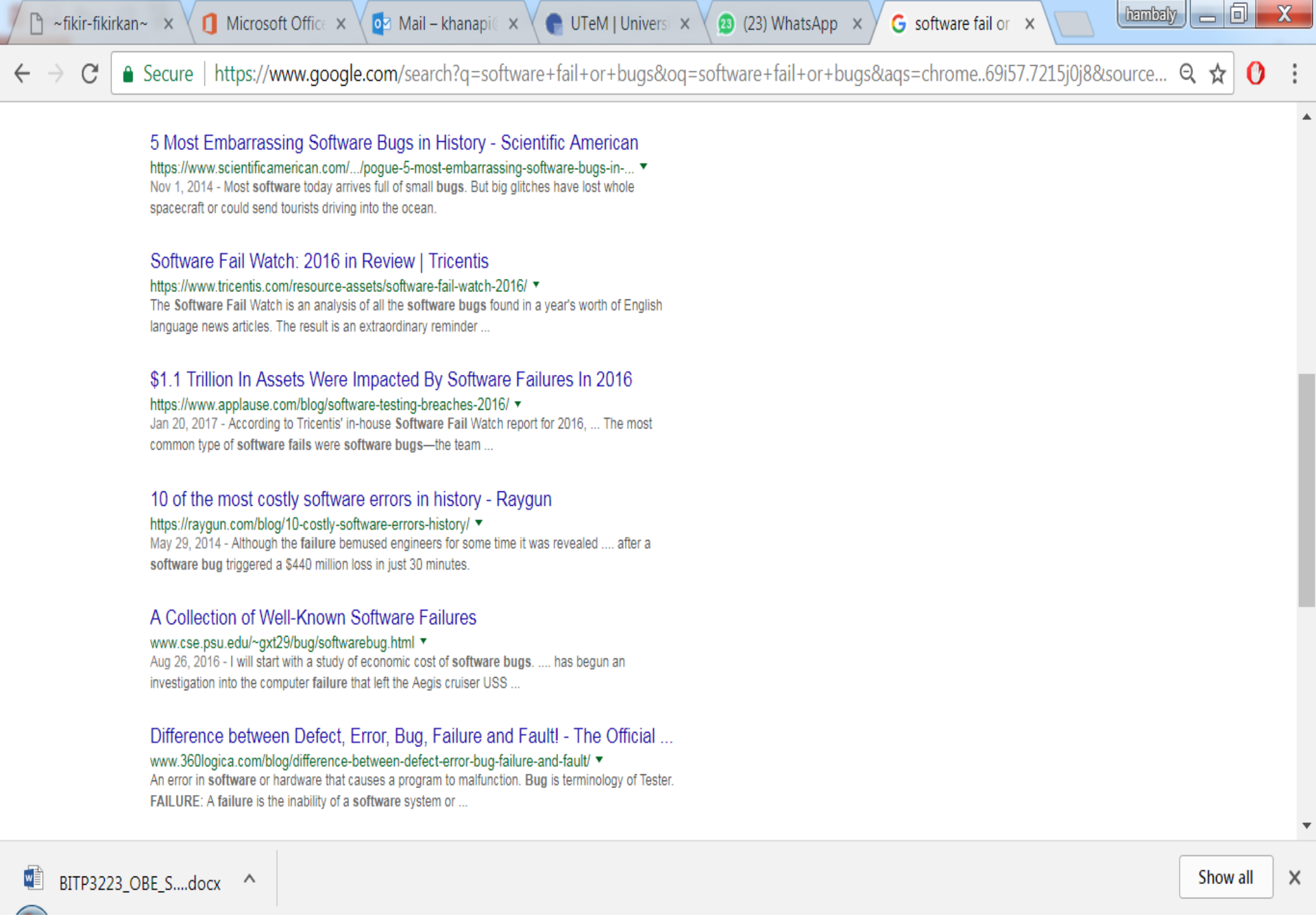
Overview of ICT Project

- By 2020, when the ICT industry reaches $5 billion - $1.7 billion larger than it is today - at least 80% of the industry's growth will driven by these 3rd platform technologies, an explosion of new solutions built on the new platform, along with rapidly expanding consumption of all of the above in emerging markets.

Source: IDC, 2013

Overview of Software Project

- Global Issues
  - 53% either over budget, delayed, fewer functions or any combinations
  - With increasing demand software development becoming a "bottleneck"
  - Thing get more complicated an users never satisfied
  - Software delivery date(s) is a major economic issue e.g Windows 8, google glass, Tablets & Smartphone, Facebook, etc.
  - Internal ICT dept is in crisis (e.g. MYSIKAP) trends towards OUTSOURCING !



- WHY ??? Many SOFTWARE PROJECT GOT ISSUES?
- Are these FAIL OR SUCSESS???

Failure and Success (1)

- Failure in many ways
  - Developers fail to deliver
  - Software delivered, but late and lots of bugs
  - Users refuse to use it
  - Users use them, but it fails to improve their business, or to meet their business

Failure and Success (2)

- Typical problems leading to failure
  - Failure to agree/understand requirements
  - Failure to correctly and plan the project (as a whole and stages)
  - Failure to control progress and keep effort at the right goals
  - Failure to recognize and manage risks early enough

Menarik hari ini

- KOMUNITI
- Waktu Solat
- Laporan Cuaca
- BERITA

mySIKAP dijangka pulih hujung tahun

KUALA LUMPUR 23 Nov. - Sistem pengkomputeran mySIKAP di kaunter urusan Jabatan Pengangkutan Jalan (JPJ) dijangka pulih sepenuhnya hujung tahun ini, selepas berlaku masalah berikutan peralihan sistem jabatan itu.

Ketua Pengarah JPJ, Datuk Seri Ismail Ahmad berkata, pihaknya telah menyelesaikan masalah yang timbul dan sistem tersebut semakin bertambah baik selepas tiga minggu mySIKAP dilaksanakan di seluruh negara.

Menurut beliau, pada dua minggu pertama sistem mySIKAP diperkenalkan, pihaknya mendapati berlaku sedikit gangguan dalam sistem.

"Pada minggu ketiga, sistem telah kembali pulih tetapi proses untuk menstabilkan sistem masih diperlukan untuk mengelakkan berlaku lagi gangguan lain dan kami meminta supaya orang ramai memahami keadaan ini, " katanya dalam sidang

More reason why projects fails

- Bad-communication
  - >> communication failure between users, developers, projet mgr
- Wicked- problems
  - >> some problems needs unconventional approach
- Inadequate skills
  - >> proj team don't have the right staff thus need time to train
- Uncontrollable changes
  - >> moving target problem, needs proper configuration mgt & change mgt
- External supply : supplier dependent
- Failure to recognize risks : require risk mgt

How to attain success? (1)

- Ensure requirements are clear, agreed upon and well understood
- Plan well : take and make the time to plan → no compromise here …
- Identify and manage risks
- Track/monitor progress against plan(s)
- Communicate to everyone

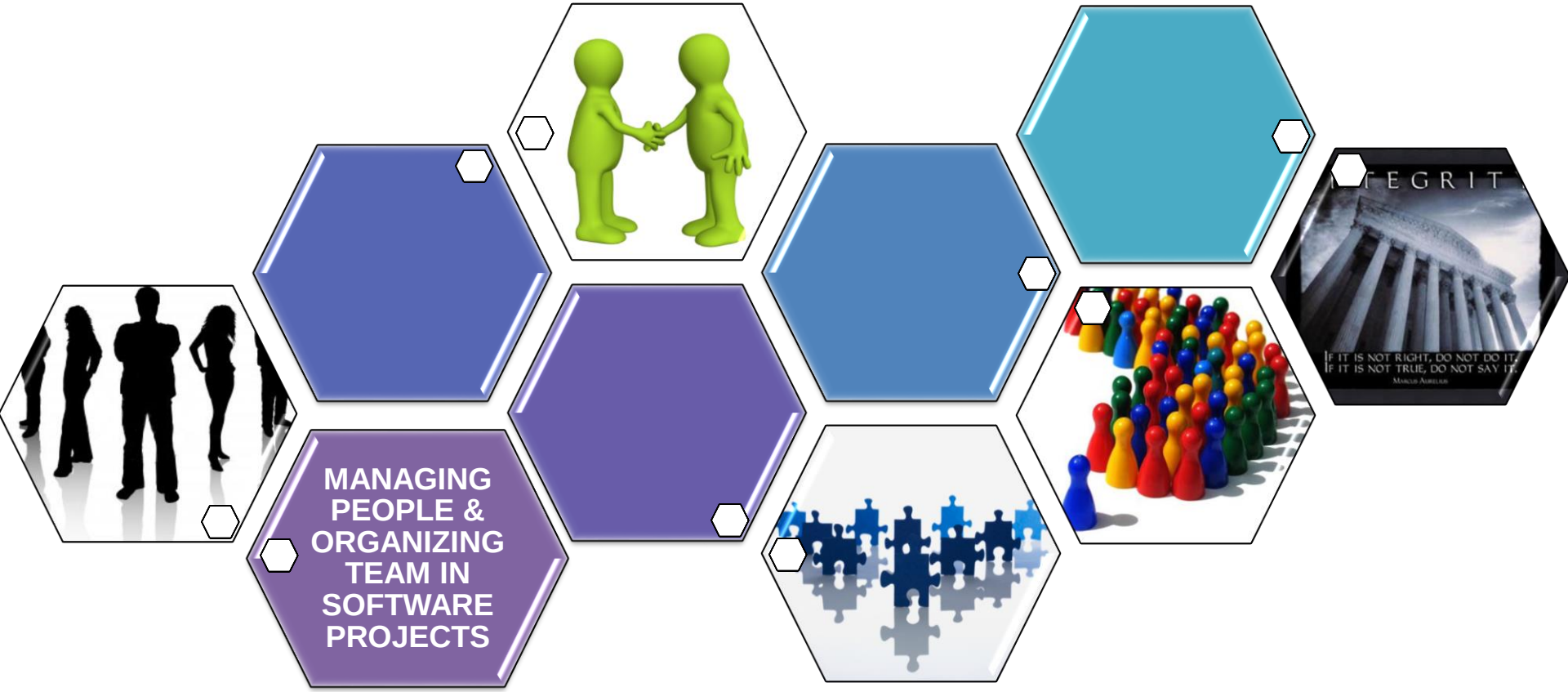
How to attain success? (2)

- Achieved 5 basic terms of reference (TOR)
  - Functional requirement : what the system must do to meet business needs.
  - Technical requirement : how the system must work.
  - Quality requirement : how well the system must work.
  - Plan : schedule of milestone and deliveries of deliverables.
  - Budget : the cost of work in effort and money terms
- At the outset also identify critical success factors for the project and measure against it.

Summary

- Software become bottleneck for business continuation.
- Software project is vital to be managed as business functionalities rapidly grow and complex.
- Project is temporary efforts
- Failure and success need to be managed accordingly

Chapter 2



The Roles of Project Manager

What does a Project Manager do ?

- Know what you are doing… don't become like the "LONE RANGER"
  - Project
  - Manager
- The Lone Ranger, long since retired, makes an unpleasant discovery

What does a Project Manager do ? (1)

- Leading and Building the team
  - Coordinate activities of a group of PEOPLE
  - Coordinate goals of different PEOPLE
- Planning
  - Every task, resource, deliverable
  - Manage quality of work done
- Communicating
  - Everyone must understand what, why, when, by whom
  - Need communication skills

What does a Project Manager do ? (2)

- Monitoring and Reporting Progress
  - Track down progress, reports to users and managers
  - Manage expectation and no surprises !
- Getting things done
  - Drives to get things done thru PEOPLE
  - Produce deliverables in achieving overall objectives

Key Skills of a Project Manager

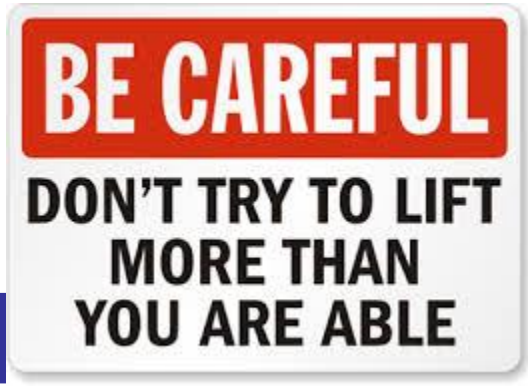
- Planning and Communicating
  - There must be a well documented project plan
  - Try answering 6 key questions
    - ✓**What, Why, When, Where, How, Who**
- Analyzing, designing and programming are not project manager jobs even though they need to be done (by member of the team through coaching)

How do I lead ?

- Get people to focus on common goal
- Develop and communicate plans
- Make sure job is done
- Communicate progress against plan to management and users
- Leadership
  - Performing task, guiding and building skills and building team

How to get people do things ?

- Normally have some authority over people… but not necessarily true
- Manage without authority
  - Based on persuasion, matching of goals, motivational factors that drive people (e.g. Recognition)
- Don’t be afraid to delegate, empower to potential people
- Manage conflicts and change
- Try to build consensus



What if people make mistake ?

- Recognize errors do occur
- Create “love-quality” atmosphere, no sloppiness tolerated
- Provide opportunity for the juniors to field and execute their ideas
- Allow some individuality and trust them
- Design and analysis errors are fatal… beware
- Invest in simple tools & templates to promote standards

How do I build a team ?

- Jelling a team
  - Everyone understands what he/she is doing and how it fits into the whole
  - Build identity for team : planning and report on behalf of team, not ‘your’ project
  - Encourage them to behave as a unit eg. Go to lunch together
  - Open up channels of communication

How do I build a team ?

- Things to avoid
  - Defensive management
  - Bad attitude to errors
  - Excessive bureaucracy
  - Paper-heavy development
  - Bad working environment

How do I make sure team is complete ? (1)

- Leadership
  - Someone to align goals of team members with team's objectives
  - To provide direction towards those objectives
  - On large project may need several team leaders for separate parts/tasks
- Decision making
  - Best collective, if does not work need someone to make and follow a decision

How do I make sure team is complete ? (2)

- Team building
  - Not explicit
  - Someone to take charge to smooth ruffled feathers (menenangkan hati/keadaan), arranging little social events
  - A catalyst (pemangkin) for team building… very invaluable
- Communication
- Selling team products
  - To sell to management and users what you have produced is what they want and asked for

How do I make sure team is complete ? (3)

- Planning
  - Someone needs to create & maintain plans and estimates
- Productivity & progress checking
  - Someone to take charge of measurement
  - To make sure meet targets… announce it
- Quality checking
  - Someone to check each deliverable against specs

How do I make sure team is complete ? (4)

- Ensuring technical coherence (kepaduan)
  - Technical integration function
  - Must exist from conception of solution and basic design
- Documentation
  - To maintain documents created either technical or management such as minutes, memos etc
- Admin & secretarial functions
- All these could be done by same people depending on size of people

How do I know if I'm communicating properly ? (1)

- Talk to people, spend some time just talking thru the job with each member of the team, managers and users
- Make sure communication is effective
  - Ask them about your plans and what they understand by it
  - Have both oral & written together
  - Always write a confirmation of discussion, phone call or meeting
  - Follow up a written communication with verbal clarification

How do I know if I'm communicating properly ? (1)

- Make the most of meetings
  - Clear agenda and objectives
  - Consensus about the way forward
  - Take minutes and distribute
  - Documents agreed actions and responsibility
  - No set of list of meeting… probably once a week progress meeting
  - Maybe separate meeting with managers and users (maybe separate) once a month

How do I plan ?

- Briefly you need to
  - Identify tasks and for each task answer 6 key questions
    - What ? Why ?
    - When ? Where ?
    - How ? Who ?

How do I know what progress I'm making ? (1)

- Be truthful ;
  - Be proud of your successes and honest about your failures and any problems you may be having
- Get team feedback on their progress against plan: 30 min progress report
  - Progress
  - Plan
  - Problems

How do I know what progress I'm making ? (2)

- Be sceptical (curiga)
  - Ask how long to complete not how much you have completed
  - Check all finishing off has been done including paperwork and delivery procedures
  - Prove targets for the components have been reached
  - Use independent QA team to verify progress made
- Inform users, managers and team of changes to objective and deadlines

How do I know what progress I'm making ? (3)

- Remember
  - " the first 10% of the development takes 90% of the time. The remaining 90% takes 10% of the time

How expert do I have to be ?

- No need to be a software expert as most problem associated to mgmt of people
- Need to common sense and sensitivity
- Need **some** technical knowledge

Things you must be able to do (1)

- Able to evaluate accuracy of info given to you
  - May need to arbitrate between 2 conflicting technical views
  - Able to reduce info to a form you can understand
- Understand what's going on
  - Have to report on behalf of team to users and managers so must understand state of the project, translate technical report to layman

Things you must be able to do (2)

- May have to provide guidance
  - Developer may time to time seek general guidance
- Must be sure that instructions are practical and estimates are realistic
- Must understand how good progress is
  - Beware 90% complete syndrome
  - Understand what actually achieved and more importantly STILL NEED TO DO !

Strategy to understand technical detail (1)

- Make sure understand the software production process
  - Many questions can be answered by team themselves if they follow methods properly
- Get independent advice
  - Get external QA advice or canvas opinions from team members
  - The idea is to get joint understanding of the situation

Strategy to understand technical detail (2)

- Get the person asking to find and assess no of options
  - Eg. use risk analysis technique, then choose that will highest benefit to risk ratio
- Try to reduce what you are told to a form you can understand
- Ask the right questions, if you don't understand you may need to ask different questions

Potential Problems

- Be a bit **pessimistic** (buruk sangka) – look for problems, don't wait
- Most people **hide** problem
- Problems **will not go** away
- Build an atmosphere for people to **spot** problems in **advance** and offer solutions

Spotting Problems

- Weapons
  - Communications, formal reporting, interim deliverables
- Do a risk analysis – to have a contingency plan
  - What are potential problems
  - What's probable impact of each problem
  - How likely
  - What to do if does occur

Summary – As PM what do I do ?

- Must
  - Lead and build team, plan, communicate, monitor & report progress, achieve overall project objectives
- Complete plan
  - Answer questions : what, why, when, where, how and who
- Talk to people to ensure they understand
  - What they have to do
  - What other people are doing
- Don't confuse project mgt tasks with technical ones
  - Dedicate time to responsibilities
  - Try read & practice Covey's 7 habits

Chapter 3

Contents

- Understand the life cycle
  - Project Life Cycle
  - The development life cycle
  - Project phases
  - Project methodology
  - How to use method
- Project management process
- Chapter summary

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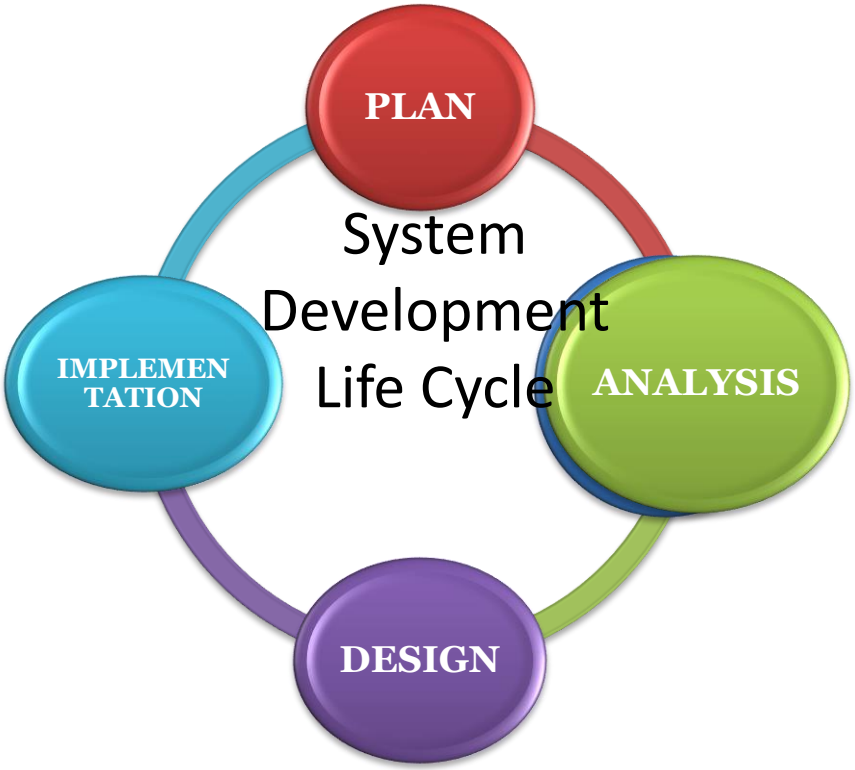
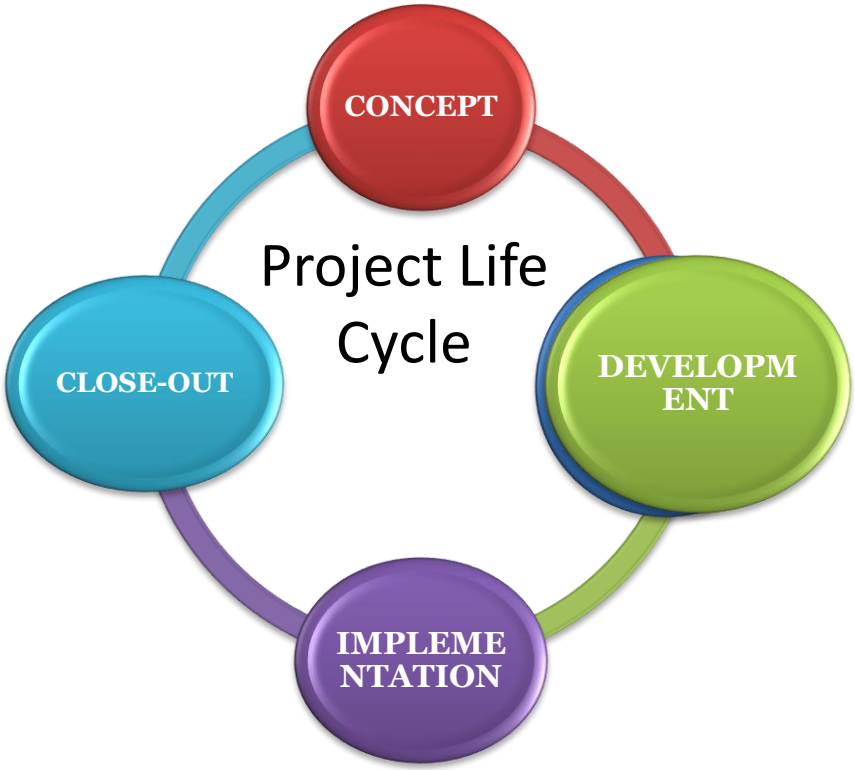
Understand The Life Cycle

System vs Project





What is project life cycle?

- A collection of project phases
- Each phases have defined work that need to be done as agreed in the project plan
- Traditional PLC Consist of 4 phases
  - Concept
  - Development
  - Implementation
  - Close-out

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What is project phases?

- A project is normally divided into several phases or unit of works.
- The objectives of project phases are to manage
  - Risk
  - Complexity
  - Expectation
  - Budget
  - Time consume

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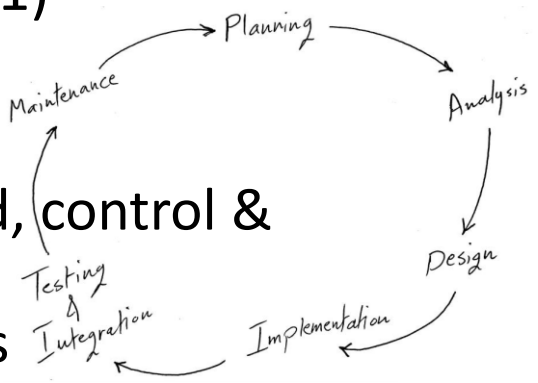
What is system development life-cycle?

Typical Methods (1)



- Structured methods
  - To make software dev easier to understand, control & repeat
  - A sequence of main development activities
- Waterfall process
  - Most commercial methods use a variation of waterfall methods
  - Good servants and bad masters
- Iterative process
  - To overcome waterfall methods which difficult to handle the software changes
  - The idea is to reduce risk early in the project by going through the identified sequence of activities (req, analysis, design, etc) multiple times

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What is system development life-cycle?

Typical Methods (2)

- Rational Unified Process (RUP)
  - A continuous and cyclic process, and allowing easier course corrections along the way and early risk eliminated.
  - Visually model software
- Extreme Programming/Feature-Driven Development
  - An anti-process & four major activities : planning, designing, coding, and testing

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What is system development life-cycle?

The Process & The Roles (1)

- Provide guidance about the order of a team's activities
- Specify what artifacts should be developed
- Direct the tasks of individual developers and the team as a whole
- Offer criteria for monitoring and measuring the project's products and activities

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What is system development life-cycle?

The Process defines the … (2)

- **Worker -** in this sense is a role performed by an individual in the process. In many projects, individuals perform the work of several workers.
- **Workflow -** is a set of activities that ultimately produce a tangible and observable result. E.g. project management, requirements gathering, use case modeling, analysis, design, implementation, testing and deployment. Each workflow typically requires several workers to complete.

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What is system development life-cycle?

The Process defines the … (3)

- **Activities -** are what the workers do to produce the output artifacts of the workflow. For example, construct use case model, construct object analysis, construct object design and implementation.
- **Artifact -** is any piece of information that is produced by the workers of the process. Artifacts can be models, model elements, or documents.

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What is project methodology?

- A methodology describes how things should be done.
- Some say an approach of doing things.
- In software project it call a systematic way and processes in developing application software.
- Different organisations often have different or sometime same ways of doing things.
- The methodology is essential for managing the development life cycle of software project.

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How do I use the method ?

- To serve you not for you to serve
- Use it to create structure
  - To communicate to users, managers, team
  - Manages development process
- Formalize plan
  - Into phases that method may not support automatically
    - Need creativity to adapt
- Quality plan documentation

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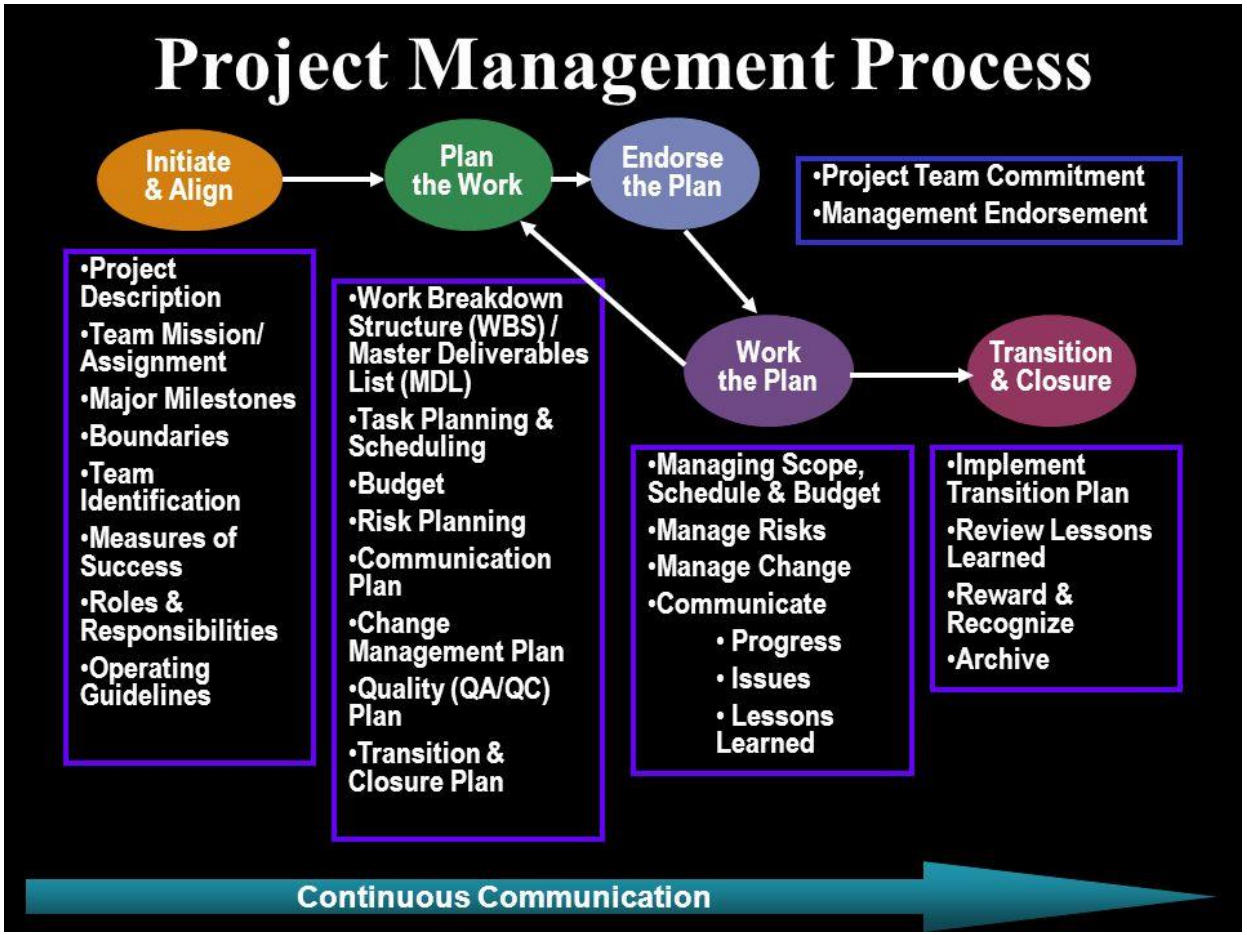
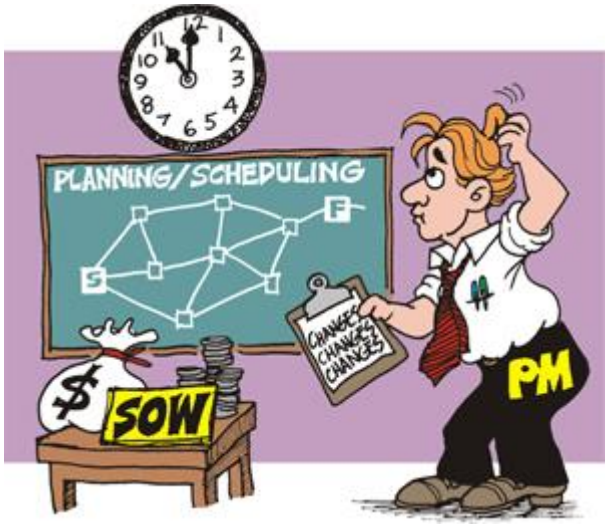
Project management process

Tasks involved (1)





Project management process

Tasks involved (1)

- Initiate
  - Project description – develop a business use case of a project
  - Team mission/assignment – select PM, identify project team members & define roles & responsibilities
  - Major milestones - Determine the scope (determine if the project should be divided into smaller projects), time, and cost constraints
  - Measures of success – define critical success factor
  - Operating guideline – standard operating procedure e.g. std method, form, protocols, committee, approval

.

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Project management process

Tasks involved (2)

- Plan the work
  - Develop Work breakdown structure (WBS)
    - A project scope statement, tasks, schedule, duration, responsibility
  - Prepare budget such as operating cost, asset, inventory, lease, licenses etc.
  - Risk planning e.g. a list of prioritised risks and the resolution
  - Change management plan e.g. procedure for changes, bugs fixed and new requirements
  - Quality plan e.g. software testing committee & acceptance criteria

Project management process

Tasks involved (3)

- Endorse the plan
  - Project team commitment e.g. a list of team members with various position and roles, organisation structure.
  - Management endorsement e.g. acceptance of software development plan

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Project management process

Tasks involved (4)

- Work the plan/Monitoring and control
  - Manage project human resource – acquire, develop and manage project team
  - Monitor and control project work e.g. change requests, PM plan updates, update project doc.
  - Manage change control e.g. change request status updates, Perform quality assurance etc
  - Verify and control scope., schedule, cost, quality & performance
  - Monitor and control risks
  - Administer procurements
  - Communicate – progress, issues, lesson learned

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Project management process

Tasks involved (5)

- Transition & closure
  - Close project or phase e.g. produce final products, service or result transition and necessary documentation.
  - Review lessons learned
  - Close procurements e.g. stop purchase any hardware or software or other equipment.
  - Get final sign-off… if any…
  - Get remaining payment…if any…
  - Archive

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How to control changes ?

- Need to exert control/discipline over changes
- Some principle
  - Ensure all proposed changes documented
  - Evaluate each request, understand the biz reason --- don't change if you/user don't understand it
  - Agree (with user) priority of approved change request
  - Check, communicate impact of change
  - Plan the change (into groups) and make them together
  - Communicate changes to everyone eg. Users, managers, team etc
- To be safe (more tips)
  - Write everything down
  - Sign-off at each stage
  - Make control change visible

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Chapter Summary

- Project phases is a division of works/deliverables/functions into several stages.
- SDLC methodology describes how software project should be done or developed.
- Prototyping is one of a development methodology.
- Methodology is used to facilitate/serve project members and activities.

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Chapter 4

Contents

- Making a plan
- How to plan staffing of project
- How to present plan
- Structuring development
  - Dividing by functional area
  - Dividing by design structure
  - A hybrid approach
- Splitting project into phases
  - A phased structure
- Plan an important documents

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Why Planning?
Purpose (1)

- Eliminate/reduce uncertainty e.g. shortage of staff, too many changes, bugs/errors etc.
- Improve efficiency e.g. lesson learned from progress
- Obtain better understanding of the project e.g. training need analysis,TOT etc
- Provide Monitoring & controlling of work e.g. compare actual vs plan
- Establish benchmarks e.g. compare & learned from existing/related project.

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Why Planning?
Purpose (2)

- To define the overall management strategy, responsibilities, authorities and specific procedures to be followed.
- To assist in fostering creation and maintenance of a team.

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Planning
Making a plan (1)

- Review resources to meet requirement timescale
  - People – specific/type of person
  - Infrastructure – computer, training room, LAN
  - Money

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Planning
Making a plan (2)

- Work out logical sequence of events
  - Look for dependencies, constraints
    - Use project mgt tools or spreadsheet (MS Project or Excel)
    - Break work into phases delivering simplest first

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Planning

Making a plan (3)

- Assign resources to tasks and estimate time required to complete different tasks
  - Rule of thumb – Four (4) effective/week taking into account sick leave, holidays, festival, training

Planning

Making a plan (4)

- Schedule tasks
  - Set start and end dates for each tasks following the req sequence
  - Try changing order subject to constraints
  - One chain of tasks following one another with no slack --- critical path
- Discuss and agree with team, mgrs & users
  - Reduce scope/break into phases/get extra resources if req timescales not met

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Planning

How I plan staffing of project ? – (1)

- Factors to take into account
  - Specify managerial and technical skills
  - Learning curves
  - Familiarization
  - Personal productivity
  - New technology, standards etc

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Planning

How I plan staffing of project ? – (2)

- How to handle this non-ideal but real situation
  - Training – before they are expected to contribute
  - Allow extra time to catch up
  - Assign low criticality tasks for first experiments

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Planning

How can I present my plan ?

- Basic requirement:
  - Clarity
    - ➢ For better communication use gantt chart or PERT chart instead of table
    - ➢ Maintainability
      - ✓ Use available and suitable tool
  - Make the plan public, invite comments
  - A plan is a living document, it will change – with agreement from all

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Structuring Development (1)

- Main ways to structure/divide work and team
  - By functional area e.g. One group build payroll subsystem, the other build loan subsystem
  - By technical specialization and design
    - Db expert to design & build db, GUI expert on user interface
    - Part of team concentrate on analysis, part on design, part on programming, part on configuration

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Structuring Development (1)

- Hybrid
  - For those that can perform multi-tasking and having multi-skills
  - E.g. system analyst cum project leader, senior software engineer cum software architect.

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Structuring Development

Dividing by functional area

- A natural division
  - Allows individual or small sub-team to concentrate on details set of functions and addressing the need of one group of users
  - Disadvantages :
    - Each team must reasonable expertise in main dev tasks
    - Difficult to keep stds and design consistent
    - Difficult if need to deliver all functions same time
    - Difficult to make decision if the personnel is in the same level

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Structuring Development

Dividing by design structure

- Split team and work based on design itself
  - Division of labor
  - Use of specialist eg. COM, J2EE Architecture, .NET Architecture (VB, C#, XML web service)
  - Modular structure eg. Component base, layering (front end & back end)
  - Disadvantages
    - Interface issues
    - Difficult to keep stds and design consistent

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Structuring Development

A hybrid approach

- Specialists working on particular areas (testing, doc, overall design)
- Small application is build by teams that split functionally
- An evolving approach
- Disadvantages
  - One staff having high work load
  - Dependency

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When to split project into phases ?

- Wrong to define all requirement before building the system when
  - Business changing very rapidly e.g. New biz
  - Major uncertainty on requirement
  - Scope too large to understand it all
  - Users want some part delivered later than others
  - Users not sure what they want
  - Users afraid to responsible what they proposed

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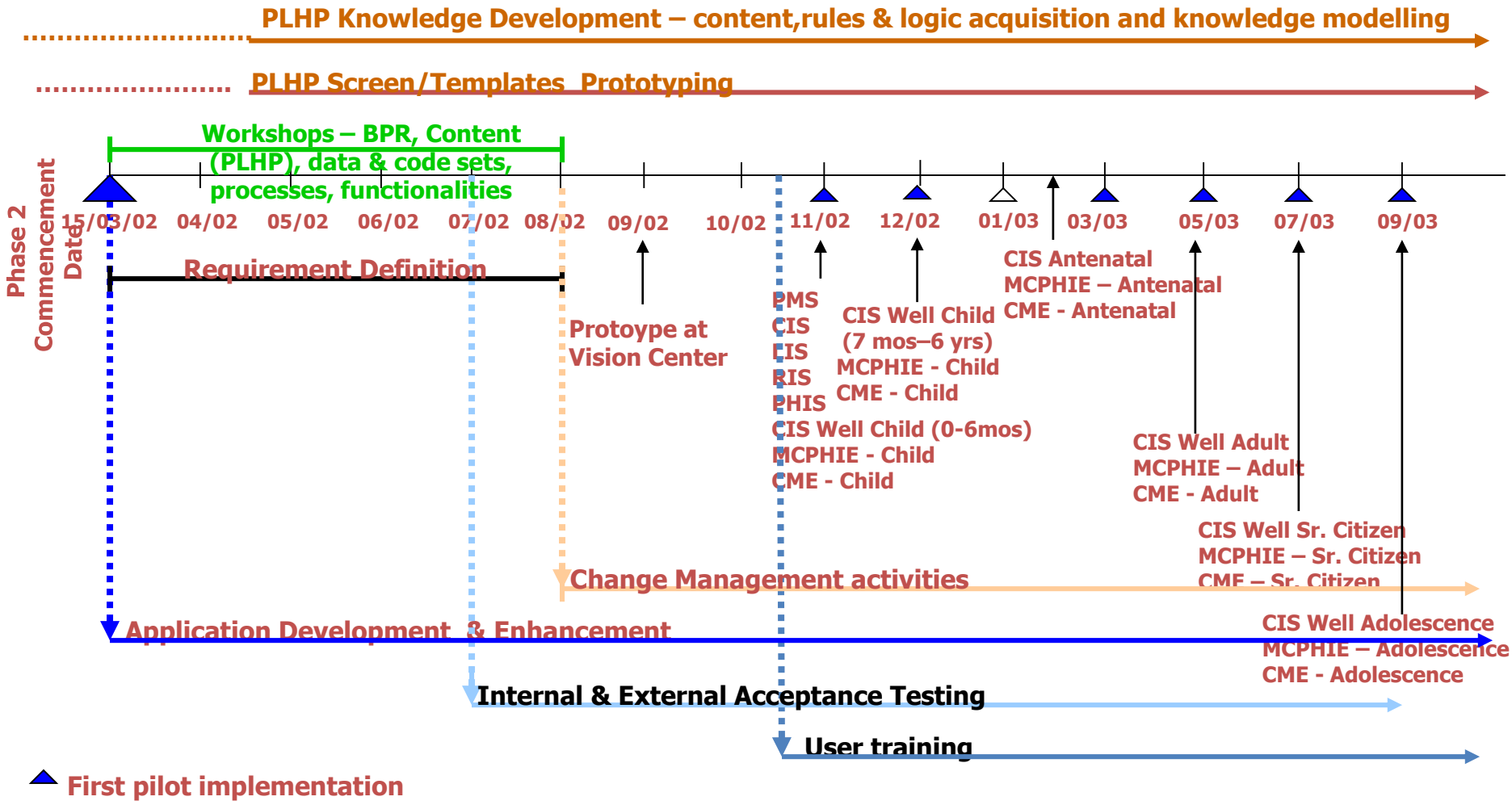
A Phased Structure



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A Phased Structure

Some Risks…

- Quality must be high so built system can used as a foundation for later development
  - Component re-use, maintainable, proper documentation
  - Required good configuration mgt
    - Required proper change control
    - Clear boundaries between phases of software versioning control
    - User must understand the phase structure, test and accept system against agreed contract not latest biz change
    - Still need big picture of overall requirement
      - Sometime overlook of budget issue

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A Phased Structure

Which part to deliver first ?

- Principle to follow
  - Lower cost
  - Simplest
- Business critical to the organization
- Deliver high value first
  - Value = benefit/(cost * risk)

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An Important Documents

- Software Development Plan (SDP)
  - Document decisions on approach to manage, team organization - wbs, how & what to develop, quality plan, timeline & milestone
- Requirement Analysis Document (RAD)
  - Document on user requirements
  - Will become important part of project scope and contract.
- Software Architecture Document (SAD)
  - This document describes how the system has been designed to handle evolution over time. This document is intended to serve as a guide to designers, testers, administrators, and others related to the solution development.

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An Important Documents

- Software Requirement Specification (SRS)
  - This document describe in detail on how the system to be designed. Process flow, constraints, procedure, user interface are defined
- Database Design Document (DBDD)
  - Document the database architecture such as database design model, schema, script, standard and planning.
- Implementation Plan
  - This document describe on approach to implement the system eg. timing, approach – pilot, parallel, new, location etc

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Example of WBS

Activity	Dur	Start	End	Who	Sts
A.Patient Mgt System - Appointment				* MAK & ZM	
1.Application Requirement/Workflow i.Refine use case and process flow ii.Refine interface requirements – from CIS, LIS, RIS & PIS		11/3/2002	14/3/2002	Mkag,Mak,Zm	
2.Graphical User Interface i.Define & Refine GUI ii.Peer Review		11/3/2002	14/3/2002	Mak,Zm	
3.Database Design i.Define & Refine data model – logical		11/3/2002	14/3/2002	Mkag,Mak	
B. Order Management System (OMS)				* KMS & MYAJ	
1.Define and Refine use case and process flow 2.Create OMS framework 3.Define & Design OMS transactions 4.Define interface requirements		15/1/2002 12/3/2002 12/3/2002 12/3/2002	16/1/2002 14/3/2002 20/3/2002 20/3/2002	fsj,mak,myaj,km Kms fsj,mak,myaj,k msfsj,mak,myaj	

Chapter 5

Contents

- Introduction to software project estimation
- Benefits of estimation
- Software estimation process
- Software effort estimation technique
- How do you know estimates are correct
- Tips to manage time and budget pressure

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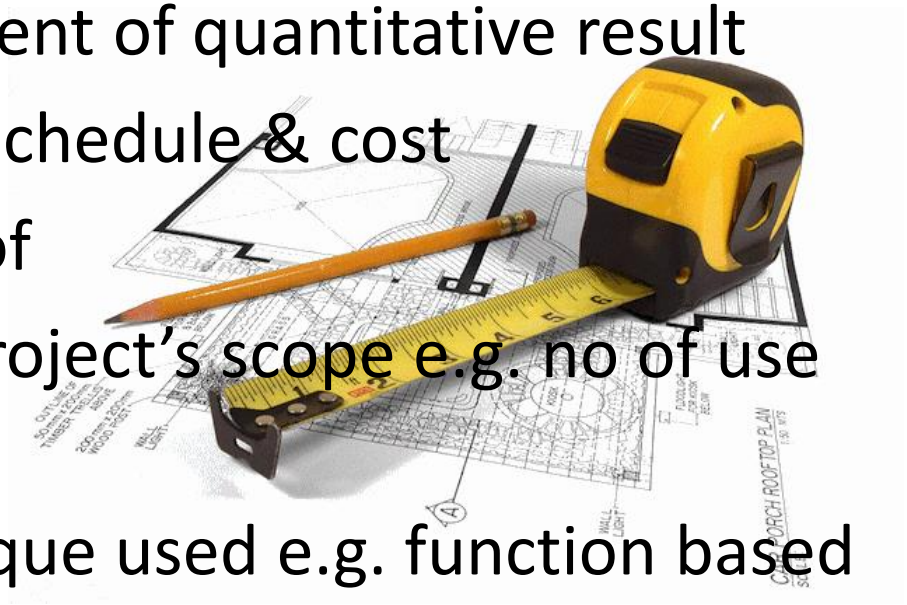
Estimation

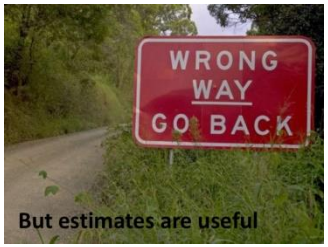
Overview

- Estimation is an assessment of quantitative result
- Estimate include effort, schedule & cost
- Good estimate consists of
  - a description of the project's scope e.g. no of use cases
  - the estimation technique used e.g. function based
  - accuracy of the estimate e.g. 85% accurate
- Early estimation will result in greater accuracy and credibility of estimates



Estimation

Benefits – to product, process, people



- To quantitatively define success or failure e.g. out-of-budget?
- To quantify improvement or degradation e.g. behind schedule?
- To make meaningful and useful managerial and technical decisions e.g. Plan B, C
- To identify trends -- Involved research to develop the estimation e.g. reveal or discover new findings

Estimation

where estimates are done?

- Business modeling
  - Costs and benefits --- to decide the priority
- Requirements analysis
  - The effort needed --- to decide the duration
- Analysis and design
  - The appropriate technology --- deliverables
- Construction/development
  - The release of version --- cut-over the development effort
- Testing
  - Software readiness & quality --- to get acceptance

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Estimation

Software estimation process(1)

- Estimate size
  - Based on source lines of code (SLOC)/modules
  - Based primarily on historical data and past experience.
- Estimate schedule
  - Determine the length of time needed to complete the project
  - Determine major milestones
  - Consider review, training, deployment process

Estimation

Software estimation process (2)

- Estimate cost and effort
  - Costs include labour (permanent, consultant, contract) hardware,software,utilities,rental, & etc.
- Inspect and get approval
  - Present and get endorsement from top management
- Track estimate
  - Check the accuracy of estimate over time
  - Develop empirical data over time

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Estimation

The Basis/References of Software Estimation

- Historical data
  - Need information about past projects --- e.g. Technical documents, technology information, standard, human resources profile.
- Measure of work of staff
  - Implementation times may vary depending on competency and experience of the programmer.
- Measure complexity
  - Two programs with the same SLOC will not necessarily take same time to complete.

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Estimation

Software Effort Estimation Technique(1)

- Bottom up estimation
  - The estimator breaks the project into its component tasks and then estimates the effort required to carry out each task.
  - Appropriate for projects which have not non historical data
- Top down estimation
  - Overall estimate that derived from global properties of the software product.
  - E.g. costs of each function, type of document, software quality assurance, configuration management, etc.

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Estimation

Software Effort Estimation Technique(2)

- Expert judgment
  - Rely on one or more people who considered experts in certain problems
- Estimation by analogy
  - Comparison between proposed and completed project
  - Need historical data --- the more data the more accurate

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Estimation

Software Effort Estimation Technique(3)

- Three time probabilistic technique
  - **Optimistic time** (O) is the shortest time in which the activity could be completed, barring outright miracles (elakkan sandaran keajaiban).
  - **Pessimistic time** (P) is the worst possible time allowing for all reasonable eventualities.
  - **Most likely time** (M) is the time usually experienced under normal circumstances.
  - The expected time is; Te = (O + 4M + P)/6.

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Estimation

Software Effort Estimation Technique - TE

Activity	Predecessor	Time estimates			Expected time
		Opt. (*O*)	Normal (*M*)	Pess. (*P*)	
A	—	2	4	6	4.00
B	—	3	5	9	5.33
C	*A*	4	5	7	5.17
D	*A*	4	6	10	6.33
E	*B*, *C*	4	5	7	5.17
F	*D*	3	4	8	4.50
G	*E*	3	5	8	5.17

Estimation

Software Effort Estimation Technique(4)

- Constructive Cost Model (COCOMO)
  - Computes software development effort (and cost) as a function of program size expressed in estimated lines of code
- Function point analysis
  - A top-down method devised by Allan Albrecht
  - Is used to quantify the functional size of programs independently of the programming languages in which they had been coded.

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Estimation

How do you know estimates are correct ?

- You don't
  - Pool experience – talk to colleagues, past experience
- Break it into small tasks
  - To get comfortable estimate
- Add 20% contingency
  - When technology is unfamiliar, low skill level

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Estimation

How to estimate testing requirement ?

- Based on no of requirements
  - 2-6 test cases per requirement
- Estimate how long will take to produce it
- Add equal amount for estimated effort to produce test
- You will find errors so allow at least a re-rest time
- Testing + test related activities around 50% if less than 40% --- poor test plan

Estimation

Overall splits between stages

- Crude but successful guide
  - 20% planning, requirement definition, analysis & design
  - 15% coding
  - 15% component test & early system test
  - 20% full system test, user test & operational trial
  - 20% documentation, training & implementation support
  - 10% overall project management

  e.g. Coding 15% of 365days = 54.5 days

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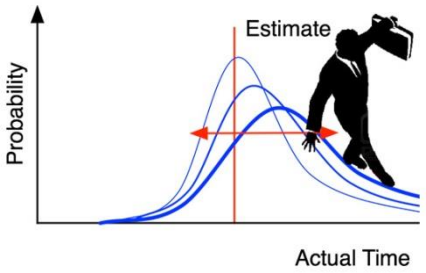
Estimation

Is there another (a better) way ?

- There are … but no better… careful of hype (gembar-gembur)
- Difficult
  - Too many variables !
    - Program languages, different requirements, tool, skill, machines, peoples, management
  - Some alternative
    - Line of code (LOC) eg. COCOMO
  - Best based on a database of experience
    - Build a database of characteristics and true costs of previous projects



Estimation

Some tips to manage time & budget pressure

- Time pressure is no excuse - do not follow method and producing requirement deliverables
- Go for phased development
  - Be firm if you are sure of estimates
- If budget insufficient
  - Deliver fewer functionalities, ask more money!
  - Challenge req, reduce, simplify, get users to prioritize then signoff a plan following the priorities
- Quality not inversely proportional to productivity

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Summary

- Early estimation will result in greater accuracy and credibility of estimates.
- Best way to make estimation is based on a database of experience.

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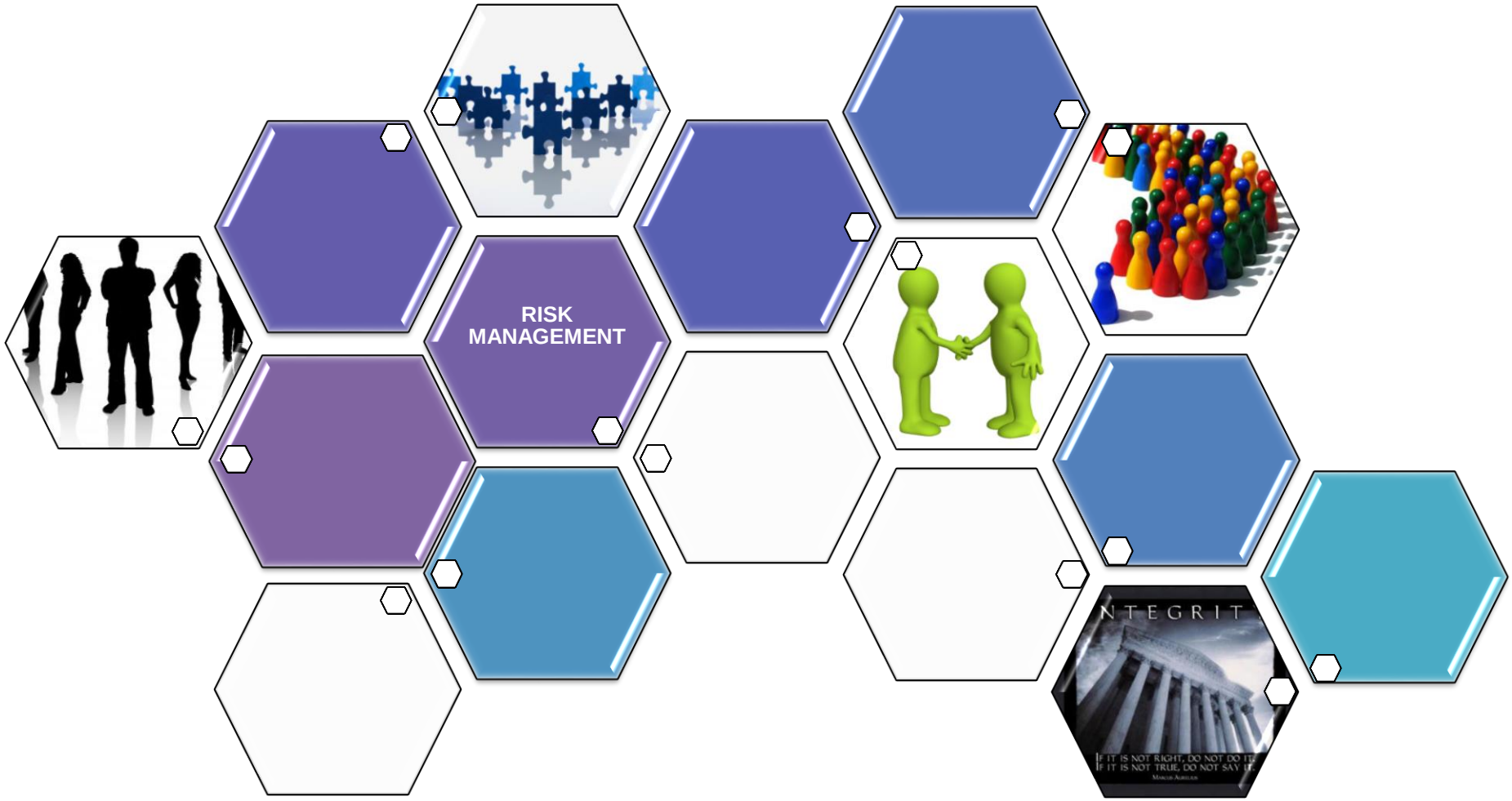
Chapter 6



Contents

- Overview of risk and its nature
- Type of risks
- Managing risk
- Hazard identification
- Factor that produce risks
- Risk value/exposure
- Risks planning and control

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Risk management

Risks and its nature (1)

- Risk is an unexpected events causes problems
- A measure of the probability and consequence of not achieving a defined project goal.
- A combination of an abnormal event and its consequences to a system's operators, users, or environment.

Risk management

Risks and its nature (2)

- Project risks include cost, wrong requirements, schedule, contract relationships, political, technical, test, logistics, development and engineering risks.
- Range from catastrophic (loss of entire system, loss of life or permanent disability) to negligible (no system damage, no injury).
- Risk increases with hazard, but decreases with safeguard.

Risk management

Types of risk (1)

- External risks
  - Outside the control of PM --- e.g. natural disaster, government regulations change, economic down.
- Cost risks
  - Deal with cost overruns, unnecessary costs, etc --- due to poor estimation and poor of control of budget.
- Schedule risks
  - Delay to deliver according to the agreed schedule due to inaccurate estimation & increase efforts on technical issues.

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Risk management

Types of risk (2)

- Technology risks
  - Can result from failure to meet system's functionality or performance standard
  - Due to immature technology, integration & support
- Operational risks
  - Characterized by an inability to implement large-scale change effectively.
  - e.g. fail to designate authority to key peoples & insufficient communication.

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Risk management

Managing risk (1)

- Identification
  - lists all potential problems and issues
- Estimation
  - Likelihood and impact of risk is assessed
- Evaluation
  - Rank and determine appropriate version of strategies
- Risk planning
  - Drawing up the contingency plan

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Risk management

Managing risk (2)

- Risk control
  - Risk manager will react to problems throughout the projects.
- Risk monitoring
  - As the project proceeds the particulars risks should be monitored and assess their probability
- Risk directing/staffing
  - Concern with the day-to-day management of risk
  - The problem-solving strategies frequently involve

Risk management

Hazard Identification (1)

- The first stage in risk management is to identify the hazards that might affect the duration or resource costs of the project. E.g. Change request
- A hazard is an event that might occur and will, if it does occur, create a problem for the successful completion of the project.
- In identifying and analyzing risks, the cause, its immediate effect (the problem that it creates) and the risk posed by it to the project should be distinguished. E.g. change request will drag duration and increase cost!

Risk management

Hazard Identification (2)

- A common way of identifying hazards is to use a checklist listing all the possible hazards and factors that influence them. E.g. Turn-over of staff
- Some hazards are *generic risks* (relevant to all software projects) and hence standard checklists can be used and augmented from an analysis of past projects to identify such risks.
- Some hazards are *specific risks* that are relevant to a particular project. --- difficult to identify

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Risk management

Categories of Factor That Produce Risks(1)

- *Application factors* : The larger the project, the greater is the likelihood of errors, communication and management problems.
- *Staff factors* : The issues of staff , like short falls in experience and skills, de-motivate, resignation or unavailability or absence of key personnel, etc.
- *Project factors* : When the project and its objectives are not clear to all members of the project team and all key stakeholders, there will be imminent risks.

Risk management

Categories Of Factor That Produce Risks(2)

- *Project methods* : When well-specified and structured methods for project management and system development are not used, risks are possible. E.g. Just do it approach!
- *Hardware/Software factors* : Risks are possible by usage of new hardware and software e.g. Tablets/Android
- *Changeover factors* : The need for an 'all-in-one' changeover to the new system poses particular risks. E.g. No pilot or staggered implementation

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Risk management

Categories Of Factor That Produce Risks(3)

- *Supplier factors* : Delays in delivery of equipment, breach of contract, etc. -- from the suppliers result in many risks.
- *Environment factors* : Changes in the Government policies and procedures, market trends, etc. -- affect the project's success.
- *Health and safety factors* : Any disorders in health and safety issues can lead to risks, by way of affecting the personnel working on the project. E.g. H1N1, SARS etc.

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Risk management

Risk Value/exposure

- Risk value is the importance of the risk and it depends on the risk likelihood and risk impact.
- '*Risk likelihood*' - the probability of a hazard occurring.
- '*Risk impact*' - the effect that the resulting problem will have on the project.
- A popular approach to assess risk is to score the likelihood and impact on a scale of, say, 1 to 10.
- Risk value = Risk likelihood * Risk impact

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Risk management

Risk Planning & Control(1)

- **Hazard prevention** : Some hazards can be prevented and likelihood can be reduced to insignificant levels. E.g., The risk of unavailability of key staff for a meeting can be minimized by early scheduling – 1 month notice for conducting meeting.
- **Likelihood reduction** : Some risks can be reduced by prior planning. E.g., the risk of late changes to a requirements specification can be reduced through system prototyping.
- **Risk avoidance** : Some risks can be avoided to happen. E.g., a project can be protected from the risk of overrunning the schedule by increasing duration estimates or reducing functionality.

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Risk management

Risk Planning & Control(2)

- **Risk transfer** : The impact of some risks can be transferred away from the project by contracting out the risky work or taking out insurance. E.g. project outsourcing and breakdown the project into phases.
- **Contingency planning** : Some risks are not preventable, contingency plans will need to be drawn up to reduce the impact of the hazard. E.g., a project manager should draw up a contingency plan for using agency programmers to minimize the risk of any unplanned absence of programming staff.

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Risk management

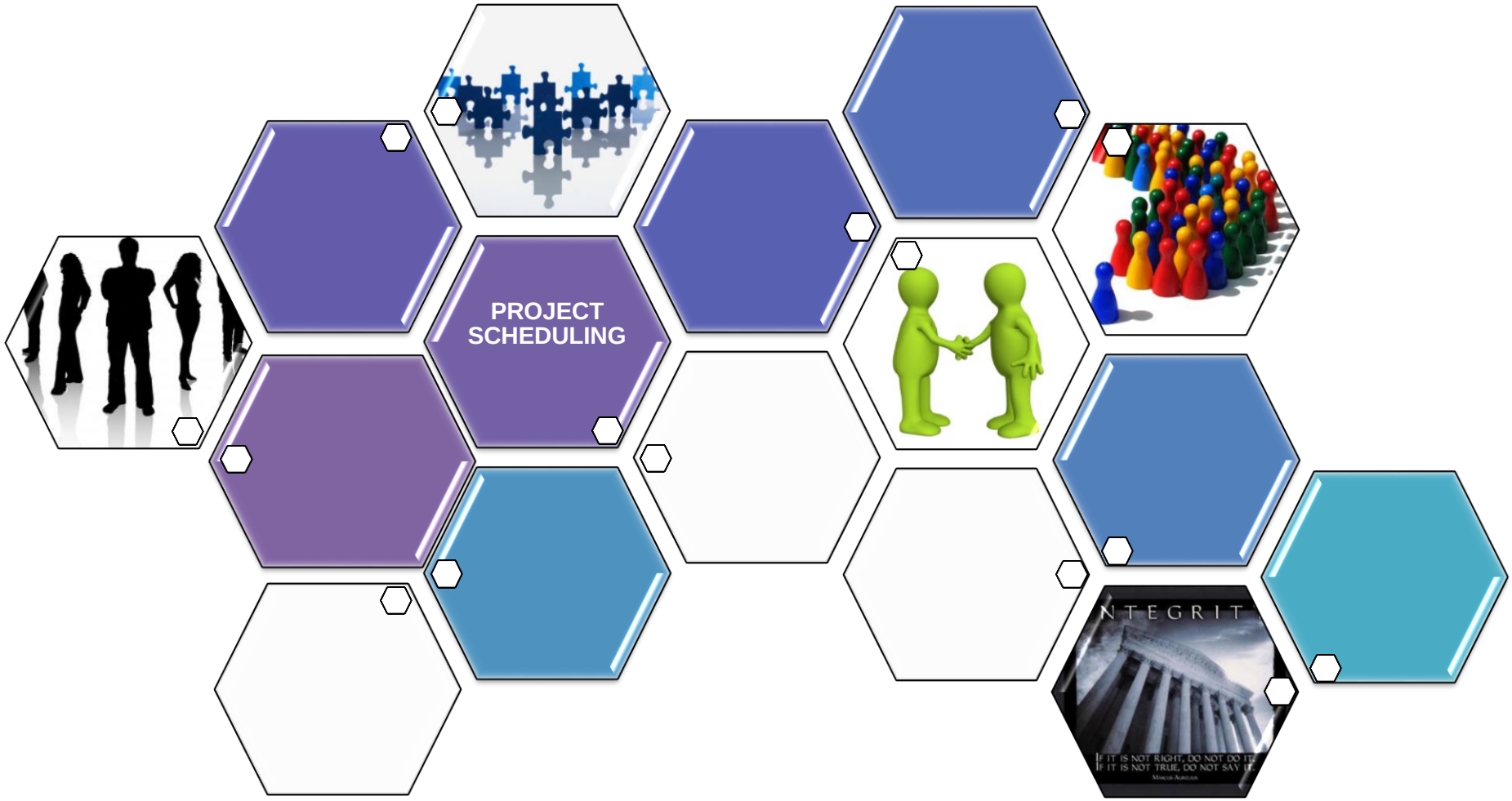
Project Risk Factors and Strategies

Project Risk	Risk Strategy
•Frequent changes to cater for enhancement, uncritical requirements	•Establish version control •Controls the change flow
•Comprehensive testing exercise	•Ensures well thought out testing strategy and planning by conducting Testing Reviews •Conduct Testing Reviews on all test cases pertaining to ***AMES*** requirements specification
•Personnel shortfalls	•Backup of resources •Full time allocation for this project •Establish this project as priority
•Tight schedule	•Minimum, a biweekly meeting to monitor project progress and resolve pending issues •Quick actions •Establish this project as priority •Any changes that would have an impact on the delivery time such as a not-so-critical requirement is put in status quo •Any change request has to go through ***AMES*** User Committee Chairman
•Shortfalls of externally supplied components and services	•Close monitoring on the readiness of these components and services •Monitor from an early stage
•Testing on changes of requirements not thoroughly done	•Ensure that the management is aware of the need for additional testing time •Allocate more testing time

Risk management Summary

- Risk is unexpected events causes problems. Therefore risk very important to be managed.
- Risks type include external factor, cost, schedule, operational and technology are among typical.

Chapter 7



Contents

- Definition of project schedule
- The reason schedule problems
- Project and activities
- Sequencing and scheduling activities
- Ways to build a project schedule
- Activity float
- Summary

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Definition & description of project schedule

- A project schedule is the conversion of project action plan into an operating timetable.
- Project scheduling determines the best means of achieving the project's objectives (general and specific).
- This involves identification and optimization of the project's overall requirements, resource availability & internal and external constraints and activity sequencing.
- The tasks listed will be the tasks required to accomplish each deliverable listed in the plan.

The reason schedule problems

- Many software project are failures in terms of meeting scope, time and cost projections.
- Changes happened along the project and poor control.
- Time is also the one variable that has the least amount of flexibility. Time passes no matter what happens on a project
- Individual work styles and cultural. E.g. some countries close businesses to take several hours every afternoon to have siestas (a rest). In western country work style remain relaxed and flexible.

You need to know - Project and Activities(1)

- A project is composed of a number of interrelated activities.
- A project may start when at least one of its activities is ready to start.
- A project will be completed when all of its activities have been completed.
- An activity must have a clearly defined start and a clearly defined end-point, normally marked by the production of a tangible deliverable.

You need to know - Project and Activities(2)

- The duration of an activity must be estimated, assuming normal circumstances, and the reasonable availability of resources.
- Some activities require completion of other activities (called predecessor activities) to begin. These requirements are known as precedence requirements.

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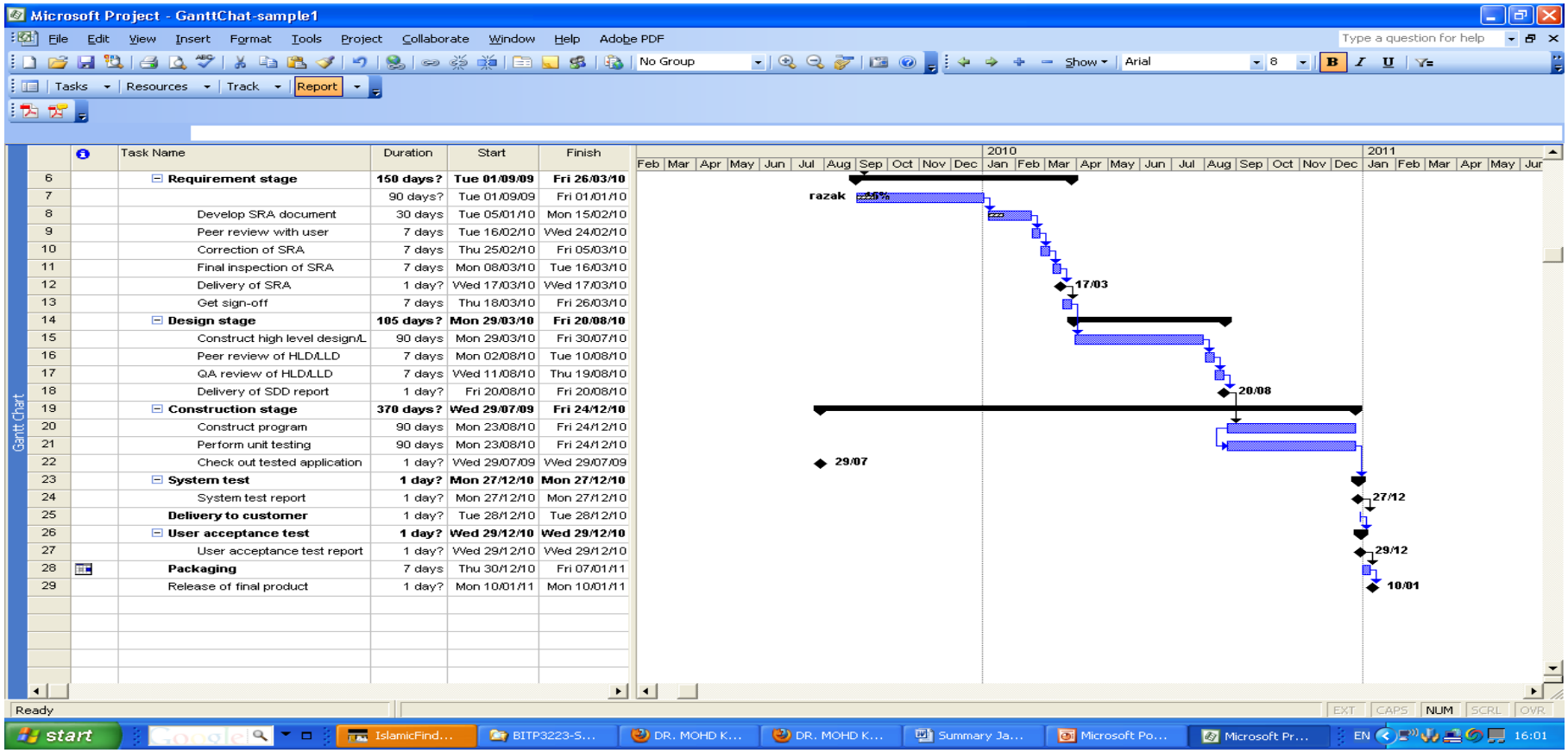
Project Schedue

e.g. Predecessor activities



	Task Name	Duration	Start	Finish
6	**Requirement stage**	**150 days?**	**Tue 01/09/09**	**Fri 26/03/10**
7		90 days?	Tue 01/09/09	Fri 01/01/10
8	Develop SRA document	30 days	Tue 05/01/10	Mon 15/02/10
9	Peer review with user	7 days	Tue 16/02/10	Wed 24/02/10
10	Correction of SRA	7 days	Thu 25/02/10	Fri 05/03/10
11	Final inspection of SRA	7 days	Mon 08/03/10	Tue 16/03/10
12	Delivery of SRA	1 day?	Wed 17/03/10	Wed 17/03/10
13	Get sign-off	7 days	Thu 18/03/10	Fri 26/03/10
14	**Design stage**	**105 days?**	**Mon 29/03/10**	**Fri 20/08/10**
15	Construct high level design/L	90 days	Mon 29/03/10	Fri 30/07/10
16	Peer review of HLD/LLD	7 days	Mon 02/08/10	Tue 10/08/10
17	QA review of HLD/LLD	7 days	Wed 11/08/10	Thu 19/08/10
18	Delivery of SDD report	1 day?	Fri 20/08/10	Fri 20/08/10
19	**Construction stage**	**370 days?**	**Wed 29/07/09**	**Fri 24/12/10**
20	Construct program	90 days	Mon 23/08/10	Fri 24/12/10
21	Perform unit testing	90 days	Mon 23/08/10	Fri 24/12/10
22	Check out tested application	1 day?	Wed 29/07/09	Wed 29/07/09
23	**System test**	**1 day?**	**Mon 27/12/10**	**Mon 27/12/10**
24	System test report	1 day?	Mon 27/12/10	Mon 27/12/10
25	**Delivery to customer**	1 day?	Tue 28/12/10	Tue 28/12/10
26	**User acceptance test**	**1 day?**	**Wed 29/12/10**	**Wed 29/12/10**
27	User acceptance test report	1 day?	Wed 29/12/10	Wed 29/12/10
28	**Packaging**	7 days	Thu 30/12/10	Fri 07/01/11
29	Release of final product	1 day?	Mon 10/01/11	Mon 10/01/11

Processes involved in managing project schedule/time(1)

- Defining activities – involves identifying the specific activities team members must perform. The main outputs from this process are activity list, activity attributes and milestone list.
- Sequencing activities – involves identifying and documenting the relationships between project activities. The main outputs from this process are project schedule network diagram/Gantt chart & project document update

Processes involved in managing project schedule/time(2)

- Estimating activity resources – involves estimating how many resources (people, equipment & materials) requires to perform project activities. The main outputs are activity resource req., resource breakdown structure & project document update.
- Estimating activity durations – involves estimating the work periods that needed to complete individual activities. Outputs include duration estimates and project document update.

Processes involved in managing project schedule/time(3)

- Developing the schedule – involves analysing activity sequences, activity resource estimates & activity duration estimates. Outputs include project schedule (including schedule baseline) & project doc update.
- Controlling the schedule – involves controlling and managing changes to the project schedule. Outputs include work performance measurements, change requests, project mgt plan update & project doc update.

Sequencing and Scheduling Activities(1)

- Throughout a project, the project requires a schedule that clearly indicates when each of the project's activities is planned to occur and what resources it will need.
- In the project plan, the tasks should be sequenced by identifying the dependencies among activities. E.g. 4 types dependencies - Finish-to-Start, Start-to-Start, Finish-to-Finish, Start-to-Finish.
- The tasks should be scheduled, by taking into account the availability of staff.

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Sequencing and Scheduling Activities(2)

- For small projects, the combined sequencing-scheduling approach may be suitable when the individuals need to be allocated to particular tasks at an early planning stage.
- In large projects, it is better to separate out the combined sequencing-scheduling approach.
  - Sequence the task according to their logical relationships. E.g. requirement, analysis etc.
  - Schedule them by taking into account the resources and other factors. E.g. prioritize

Ways to build a Project Schedule (1) – you can choose!

- The most common scheduling techniques are:
  - Network planning models (or Network diagrams)
    1. Program Evaluation and Review Technique (PERT)
    2. Critical Path Method (CPM)
  - Gantt or bar charts, and Milestone charts.
- The interdependencies between events and activities can be shown through the construction of networks.
- Whereas this is not possible with Gantt or Milestone charts.

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Ways to build a Project Schedule (2) – Network planning models

- PERT – event-oriented.
  - Basically a management planning and control tool.
  - Used for R & D projects where the risks in calculating time durations have a high variability.
  - It is event-oriented and probabilistic in nature.
  - It serves as a road map for a particular project in which all of the major elements (events) have been completely identified together with their corresponding interrelations.
  - It uses the 3 time probabilistic model to find the probability of the likelihood that the critical path of the project will be completed.
  - It uses time as a common denominator to analyse those elements that directly influence the success of the project, time, cost and performance.

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Ways to build a Project Schedule (3) – Network planning models

- Critical Path Method (CPM) – activity-oriented.
  - CPM uses one time estimate that represents the normal time. Hence it is deterministic in nature.
  - It is activity oriented. So, for CPM chart, the emphasis is on activities, not events.
  - In CPM, both time and cost of each activity are considered.
  - It is used in construction projects that are based on accurate time estimates.
  - Only those activities on the critical path are considered, starting with the activities for which the crashing cost per unit time is the lowest.

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Ways to build a Project Schedule (4) – Gantt chart

- This way of project schedule is used effectively in simple and short-duration types of projects.
- To build a Gantt chart, the PM begins by associating a rectangular bar with every activity.
- The length of the bar corresponds to the duration of the activity.
- The PM places the bars horizontally along a timeline in the order in which the activities should be completed.
- The activities can be located on the timeline so that they are worked on concurrently with other activities.
- The sequencing is often driven more by resource availability than any other consideration.

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Ways to build a Project Schedule (5) – Gantt chart

- Advantages
  - Gantt charts are easily understood.
  - Easy to maintain as long as task requirements are not changed or major alterations are not made.
  - Easy to construct.
  - Provide a clear picture of the current state of a project.
  - The PERT/CPM networks can be easily transferred to Gantt charts.

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Ways to build a Project Schedule (6) – Gantt chart

- Disadvantages.
  - Gantt chart doest not contain detailed information due to its simplicity, and it will be difficult for people other than the project manager to tell what comes before and after what.
  - It does not tell the project manager whether the schedule that results from the chart completes the project in the shortest possible time or even uses the resources most effectively.

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Building network diagram (1)

- Network diagrams are built using 2 methods
  - i) activity-on-the-arrow (AOA) method.
  - ii) activity-on-the-node (AON) method.

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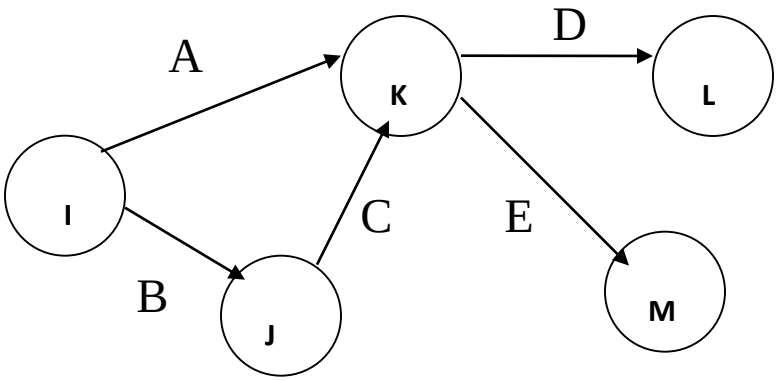
Building network diagram (2) – AOA method

- Nodes (or circles) represent events, and arrows represent activities.
- Nodes at the left edge of the arrow is the event “begin the activity”.
- Nodes at the right edge of the arrow is the event “end the activity”.
- Nodes are numbered sequentially and the sequential ordering had to be preserved.
- A sample AOA network diagram is given below.

Building network diagram (3) – AOA method



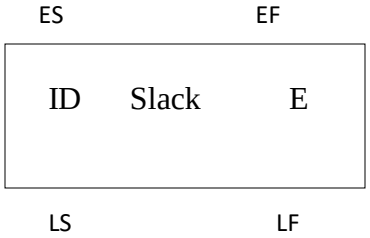
Building network diagram (4) – AON method

- Activity nodes (rectangles) represent activities, and arrows represent the predecessor/successor relationship between the activities
- The entries in the activity node describe the time-related properties of the activity. Some of the entries describe characteristics of the activity such as its expected duration (E), while others describe calculated values (ES,EF,LS,LF) associated with that activity.
- Earlier start (ES) time for an activity is the earliest time at which all of its predecessor activities have been completed and the subject activity can begin. The earliest finish (EF) of an activity is calculated as ((ES+duration) – one time unit). The ES time of activities having 2 or more predecessor activities is determined from the latest of the EF of the predecessor activities.

Building network diagram (5) – AON method

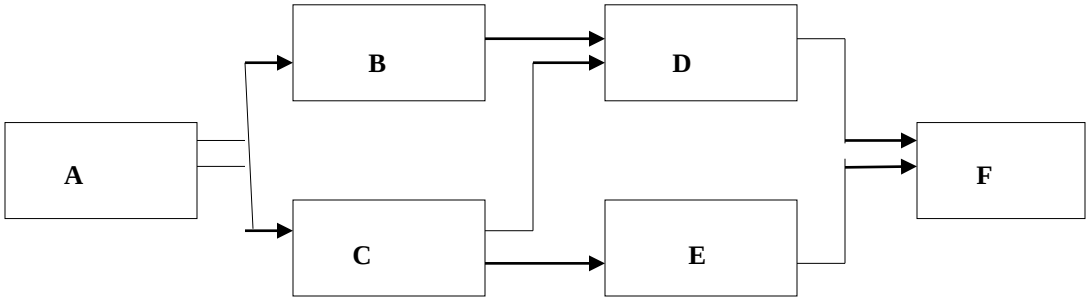
- The latest start (LS) and latest finish (LF) times of an activity are the latest times at which the activity can start or finish without causing a delay in the completion of the project.
- Every activity in the network, except the start and end activities, must have at least one activity that comes before it and one activity that comes after it
- An activity begins when its predecessors have been completed.
- The node representing the activity is shown in the below figure.

Building network diagram (3) – AON method



ES = Early Start date/time, EF = Early Finish, LS = Late Start, LF = Late Finish, ID = Identity Number of the activity, and E = Estimated time for completion of the activity.

- A sample AON network is given below:
- A network may not contain loops.
- A network should not contain angles (activity without continuity)



Activity Float or Slack

- Activity float is the difference between an activity's earliest start time (ES) and its late start time (LS), (or the difference between the earliest and late finish times). That is,

  Activity float = ES ~ LS = EF ~ LF.

- Activity float is a measure of how much the start or completion of an activity may be delayed without affecting the end date of the project.

Activity Float or Slack

- Activity float is useful to find the critical path in the network diagram.
- Any activity with a float of zero is critical in the sense that any delay in carrying out the activity will delay the completion date of the project as a whole. There will always be at least one path through the network joining these critical activities. This path is called the critical path.

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Summary

- A project schedule is the conversion of project action plan into an operating timetable.
- A project is composed of a number of interrelated activities.
- A schedule got problems due to change of requirements along the project and poor control.

Chapter 8

Contents

- Introduction to project resources
- Resources allocation and nature
- Factors That Affect Human Resources Allocation
- How to Identify Resources Req. and Schedule Resources
- Resource loading
- Resource leveling
- Summary

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Resources Allocation and nature of resources(1)

A resource is …

- The allocation of physical resources to different activities.
- Any item or person required for the execution of the project.
- 7 categories of resources – Labour, equipment, materials, space, services, time and money.

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Resources Allocation and nature of resources(2)

- Labour resources consist of project development team members; equipment includes computing and office equipment; materials are items that are consumed; space is the space required to accommodate the people and items; and services are special services like telecommunications services, etc.
- Time is the resource that appears in the form of project timescales. reduced time --increase resources; extend time – reduce resources.
- Money is a resource used to buy other resources and will be consumed when those resources are used.

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What Factors That Affect Human Resources Allocation?(1)

- **Availability**: The project manager must always have the knowledge of the availability of a particular individual who is assigned a certain task.
  - Working duration of a resource = (Activity duration) / (percentage of resource availability)
- **Criticality**: Allocation of more experienced personnel to activities on the critical path often helps in shortening project durations or at least reduces the risk of overrun.

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What Factors That Affect Human Resources Allocation?(2)

- **Risk**: Identifying the activities that pose the greatest risk, and knowing the factors influencing them, helps to allocate staff. Allocating experienced staff to the highest risk activities will have the greatest effect in reducing overall project uncertainties.
- **Training**: Training will benefit the organization if positive steps are taken to allocate junior staff to appropriate non-critical activities where there will be sufficient slack (not tight) for them to train and develop skills.
- **Team building**: The selection of individuals must also take account of the final shape of the project team and the way they will work together.

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How to Identify Resources Req. and Schedule Resources (1)

- Resource allocation plan consists of the **list** of **the resources** that will be required along with the expected level of demand.
- The required resources will normally be done by **considering each activity in turn and identifying the resources required**.
- The resource requirements **list** should be as **comprehensive** as possible.
- Resource requirements list should be **mapped onto** the **activity plan** to assess distribution of resources required over duration of the project.

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How to Identify Resources Req. and Schedule Resources (2)

- The **scheduling resources** is best **done** by **representing** the **activity plan as a bar chart** and using this to produce a resource histogram for each resource, for each day of project, etc. --- estimate time frame
- **Changing** the level of **resources** on a project **over time**, particularly personnel, generally adds to the cost of a project. --- mobilize resources
- **Allocating a resource to one activity** limits the flexibility for resource allocation and scheduling of other activities. --- control loading

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How to Identify Resources Req. and Schedule Resources (3)

- **Prioritization of activities** involves allocation of resources to competing activities in some rational order.--- full resources focus to certain activity --- can be done and complete smoothly…
- 2 ways of prioritizing activities,
  - **Total float priority** : Activities are ordered according to their total float, those with the smallest total float having the highest priority.
  - **Ordered list priority** : Activities that can proceed at the same time are ordered according to a set of simple criteria. E.g., (a) Shortest critical activities, (b) Critical activities, (c) Shortest non-critical activities, (d) Non-critical activities with least float, (e) Non-critical activities.

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Resources Loading

- Mainly involves manpower or employees. Each employee is assigned a task or a percentage of a project assignments. Then the employee is assigned other tasks until he or she reaches 100% booked. This would then mean that the employees cannot take on any additional work.
- With resource loading, a PM can forecast an employee's hours for the year and see how tasks can be assigned. This also allows the PM to decide whether or not additional employees are needed to complete the scheduled projects.
- The downside to resource loading is that employees cannot be 100% booked. Other things may arise to take away their time, such as unexpected problems that need to be fixed. (source: http://www.brighthubpm.com/)
- When the **resource requirement exceeds the available resources, it is called resource overload**. This delays some activities leading to delay in the completion of project.
- When the **resource requirement is lower than the available resources, it is called resource underload**.

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Resources Leveling

- Deals with both time (project starting and ending date) and resources, including manpower and money.
- Resource leveling tries to balance the conflicting interests of projects with the available resources. It breaks things down into 2 categories: time and available resources.
- Some projects need to be finished within a certain time frame. These projects will use all the available resources money & manpower) to complete the project tasks by a certain date.
- Projects that aren't as pressing can be spread out for an indefinite period of time until resources do become available. These projects are usually ones that are not on the critical path and will not affect the project completion date. (source: http://www.brighthubpm.com/)
- When resources are leveled, associated costs also tend to be leveled and it leads to leveling employment through out a project or task.

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Costs Schedule

- A detailed cost schedule shows weekly or monthly costs over the life of the project.
- It will provide a more detailed and accurate estimate of costs and will serve as a plan against which project progress can be monitored.
- Generally, the costs are categorized as :
  - Staff costs (staff salaries and other allowances)
  - Overheads (space rental, costs of service department, etc.)
  - Usage charges (using resources such as computer time, etc.)
- The activity plan and risk assessment would provide the basis for resource allocation and schedule from which cost schedules would be produced.

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Scheduling Sequence

- Going from an ideal activity plan to a cost schedule can be represented as a sequence of steps.
- Successful resource allocation often necessitates revisions to the activity plan, which, in turn, will affect the risk assessment.
- The cost schedule may indicate the need or desirability to reallocate resources or revise activity plans – particularly where that schedule indicates a higher overall project cost than originally anticipated.
- The interplay between the plans and schedules is complex – any change to any one will affect each of the others.
- Successful project scheduling is largely dependent upon the skill and experience of the project manager in juggling the many factors involved.

Summary

- There are 7 categories of resources include labor/human resource, equipment, materials, space, services, time and money
- Human resource is a major components involved in project resource allocation.
- When the resource requirement exceeds the available resources, it is called resource overload.
- When the resource requirement is lower than the available resources, it is called resource under load.
- Resource leveling levels the resource overload to meet resource availability.
- Project resource is crucial to be monitored and controlled for succession of the project.

Chapter 9

Contents

- Introduction to contract
- Procurement and contract
- Type of contract
- Tender process
- Stages in Contract Placement
- Summary

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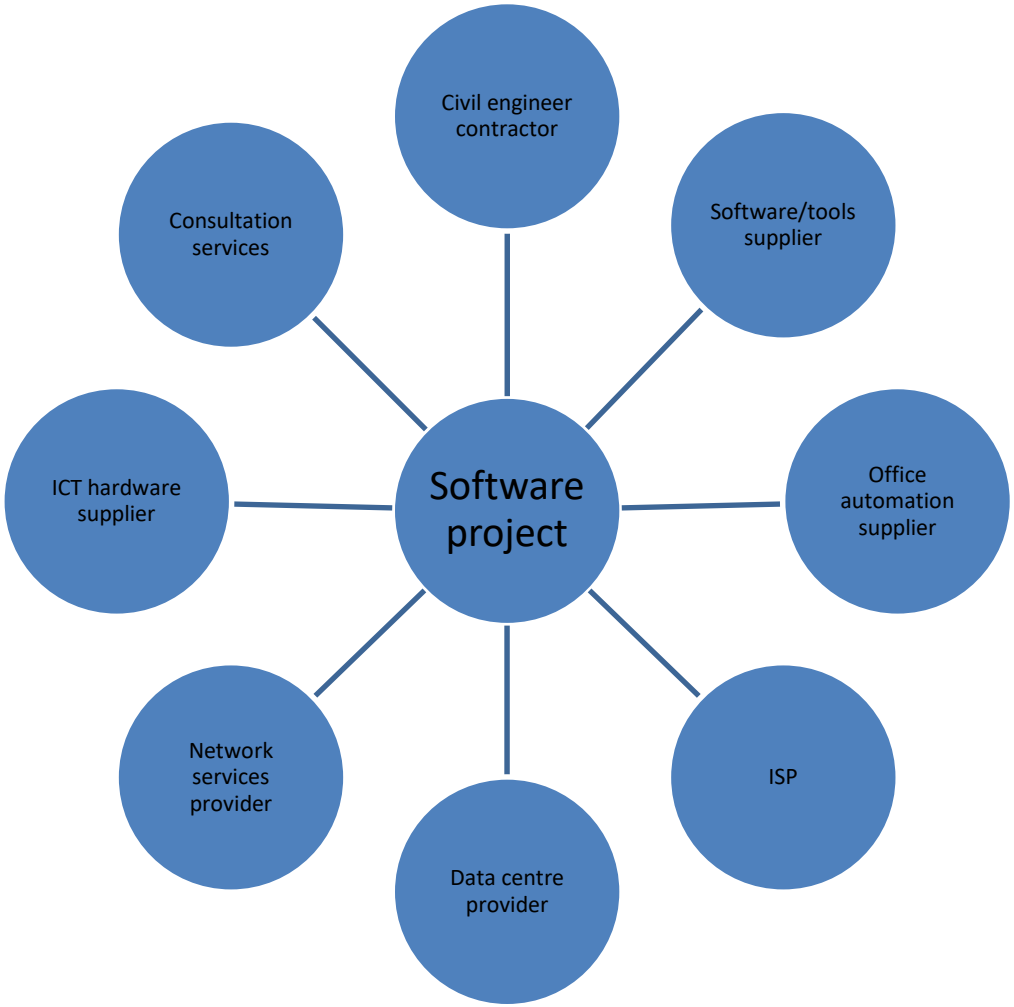
Managing Contract

Procurement and Contract



Managing Contract

Procurement and Contract

- Software project may need some services of outside people or organizations to supply specialist services, equipment & resources.
- Procurement is the process of acquisition of goods or services that involves two parties with different objectives and interacting in a given market segment.
- A contract is an agreement between the parties defining the benefits and responsibilities for those concerned.

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Managing Contract

Procurement and Contract

- Contract management is needed for ensuring the interest of contractor and supplier.
- Software project procurement may include
  - *Custom development*
  - *Package Integration*
  - *On-the-shelf application software*

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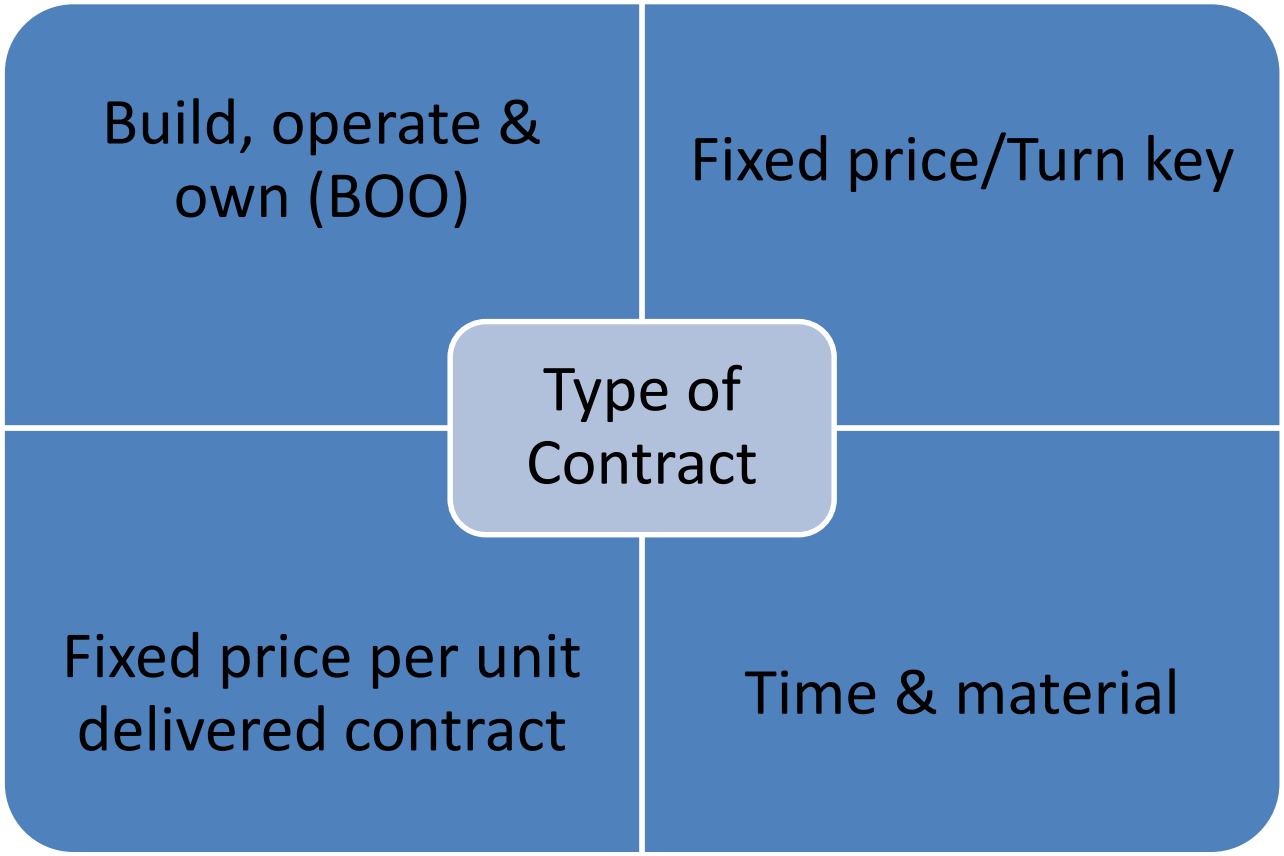
Managing Contract

Type of Contract



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Managing Contract

Type of Contracts – Fixed Price

- The fixed price to be paid to the contractor upon completion of the work
- Also named as 'turn-key' project contract where the payment is disbursed according to the agreed payment schedule.
- Advantages *:*
  - *Known customer expenditure:* The scope of requirements is fixed and outlay if exceeds.
  - *Supplier motivation :* The supplier has a motivation to manage the delivery of the system in a cost-effective manner.

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Managing Contract

Type of Contracts – Fixed Price

- Disadvantages *:*
  - *Higher prices to allow for contingency:* Supplier will add a margin when calculating the price to be quoted in a tender --- pay for managing risks, not system
  - *Difficulties in modifying requirements :* Difficult to change or add the scope of the requirements.
  - *Upward pressure on the cost of changes :* low price is quoted to compete other suppliers, but it is temporary
  - *Threat to system quality :* The need to meet a fixed price can mean that the quality of the software suffers.

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Managing Contract

Type of Contracts – Time & Materials

- The customer is charged at a fixed rate per unit of effort, for example, per staff-hour.
- Advantages
  - Ease of changing requirements
  - Lack of price pressure
- Disadvantages
  - Customer liability
  - Lack of incentives for supplier

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Managing Contract

Type of Contracts – Fixed price per unit delivered contract

- Often associated with function point (FP) counting. The size of the system to be delivered is calculated at the outset of the project.
- Advantages
  - Customer understanding, Comparability, Emerging functionality, Supplier efficiency, life-cycle range

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Managing Contract

Type of Contracts – Fixed price per unit delivered contract

- Disadvantages
  - Changing requirements
    - The requested changes might affect the overall function point count.
  - Difficulties with software size measurement
    - The cost estimate based on line of code is unfair. Some of programs are coded depend on programmer's creativity. Hence, the estimated cost usually give inaccurate result.

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Managing Contract

Type of Contracts – Build Operate and Own (BOO)

- This method is also called concession project. The cost of the project normally provided by the supplier and the profit is collected through the period of concession contract.
- E.g. the development of PLUS Highway by PLUS, 7 flagship applications of MSC project.
- Advantages
  - Overcome cost burden of government, Less pressure on requirement's changes.
- Disadvantages
  - Monopoly, long term cost increase

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Managing Contract

Tender Process

- Open tendering process
  - The tender is publish/advertise to public. It specify tender requirements, closing date, tender cost and agency address to be submitted.
- Restricted tendering process
  - Close tender where preferred vendors are short-listed.
- Negotiated procedure
  - Similar to restricted tender but the procedure more simple to avoid lengthy processes.

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Managing Contract

Stages in Contract Placement

- Requirements analysis
  - The customer has to set a clear requirements before approaching the potential vendors.
- Evaluation plan
  - After drawing-up the list of req, an evaluation plan need to be drawn up to evaluate the proposal submitted by the vendors.
- Invitation to tender
  - The tender will be advertised
- Evaluation of proposals
  - Prepare/provide evaluation form to weight the potential vendors.
  - The selected vendors will be invited for presenting its proposal.
- Decision and award
  - Procurement committee will decide the potential vendors
  - Letter of award (LOA) will be produced

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Typical Terms of Contract

- Definitions
- Form of agreement
- Goods and services to be supplied
- Ownership of the software
- Environment
- Customer commitments
- Acceptance procedures
- Standards
- Project and quality management
- Timetable
- Price and payment method, Miscellaneous legal requirements

Managing Contract

Acceptance of Contract …more tips

- When works has been completed, the customer needs to take action to carry out acceptance testing before the time limit for requesting corrections expires.
- There should be a check that the acceptance tests have been carried out and signed off and that the items received are of the approved build standard.
- Part or all of the payment to the supplier will depend on this acceptance testing. Sometimes part of the final payment will be retained for a period of operational running and is eventually paid over if the levels of reliability are as contracted for. This is usually a period of warranty during which the supplier should fix any errors found for no charge.

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Managing Contract

more tips…

- When the contract is being negotiated, certain key points in the project can be identified where customer approval is needed before the project activity can proceed. These may be called *decision points*.
- At certain decision points, the customer needs to examine work already done and make decisions about the future direction of the project.
- The project will require representatives of both supplier and customer to interact at many points in the development cycle.
- For each decision point, the deliverables to be presented by the suppliers, the decisions to be made by the customer and the outputs from the decision point all need to be defined. These decision points have added significance if payments to the supplier are based on them.

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Managing Contract

more tips…

- Where work is contracted out there will be a general concern about the quality of that work. The representatives of the supplier or customer will carry out verification, validation, quality assurance, review of project processes and products, etc.
- An effective change procedure is needed to record requests for changes in some requirements, along with the supplier's agreement to them and any fees for the additional work.
- It could happen that the supplier does not meet one or more of their legal obligations. The customer should therefore protect their legal rights by officially notifying the supplier as soon as possible after recognizing the failure.

Summary

- Managing contract is one of the crucial task need to be addressed by the PM while managing the project.
- Contract involved procurement and tendering process where you need to communicate with internal department and external suppliers. One or more suppliers will be interacted with PM and project members. Thus, be careful…
- Clearly define a type of contract you deal with. By doing so, you will easily manage the expectation and challenges.

Chapter 10: Project Monitoring

Contents

- Discuss purpose of project monitoring
- Step or processes to monitor project status
- Project monitoring status input
- Project monitoring status output
- Step to prepare status assessment
- Handling exception & problem
- Issue of change request

What is monitoring?

- Regular observation and recording of activities taking place in a project.
- Routinely gathering information on all aspects of the project
- To monitor is to check on how project activities are progressing.

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Project Monitoring Purposes

- To capture current status of the project and regular reporting to Project Director/Top Mgt.
- To evaluate status against plans
- Dealing with changes request and scheduling of the project for the current or future requirements
- Dealing with issues and problems encountered in the project

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Step to Monitor Project Status(1)

- Capture works status
  - The purpose is to collect quality and progress information on the project for assessing current status. e.g. methods, classes, packages
- Derive progress indicators
  - PM “rolls-up" the primitive metrics reported by the project team to provide a full picture of the project's progress
- Derive quality indicators
  - The PM monitor the quality of project artifacts

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Step to Monitor Project Status(2)

- Evaluate indicators vs plans
  - compares these against the expected state of the project as defined by the Software Development Plan and Iteration Plans
  - Evaluate the following:
    - Have all planned tasks been completed?
    - Have all artifacts been published as planned?
    - Is the estimated effort to complete tasks that are "in progress" within plan?

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Project Monitoring Status Input

- Software development plan
  - comprehensive, composite artifact which gathers all information required to manage the project.
- Project scheduling
  - Timeline and milestone
- Risk management plan
  - The details how to manage the risks associated with a project
- Review record
  - A Review Record is created to capture the results of the review of a project artifact. E.g. design review rpt

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Project Monitoring Status Output

- Project measurements
  - It contains the most current project, resources, process and product measurements at the primitive and derived level.
- Project status
  - Where you are?
  - In schedule?
  - Behind schedule?

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Report Status

- Status of the project has to report to project committee (project director/user head/heads).

Purpose:

- Provide regular updates on project status for review by the Project Committee
- Escalate issues beyond the project manager's authority for resolution by the Project Committee. E.g. increase budget, amendment of contract etc.

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Steps to Prepare Status Assessment(1)

- **Technical progress:**
  - Work completed during this reporting period (e.g. tasks completed, artifacts delivered). Highlight any slippage-(kemerosotan).
- **Budget progress:**
  - Spending to date. Highlight any cost over-runs.
- **Progress against scheduled milestones:**
  - Were scheduled milestones achieved?
- **Total project/product scope:**
  - Report on the revised estimate for the project scope based on work done and estimates to complete work in progress.

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Steps to Prepare Status Assessment(2)

- **Personnel/staffing status:**
  - Status of personnel. Report any issues or concerns.
- **Risk status:**
  - Are any risks becoming realized?
- **Issues arising:**
  - Project issues requiring project committee resolution.
  - Recommend potential solutions for consideration.
- **Action items:**
  - A list of action items from previous status assessments and their current status.

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Handling Exceptions & Problems(1)

- Purpose
  - To initiate appropriate corrective actions to problems & exceptions arising in the project
- The steps…
  1. Evaluate Exceptions and Problems
  2. Determine Appropriate Corrective Actions
  3. Issue Change Requests and/or Work Orders

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Evaluate Exceptions and Problems(2)

- The first step is to evaluate each of the identified problems/issues in the Status Assessment.
- For each problem/issue you need to identify the cause, its impact on the project,
- Determine what your options are to resolve it.
- You should also determine if the possible solutions are within the authority of the project team to implement.

Determine Appropriate Corrective Actions(3)

- For each problem/exception, select the preferred approach for resolution and determine the steps you need to take to implement it.
- If this approach will require a change to the Software Development Plan or the product's requirements or design, you will need to create a Change Request and implement the change following the project's Configuration Management Plan.
- If the approach does not change one of the baseline plans then the solution can be implemented by the project manager; issuing a new Work Order.
- In either case, if the preferred solution is beyond the authority of the project team the issue should be escalated to the Project Review Authority for resolution.

Issue Change Requests and/or Work Orders(4)

- Once the corrective action for each problem or exception has been determined, and any necessary approvals, the project manager documents the work involved and raises Change Requests and/or Work Orders to initiate the work.

Case study: **How to Address Annoying and Continual Change Requests From Web Design Clients**

You know, I love web design. I love building sites for clients. I love being self employed and meeting new people and taking on new challenges daily. This is the very reason why I quit my unfulfilling full time job and decided to start my own web design business.

But one thing that really annoys me as a freelance web designer is - **change requests!**

Have you ever experienced a client that does nothing but make your job harder by demanding continual, and at times, silly or pointless change requests? They might call at 10 o'clock at night and ask you to move their logo up 2 pixels, or change the background color to light blue instead of beige. For whatever the reason, it sure is annoying, and something that needs to be addressed, ahead of taking on the project. To an extent, its about **educating the client**.

Change requests, apart from wasting your time, can lead to **scope creep**. This can cause you to work tirelessly in circles, in a never ending whirlpool of problems. The end of the project just seems to become further and further away with each and every modification. And what started out as a 3 week job, is now blowing out to 4 months!

What then, can you do to prevent clients making ongoing change requests? The answer lies in your **contracts, and agreements**.

It is absolutely vital that you address change requests in your **web design contract**, which the client must sign off on before starting the project. I include a comprehensive web contract template that covers change requests in detail.

It reads as follows....
Section 24, page 8. Change Requests
Developer prides itself in providing excellent customer service. That is the spirit of our agreement and the spirit of the Developer's business. To that end, we encourage input from the Client during the design process. The Developer understands, however, that Clients may request significant design changes to pages that have already been built to the Client's specification. To that end, please note that our agreement does not include a provision for "significant page modification" or creation of additional pages in excess of our agreed proposal. If significant page modification is requested after a page has been built to the Clients specification, we must count it as extra design work.

Summary

- Project monitoring is important as it capture the project status and progress.
- Project monitoring provide crucial input on project status either the project is behind, on-time or ahead of schedule.
- Through monitoring exercise issues, problems, changes and exceptions could be triggered at early stage.
- Alternative action plan could be determined effectively if the project is monitored accordingly.

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Chapter 11: Project Control

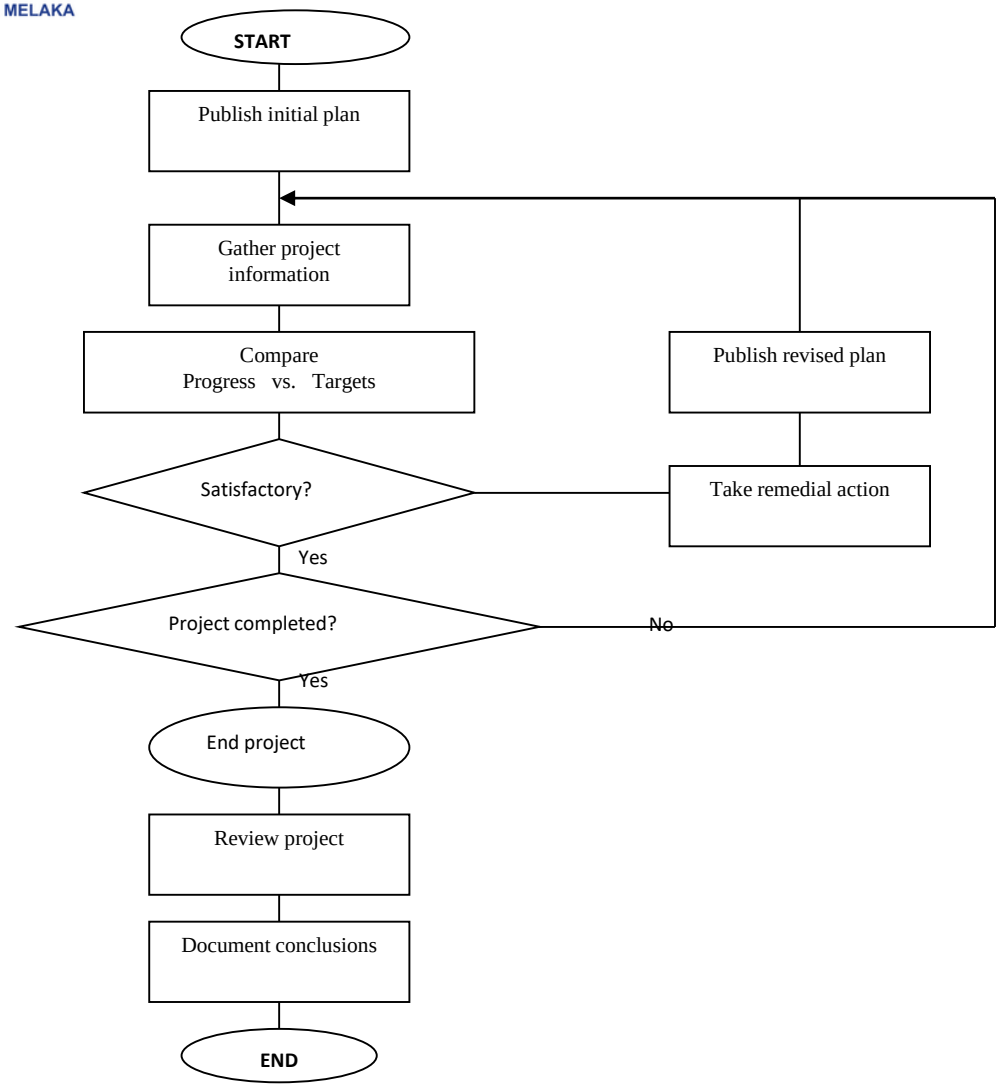
Contents

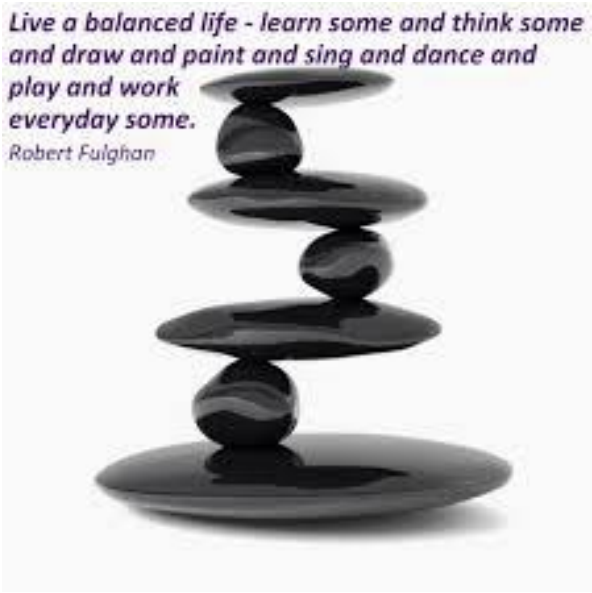
- Purpose & fundamental of project control
- Project control cycle
- Criteria of effective project control
- Configuration management

Purpose of controls

- To make actions on a result of reports e.g. too many bugs/errors in system test report – add more expert or etc.
- To bring actual project status back into conformance with the project plan
- To draw attention to certain aspects or characteristic of the project e.g. planned vs actual schedule.
- To control performance levels, costs and time.

Project control cycle





Criteria for effective project controls (1)

- Detailed project planning – develop a detailed project plan, involving all key personnel, defining the specific work to be performed, the timing, the resources and the responsibilities.
- Results and deliverables – define the program objectives and req in terms of specifications, schedule, resources and deliverable items for the total program
- Measurable milestones – define measurable milestones and checkpoints throughout the program.
- Commitment – obtain commitment from all key personnel regarding the problem plan, its measures and results.

Criteria for effective project controls (2)

- Measurements – assure accurate measurements of project performance data, especially technical progress against schedule and budget.
- Regular reviews – project should be reviewed regularly, both on a work package or subsystem level and total project level.
- Communication – communicate, communicate …
- Leadership – lead, guide, motivate, direct, teach etc…
- Minimise threats – PM must foster a work environment that is low on personal conflict, power struggles, surprises, and unrealistic demands.

Configuration management

- CM deals with maintaining control of the project's assets (the products developed by project such as software version, technical and admin documents, hardware description and etc.)
- CM is a key management tool used in controlling software projects
- CM directs and controls the development of a product by the identification of the product components and control of their continuous changes
- CM includes documentation of composition the defined product and its components.

Objective configuration management

- CM acts as center of information about a project's products
- CM ensures that at any given time the status of each product is known
- CM ensures that only current versions of products are released for use.
- CM safeguards all master copies of products
- CM provides information on the project status history, so that project audit trail can be carried out effectively.

Benefits of configuration management (1)

- At any point in the development life cycle, if a failure occurs, the current state of all project items can be regenerated from stored backups, base lines or safe copies of masters.
- Design changes, corrections and enhancements can be made in a controlled manner.
- CM can control the sharing of objects during the software development life cycle.
- At any time, managers will know and are able to check the precise status of a deliverable internal item.

Benefits of configuration management (2)

- Whenever a product is delivered or released, it can be supported by relevant and corresponding documentation.
- After delivery, CM provides a starting point for controlled changes and future enhancements – based-line.
- Operational issues can be related directly to the system components and their documentation – you have base to refer…

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Summary

- Project control is crucial as it trigger the project on schedule, behind schedule or ahead of schedule.
- Leadership and communication are key to gather information for controlling the project.
- Configuration management is a good practice to manage and control project artifacts.

Chapter 12: Managing Quality

Contents

- Introduction to quality
- The need of quality in software project
- Quality plan
- Quality system
  - Capability Maturity Model (CMM)
  - Capability Maturity Model Integrated (CMMI)
- Summary

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What quality is required ? – (1)

- Quality of a software is combination of factors
  - Adaptability
    - Can business functions be created or modified easily?
  - Completeness
    - Are all the document functionalities delivered and consistent
  - Data quality
    - How accurate & complete data stored in the system
  - Efficiency
    - What machine resources does it use ? Does it work fast enough?

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What quality is required ? – (2)

- Friendliness
  - How easy is to use the system ? Is it ergonomically sound ?
- Maintainability
  - Can the current functions of software be maintained ?
- Portability
  - Can system be migrated to other environment if necessary ?
- Reliability
  - How often system fail to perform its functions ?

What quality is required ? – (3)

- Resilience (elastic/good features/ketidaklenturan)
  - How does system respond to user errors or external problems ?
- Security
  - System protected against unauthorized access and corruption ?
- Testability
  - How easy can system be tested
- Timeliness
  - Will software be available, properly implemented, when needed ?

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Quality Plan - 1

- What is a Q-Plan ?
  - Q-plan is the document where we define the form of the project:
    - Structure
    - Methods & standards e.g. design std, programming std – do not use *go to, class/method start with small letter (addStudent(), viewSubject())*
    - Who has what responsibilities
  - Important to get an AGREED Q-plan early in the project, else you have been building a system for the wrong person or to unacceptable standards

Quality Plan - 2

- Questions to ask (to make sure quality plan workable)
  - Who makes the decisions ?
    - Quality plan must get consensus/agreement and have realistic and agreed sign-off list/committee
  - Who are you building the system for ?
    - May not be the decision makers but for operational staff
    - Need to involve the users in requirement analysis (SRA review), SRS, prototypes (SDD review), tests (STP review) etc
  - Who will do what ?
    - Determine roles of project team and user groups
    - What tasks will they do ? What they will not do ?

Q-Plan - 3

- What will the project structure ?
  - What decisions have been made about the structure of the project ?
  - Follow defined structured method of different ? Software quality team is different?
  - Criteria for starting & ending each stage of the work? E.g sign-off first!
- What stds and QA procedure will you follow ?
  - Eg. As in change control, document approval
  - Technical stds to be applied in different parts of the work

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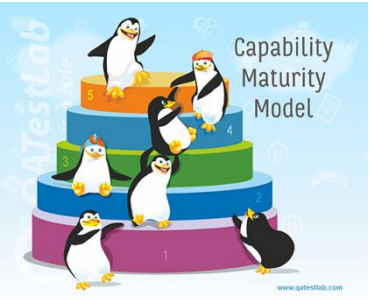
Q-Plan - 4

- What deliverables are you going to produce ?
  - Output of each part of work will be a defined deliverable
  - Each deliverable will have a defined content, and subject to a defined process of review and testing so that it can be formally approved
- How are you going to do configuration management?
  - How will different docs and software components be identified ?
  - How will you mark versions ? By date? Time? Released #?
  - What tools or techniques to use for controlling changes? Github? CVS? VisualSourceSafe?
  - Where will software & docs be stored ? Burn In CD, rent the cloud, keep off-site, use local server?
  - How will items be approved for inclusion in a software release ?

Q-Plan - 5

- What else to include ?
  - Details of the QA organization, process for procurement and subcontract work, how will you plan, monitor and report progress
  - For small project may include describing the structure for testing, approach to user doc and training
- Basic principles of Q-standards (e.g. ISO9001/CMM)
  - Say what you are going to do, do what you said, document, so you can prove you did it
  - Q-plan sets up the framework so you can do this

CMM - Introduction



- Capability Maturity Model (CMM)
- Quality framework – processes to get a standard and certified quality software
- Created by Carnegie Mellon University's Software Engineering Institute (SEI) in 1992

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CMM - Introduction

What is CMM?

- A framework that describes the elements of an effective software process and an evolutionary path that increase an organization's software process maturity.
- The framework therefore maps out a path which can be used by organizations to move from an ad hoc, chaotic process to a mature, disciplined process in several stages.
- Each stage provide the foundation on which to build improvements undertaken at the next stage. Therefore, the framework is a road-map for organizations embarking on the journey of continuous process improvement rather than a quick fix for projects in trouble.

CMM - Introduction

- A common sense application of process management and quality improvement concepts to software development and maintenance.
- A community-owned guide for evolving toward a culture of engineering excellence.
- A model for organizational improvement
- The underlying structure for reliable and consistent software process assessments and software capability evaluations.

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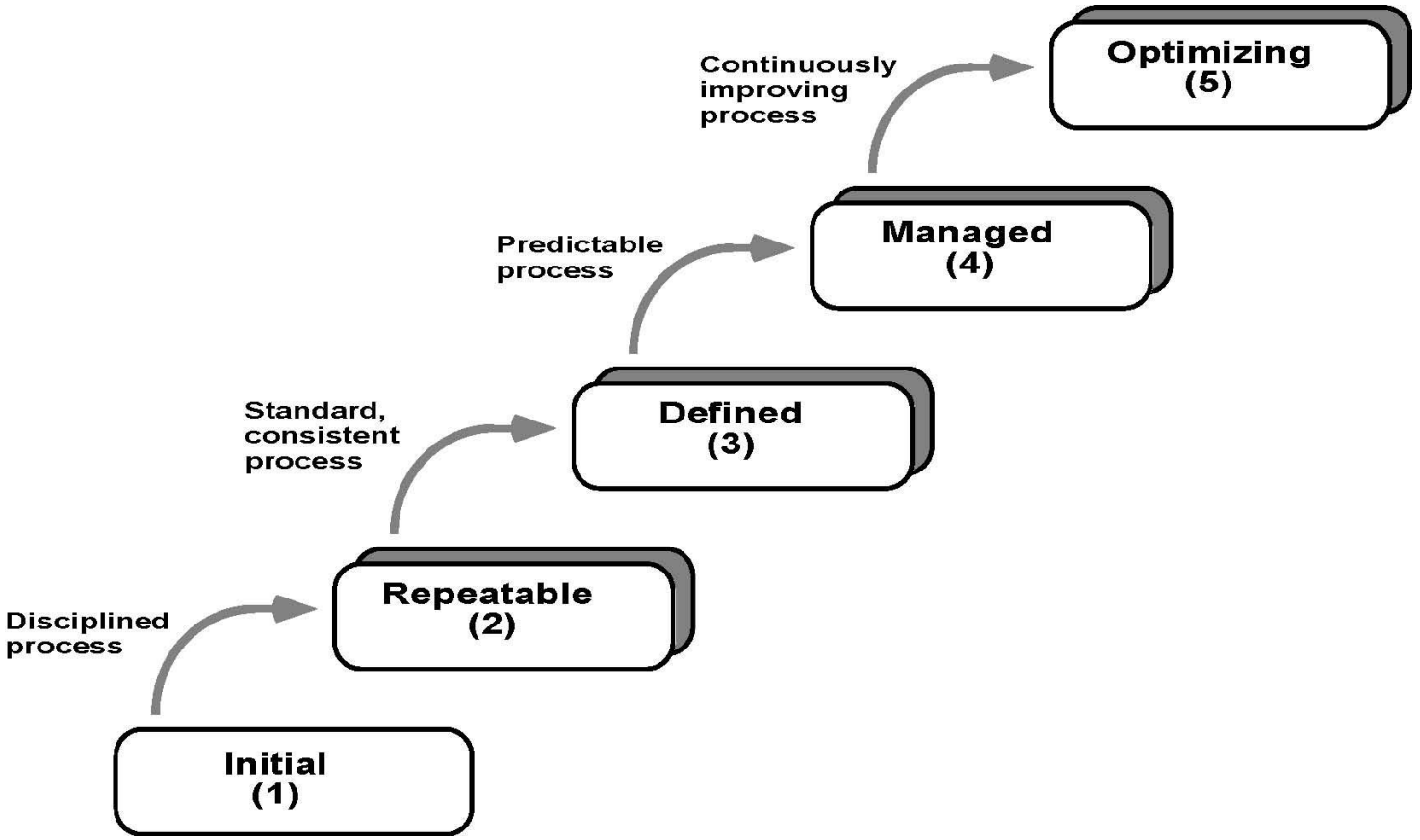
Focus of CMM

- Problems are managerial matters then it should handle through mgt approach and systematic process.
- Need for the governance to strengthen (and assess) its software supplier community.
- Size and number of problems is overwhelming once it happened. Disagree on what problems to attack first but look at the overall process.
- The quality of a (software) system is largely governed by the quality of the process used to develop and maintain it.
- The level of technology used must be consistent with the maturity of the process.

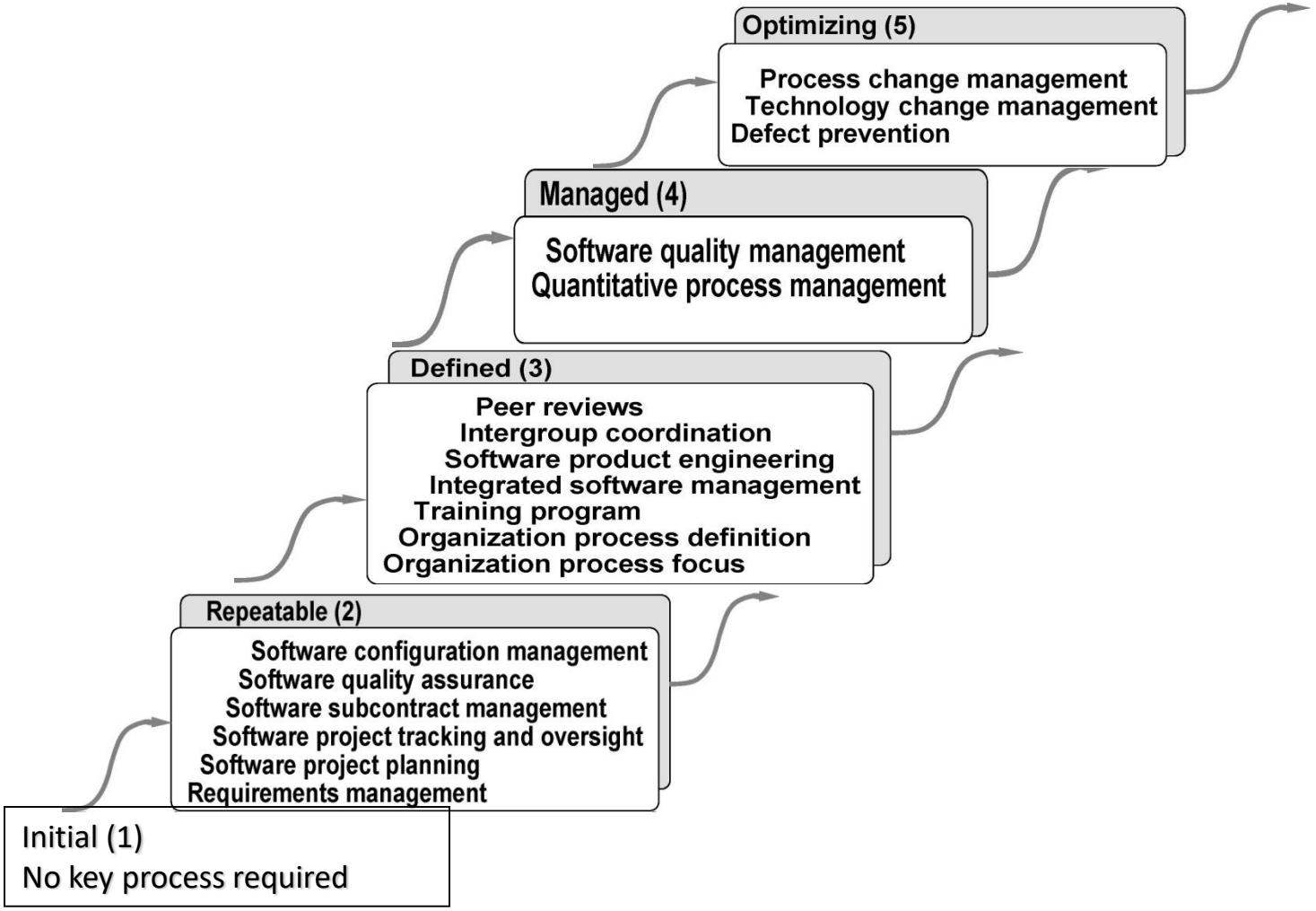
CCM's Level & Characteristics

Level	Characteristics
Optimized 5	The mgt focuses on the continuous improvement of the process
Managed 4	Product and process are managed quantitatively
Defined 3	The software is managed in accordance with a well-defined process
Repeatable 2	A project mgt system is in place; broad visibility over the process exists.
Initial 1	Control over software is an obscure art

Capability Maturity Model
The Five Maturity Levels



CMM's Model Level & Key Process Areas (KPAs)



CMM's Key Process Area

- Identify a cluster of related activities that, when performed collectively, achieve a set of goals considered important for enhancing process capability
- Identify the issues that must be addressed to achieve a maturity level.

CMMI - Introduction (1)

- Is a quality framework that integrate multiple disciplines and different approaches of source models
- Was formed to sort out the problem of using multiple CMMs. Applying multiple models that are not integrated will lead to inadequate cost effective.

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CMMI

Introduction(2)

- The combination of three models into a single improvement framework
  - Capability maturity model for software (SW-CMM)
  - System engineering capability model (SECM)
  - Integrated product development capability maturity model (IPD-CMM)
- A process improvement framework that covers product and service development and maintenance.

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CMMI

Knowledge integration

- Systems engineering
  - Covers the development of total system, which may or may not include software. E.g. development of microprocessor and system hardware.
  - System engineers focus on transforming customer's needs, expectations and constraints into products and supporting these products throughout their life.
- Software engineering
  - Covers the development of software/appl systems
  - Software engineers focus on applying systematic, disciplined and quantifiable approaches to the development, operation & maintenance of software

CMMI

Knowledge integration

- Integrated Product & Process Development
  - A systematic approach that achieves a timely collaboration of relevant stakeholders throughout the life of the product to satisfy customer's needs, expectation & requirements. e.g. system integration
- Supplier sourcing
  - Use suppliers to perform functions or add modification to products that are specifically needed by the project.
  - Involve the acquisition process of products from suppliers

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Summary

- Software quality is crucial as software involve critical business process and human life.
- Quality plan should be prepared and agreed before the project started.
- Quality system such as CMM and CMMI is a good practice for managing software quality and trust from the user point of view.

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Chapter 13: Project Close Out

Contents

- Introduction
- The purpose
- Steps in closing the project
- The checklist
- The deliverables

Introduction

- Software projects are much like bus trips, houses, highways and bridges, need to be completed successfully.
- For example, a structurally beautiful bridge will not be attractive if left steel gray with unpainted welds and the most beautiful house will suffer if surrounded by a yard of mud upon completion.
- A software project requires that all tasks be completed and then delivered effectively to gain the positive feedbacks the team has worked so hard to get.
- The smallest detail gone away during delivery can set the wrong impression of a project. E.g. forget to change the local host name to actual www.xxxx.xxx.

Purpose to Close Out

- The Project Manager readies the project for termination.
- A final Status Assessment is prepared for the Project Acceptance Review and finally get formal customer acceptance of the software product.
- Completes the close-out of the project by disposing of the remaining assets and reassigning the remaining staff.

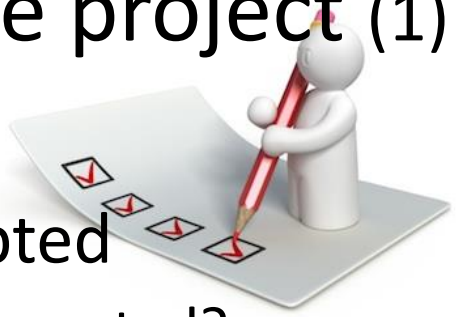
General steps in project closing

- The general steps in closing a successful project are :
  - Get client acceptance of deliverables.
  - Ensure that all deliverables are installed.
  - Ensure that documentation is in place.
  - Get client sign-off on final report.
  - Conduct post-implementation audit.
  - Celebrate success.

Steps in closing the project

- Update project close-out plan & schedule activity
- Schedule final configuration audit
- Conduct a project post-mortem review
- Complete acceptance action items
- Close-out the project

Check list in close-out the project (1)



- Ensuring that the project is formally accepted
  - All contracted deliveries have been made & accepted?
- Settling the project's finances
  - Making sure all payments have been received and all suppliers and subcontractors paid
- Archiving all project documentation and records
  - Making sure all documentation have been generated
- Transferring any remaining (non-deliverable) hardware and environment assets to the owning organization's pool of assets.

Check list in close-out the project (2)

- Transferring any remaining (non-deliverable) hardware and environment assets to the owning organization's pool of assets.
- Transfer the project measurements to the corporate historical database.
  - Project knowledge for future project
- Reassign remaining project staff
  - Most projects can accommodate a gradual ramp-down of staff levels, and allow a smoother transition of staff to other projects.
  - This should not be done abruptly/drastic (hindar keterlaluan dlm mengurangkan jumlah staf)

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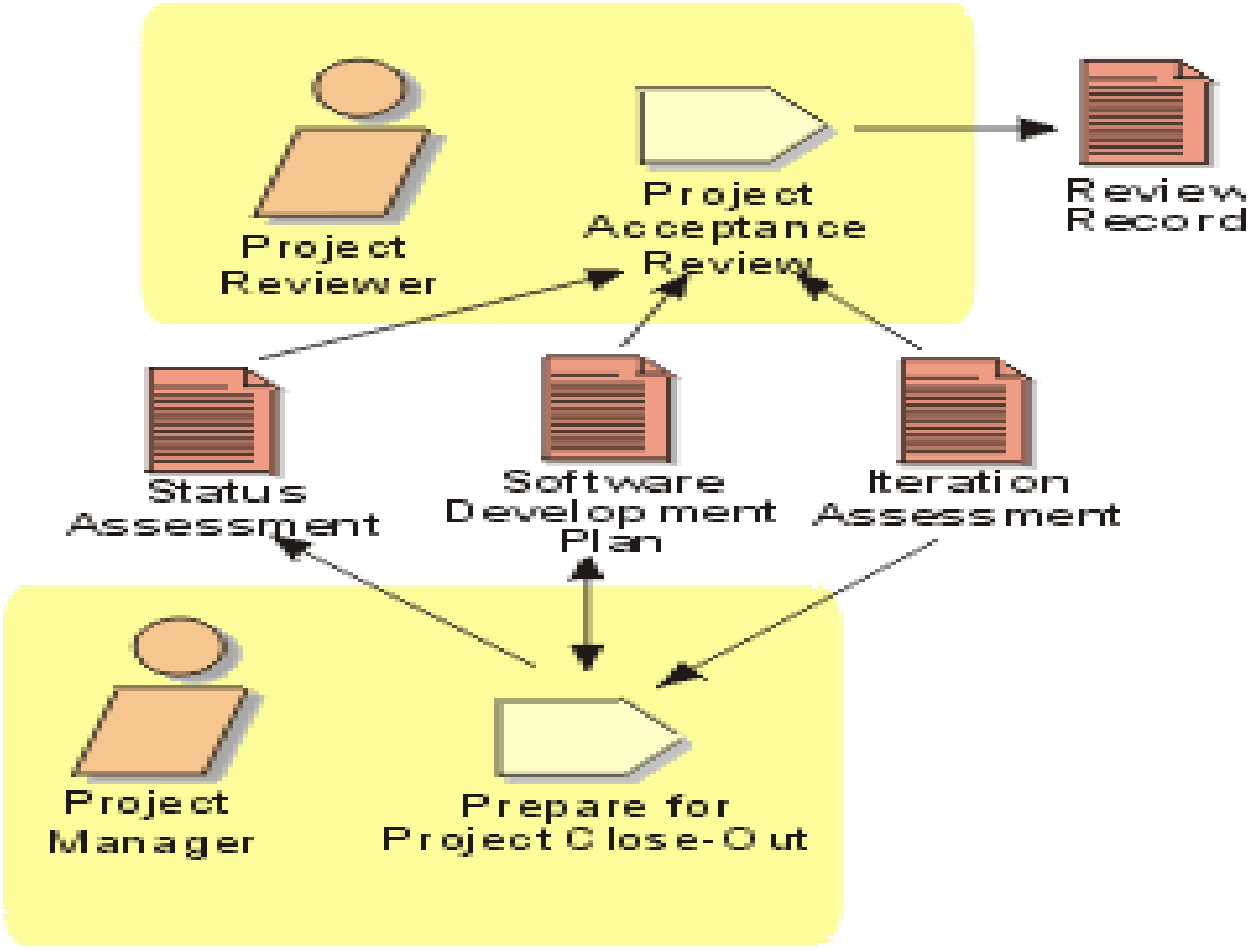
General Workflow (RUP)



Deliverables during hand over of project

- User documentation (including technical documentation)
- User training – one-time or as-requested or continuous?
- Development support during live transition – on-site or off-site?
- Procedures for tracking user/system errors – e.g. support procedures, problem database or FAQ
- Help desk support – do you need to set-up help desk unit?

Summary

- Project close out is important to be taken-care as to ensure smooth implementation of the application.
- Project close out ensure the remaining deliverables are hand over to the customer/end user.
- Project close out provide check list of completed and pending tasks or deliverables.

THE END

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Thank you

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