Project: complex, non-routine, one-time effort limited by time, budget, resources, perf specs designed to meet customer needs

Project characteristics: established objective, defined life span with beginning & end, requires participation across the org, typically involves doing sth never done before, has specific time, cost, perf reqs

Project life cycle:
Defining: goals, specs, tasks, responsibilities
Planning: schedules, budgets, resources, risks, staffing
Executing: status reports, changes, quality, forecasts
Closing: train customer, transfer docs, release resources, evaluation, lessons learned

Factors leading to increased use of PM: compression of product life cycle, knowledge explosion, triple bottom line (planet, people, profit), corporate downsizing, increased customer focus, small projects represent big problems

PM: manages temporary, non-repetitive activities, frequently acts independently of formal org, marshals resources for project, linked directly to customer interface, provides direction, coordination & integration to the project team, responsible for performance & success of the project, must induce right people at right time to address the right issues and make right decisions

PM Technical Aspects: scope, WBS, schedules, resource allocation, baseline budgets, status reports

PM Sociocultural Aspects: leadership, problem solving, teamwork, negotiation, politics, customer expectations

Integrated mngt of projects: strategic alignment, portfolio mngt, PM, with org culture env wrapped around

Integrative PM approach benefits: provide senior mngt with overview of all PM activities, big picure of how org resources used, risk assessment of project portfolio, rough metric of org's improvement in managing projects relative to others in industry, linkages of senior mngt with actual project execution mngt

Portfolio mngt Functions: oversee project selection, monitor aggregate resource levels & skills, encourage use of best practices, balance projects in portfolio in order to represent risk level appropriate to the organisation, improve communication among all stakeholders, create total ord perspective that goes beyond silo thinking, improve overall mngt of projects over time

Program: a series of coordinated, related, multiple projects that continue over an extended time and are intended to achieve a goal

Traditional PM: focus on thorough, upfront planning of entire project, requires high degree of predictability to be effective

Agile: relies on incremental, iterative dev cycles to complete less predictable projects, ideal for exploratory projects in which requirements need to be discovered and new tech tested (uncertain ablut how long, what is required, allows change in reqs), focus on active collaboration between project tem & customer reps

Traditional	Agile
Design up front	Continuous design
Fixed scope	Flexible
Deliverables	Features/requirements
Freeze design as early as possible	as late as possible
Low uncertainty	high
Avoid change	embrace
Low customer interaction	high
Conventional project teams	self-organised

Agile Advantages: useful in developing critical breakthrough tech or defining essential features; continuous integration, verification & validation of the evolving product; frequent demonstration of progress to increase likelihood that end product will satisfy customer needs; early detection of defects & problems

Agile Limitations: does not satisfy mngt's need for budget, scope & schedule control; self-organisation & close collaboration principles can be incompatible with corporate cultures; appears to work best on small project with 5–9 people, requires active customer involvement & cooperation

Agile Principles: focus on customer value, iterative & incremental delivery, experimentation & adaptation, self-organisation, continuous improvement

Project uncertainty dimensions: scope & tech

Scrum: holistic (interconnected emphasis) approach for use by cross-functional team collaborating to develop new product, defines product features as deliverables & prioritises them by perceived highest value to the customer, re-evaluates priorities after each iteration/sprint to produce fully functional features, phases: analysis, design, build, test

Scrum roles & responsibilities:
Product owner: acts on behalf of customer to represent interests, responsible for product backlog priorities & process selection
Development team: 5–9 people with cross-functional skillsets responsible for delivering product, sets own goals, organises itself, makes decisions
Scrum master: facilitates scrum process and resolves impediments at the team & org level by acting as buffer between team & outside interference

Scrum practices:
Sprint: time-controlled mini-project that implements specific portion of a system, 30 day time box with specific goals & deliverables, frozen scope defined from sprint backlog
Daily Scrum: daily meeting of all team members to report progress (15 min max), also called standup
Sprint final half-day review meeting: review & identify changes needed for following sprints
Sprint meetings: sprint planning, daily scrum, sprint review, sprint retrospective
Product backlog: customer's prioritised list of desired key features for the completed project, can only be changed by product owner
Sprint backlog: amount of work team commits to complete during the next sprint, developed & controlled by team
Scaling: using several teams to work on different features of large scale project at same time
Staging: upfront planning to manage interde-

pendencies of the different features to develop, involves developing protocols & defining roles to coordinate efforts & assure compatibility & harmony

Strategy Importance: PMs must respond to changes to organisation mission and strategy appropriately, if understand strategy can become effective advocates of projects aligned with firm's mission

Mistakes by not understanding role of projects in accomplishing strategy: focus on problems/solutions with low strategic priority, focus on immediate customer rather than whole marketplace & value chain, over-emphasising tech that results in projects that pursue exotic tech that does not fit strategy or customer need, trying to solve customer issues with product/service rather than focusing on 20% with 80% of value (**Pareto's law**), engaging in never-eding search of perfection that only team really cares about

Strategic mngt: requires every project to be clearly linked to strategy; provides theme & focus of organisational future direction (responding to changes in external env — env scanning, allocating scarce resources of firm to improve competitive position — internal responses to new programs); requires strong links among mission, goals, objectives, impl

Strategic mngt activities:
Review & define org mission: identify & communicate purpose of org to stakeholders, identify scope of org in terms of product/service, provides focus for decision making, used for eval org perf
Set long-range goals & objectives: translate mission to specific, concrete & measurable terms; sets targets for all levels of org in a cascaded manner; where is org headed and when it will get there; focus managers on where org should move to
Analyse & formulate strategies to reach objectives: focus on what needs to be done to reach objectives, realistic view of past & current position, SWOT analysis, alternatives generated & assessed, strategy formulation & assignation
Implement strategies through projects: focus on how strategies will be realised with resources, maintain link between strategy (what) & impl (how), requires resource allocation, action & completion of tasks, prioritisation
SMART objectives: Specific, Measurable (indicators of progress), Assignable (to one person for completion), Realistic (what can realistically be done with avail resources), Time related (state when objective can be achieved)
SWOT analysis: internal (strengths, weaknesses) & external (opportunities, threats) analysis
Scenario planning: longer term, steps: clarifying core business & assessing drivers of change in industry env, dev potential scenarios & assess impact of STEEP factors, dev potential contingency strategies & best future strategic options, identifying early indicators & establishing triggers for strategic action
STEEP factors: social, tech, env, economic, political

Project portfolio mngt benefits: build discipline to project selection process, link project selection to strategic metrics, prioritise project proposal across common set of criteria rather than politics/emotion, allocate resources to projects that align with strategic direction, balance risk across all projects, justifies stopping projects that don't support strategy, improves comms & supports agreement on project goals

Project portfolio mngt problems:
Implementation gap: lack of understanding & consensus on strategy among to mngt & middle-level (functional) managers who independently implement strategy
Org politics: project selection based on persuasiveness & power of people advocating projects
Resource conflicts & multitasking: Multiproject env creates interdependency relationships of shared resources which results in starting, stopping & restarting of projects

Project types: compliance (must-do, incl emergency, meet regulations, usually have penalties if not impl), strategic (directly support long-run mission, increase revenue/market share, ex: new products, R&D), operational (support current ops, improve perf, reduce product cost, improve efficiency of delivery sys, ex: upgrade building green rating)

Financial Selection Criteria: payback, NPV, IRR (internal rate of return, inverse of payback)

Payback model: measures time project takes to recover investment; uses more desirable, shorter paybacks; emphasises cash flows (key factor in business)

Payback limitations: ignores time value of money, assumes casf inflow only for investment period, does not consider profitability

Net Present Value: $I_0 + \sum_{t=1}^{n} \frac{F_t}{(1+k)^t}$, I_0 is initial investment (negative), F_t is net cash inflow for period t, k is required rate of return, want positive

Non-financial strategic criteria: capture larger market share, make it difficult for competitors to enter the market, develop enabler product which by interduction will increase sales in more profitable products, develop core tech to be used in next-gen products, reduce dependency on unreliable suppliers, prevent government intervention & regulation

Multicriteria selection models:
Checklist model: use list of questions to review potential projects & to determine accept/reject, fails to answer relative importance/value of potential project & doesn't allow for comparison with others
Multiweighted scoring model: use several weighted qualitative and/or quantitative selection criteria to evaluate project proposals, can use for comparison
Selection model advantages: bring projects to closer alignment with org strategic goals, reduce number of wasteful projects, help identify proper goals for projects, help everyone involved understand how & why project is selected
Project relativity matrix: 2 dimensions (technical feasibility, NPV), white elephant (low, low, showed promise at one time but are

no longer viable), oyster (low, high, technological breakthroughs with high commercial payoffs), bread-and-butter (high, low, evolutionary improvements to current products & services), pearl (high, high, revolutionary commercial opportunities using proven tech advances)

Challenges to organising projects: need to balance needs of project with org, uniqueness & short duration of projects relative to ongoing longer term org activities, multidisciplinary & cross-functional nature of projects creates authority & responsibility dilemmas

Functional org: different segments of project delegated to functional units, coordination maintained through normal mngt channels, used when interest of 1 functional area dominates project or has dominant interest in project success
Functional +: no structural change, flexibility, in-depth expertise, easy post-project transition
Functional -: lack of focus, poor integration, slow, lack of ownership
Dedicated project teams: teams operate as separate units under leadership of full-time PM, in projectised org where projects are dominant form of business functional depts are responsible for providing support to teams
Dedicated +: simple, fast, cohesive, cross-functional integration
Dedicated -: expensive, internal strife, limited tech expertise, difficult post-project transition
Hybrid/Matrix: overlaid on normal functional structure, 2 chains of command (functional & project), project participants report simultaneously to both functional & PMs, optimise use of resource (allows pariticipation on multiple projects while performing normal functional duties)
Matrix +: efficient, strong project focus, flexible, easy post-project transition
Matrix -: dysfunctional conflict, infighting, slow, stressful
Weak matrix: authority of functional manager predominates, PM has indirect authority
Balanced matrix: the PM sets overall plan & the functional manager determines how work is to be done
Strong matrix: PM has broader control, functional departments act as subcontractors to project

Matrix division of responsibilities:
PM: what has to be done, when should the task be done, how much money is available to do the task, how well has the total project been done
Functional manager: how will it be done, how will project involvement impact normal functional activities, how well has the functional input been integrated
Negotiated issues: who will do the task, where will the task be done, why will the task be done, is the task satisfactorily completed
Org culture: system of shared norms, beliefs, values & assumptions that bind people together, thereby creating shared meanings; personality of org that sets it apart from other orgs
Org culture benefits: provides sense of identity to members, helps legitimise mngt system of org, clarifies & reinforces standards of behaviour, helps create social order
Diagnosing org culture: study physical characteristics (architecture, office layout, decor, attire), read about org (annual reports, internal newsletters, vision statements), observe how people interact within org (pace, lang, meetings, issues discussed, decision-making style, comm patterns, rituals), interpret stories & folklore surrounding org (anecdotes, heroines, heroes, villains)
Org culture dimensions: member identity (job, org), team emphasis (individual, group), mngt focus (task, people), unit integration (independent, interdependent), control (loose, tight), risk tolderance (low, high), reward criteria (performance, other), conflict tolerance (low, high), means-ends orientation (means, ends), open-system focus (internal, external, degree to which org monitors & responds to changes in external env)
Defining the project: defining project scope, establishing project priorities, creating WBS, integrating WBS with org, coding WBS for information sys
Project scope: definition of end result or mission of project — a product/service for clinet/customer — in specific, tangible & measurable terms
Scope statement: statement of work (SOW)
Scope statement purpose: clearly define deliverables for end user, focus project on successful completion of its goals, to be used by project owner & participants as planning tool & measuring project success
Project scope checklist: project objective; deliverables; milestones; technical reqs; limits & exclusions; reviews with customer
Project charter: can contain expanded version of scope statement, document authorising PM to initiate & lead project
Scope creep: tendency for project scope to expand over time due to changing requirements, specs, priorities
Priority matrix: budget/cost, schedule/time, performance/scope, constrain, enhance (optimise), accept
Work Breakdown Structure: hierarchical outline (map) that identifies products & work elements involved in project, defines relationship of final deliverable to subdeliverables & in turn their relationships to work packages, best suited for design & build projects that have tangible outcomes rather than process-oriented projects
WBS Hierarchy: project, project, deliverable, sub-deliverable, lowest sub-deliverable (lowest mngt responsibility level), cost account (group of work packages for monitoring progress & responsibility), work package
WBS benefits for PM: facilitates evaluation of cost, time & technical perf of org on project; provides mngt with info appropriate to each org level; helps in dev of OBS, which assigns project responsibilities to org units & individuals; help manage plan, schedule & budget; define comm channels & assists in coordinating various project elements
Work Package: defines work (what), identifies

time to complete, time-phased budget to complete (cost), resources needed to complete (how much), person responsible for units of work, monitoring points/milestones for measuring success (how well)
Org Breakdown Structure: how company organised to discharge work responsibility for project
OBS details: provides framework to summarise org work unit perf, identifies org units responsible for work packages, ties org units to cost control accounts
Intersection of WBS & OBS: project control point/cost account
WBS coding system: defines levels & elements of WBS, org elements, work packages, budget & cost info, allows reports to be consolidated at any level in org structure
Responsibility Matrix: linear responsibility chart, summarises tasks to be accomplished & who is responsible for what on the project
RM details: list project activities & participants, clarifies critical interfaces between units & individuals that need coordination, provides means for all participants to view responsibilities & agree on assignments, clarifies extent/type of authority that can be exercised by each participant
Comm plan steps: stakeholder analysis, info needs, sources of info, dissemination modes, responsibility & timing
Estimating: process of forecasting/approximating time & cost of completing project deliverables, task of balancing expectations of stakeholders & need for control while project is implemented
Estimating importance: support good decisions, schedule work, determine how long project should take & cost, determine whether project worth doing, develop cash flow needs, determine how well the project is progressing, develop time=phased budgets & establish project baseline
Estimation accuracy factors: planning horizon, project duration, people, project structure & org, padding estimates, org culture, other non-project factors
Estimating guidelines: have people familiar with tasks make estimate; use several people to make estimates; base estimates on normal conditions, efficient methods & normal level of resources; use consistent time units; treat each task as independent; don't make allowances for contingencies, adding risk assessment helps avoid surprises to stakeholders
Top-down estimates: derived from someone who uses experience and/or info to determine the project duration & total cost, are made by top managers who have little knowledge of the processes used to complete the project, time & costs are not considered, grouping tasks may lead to omissions & unrealistic times & costs, accuracy -20% to +60%, cost 0.1–0.3%
Conditions for top-down: strategic decision making; high uncertainty; internal, small project, unstable scope
Top-down intended use: feasibility/conceptual phase, rough time/cost estimate, fund reqs, resource capacity planning
Bottom-up approach: can serve as a check on cost elements in WBS by rolling up work packages & associated cost accounts to major deliverables at work package level, more accurate but takes more time, accuracy level may not be required for some projects, accuracy -10% to +30%, cost 0.3–1%
Conditions for bottom-up: cost & time important, fixed-price contract, customer wants details
Bottom-up intended use: budgeting, scheduling, resource reqs, fund timing
Preferred estimating approach: rough top-down estimates, dev WBS/OBS, make bottom-up estimates, dev schedules & budgets, reconcile diffs between top-down & bottom-up estimates
Top-down approaches:
Consensus: use xp of senior and/or mid managers to estimate total project duration & cost; typically involve meeting where experts discuss, argue & ultimately reach decision for best guessestimate
Delphi: about likelihood that certain events will occur, ask experts, then return summary of opinions (anon), encourage to reconsider/change based on others' opinions, repeat 2–3x, median will move toward 'correct' estimate, avoid ego, domineering, bandwagon, halo effect, no need for physical contact
Ratio: use cost/time per area/capacity size/features/complexity
Apportion: extension of ratio, use if projects closely follow past projects in features & cost, pay contractor by completion of parts or split costs based on deliverables in WBS (each has percent allocated)
Function point: for software & system projects, take several elements (input, output, inquiries, files, interfaces), rate complexity, multiply number of each with complexity, total is estimate
Learning curve: take number of units & improvement rate
Bottom-up approaches:
Template: start wirh standard task cost/time estimates then adjust specifics
Parametric applied to specific tasks: need to do X work, 1 person can do Y work in Z time
Range estimates for work packages: low, average, high for each, useful if work packages have significant uncertainty
Phase estimating: hybrid top-down & bottom-up, macro long-term (rest of project) & micro short-term (current phase, need, specs, design, produce, deliver), for projects with high uncertainty, customers may be able to change features & re-evaluate project at each stage, but customers & clients typically want front estimates of time & overall cost up front
Cost types:
Direct: clearly chargeable to specific work package, ex: labour, materials, equipment
Direct (project) overhead: directly tied to identifiable deliverable/work package, ex: salary, rents, supplies, specialised machinery
General & administrative overhead: indirectly linked to specific package apportioned to project, carried for project duration, ex: ads, accounting, senior mngt

Cost views: committed, scheduled budget, actual cost

Reasons for adjusting estimates: interaction costs hidden in estimates, normal conditions do not apply, things go wrong in projects, changes in project scope & plans

Project network: flow chart that graphically depicts sequence, interdependencies, start & finish times of project job plan of activities

Critical path: longest activity paths through network that allows for completion of all activities; shortest expected time in which entire project can be completed; 0 slack, also consider deps caused by resource constraints

Project network benefits: provides basis for scheduling labour & equipment, enhance comms among project participants, provides estimate of project duration, provides basis for budgeting cash flow, highlights 'critical' activities that cannot be delayed, highlights activities that can be compressed to meet deadline, help managers get & stay on plan

Activity: project element that requires time

Event: point in time when activity started/completed, does not consume time

Total slack: amount of time activity can be delayed & not delay project, time activity can exceed early finish date without affecting project end date/imposed completion date, LS — ES or LF — EF

Sensitivity: likelihood original critical paths will change once project initiated

Free slack (float): amount of time activity can be delayed after start of longer parallel activities, how long activity can exceed ES without affecting ES of successors, allows flexibility in scheduling scarce resources

Laddering: activities broken into segments so following activity can begin sooner & not delay work

Lags: minimum amount of time dependent activity must be delayed to begin/end, lengthy activities broken down to reduce delay in start of successor (if successor only dep on part finished early), with lags start and finish can have different slacks

Lag types:
Finish-to-start: order materials, 1 day to place order & 19 days to receive goods, can use for laddering
Start-to-start: can also be used for laddering, reduce network detail & project delays, often used in concurrent engineering (instead of completely sequential, can start next stage once part of predecessor complete)
Finish-to-finish: test cannot be completed any earlier than 4 days after prototype complete, cannot be f-s because subcomponent test does not qualify as complete sys test, which takes 4 days
Start-to-finish: system doc cannot end until 3 days after test start, since relevant info is generated after 3 days of testing

Risk: uncertain/chance events that planning cannot overcome/control, focus on future, deals with probabilities, tends to emphasise consequences

Threat: risk event external to org (inflation, market acceptance, laws), not within PM/team's responsibility area, normally considered before decision to proceed with project, if project initiated contingency funds placed in mngt reserve budget

Risk project life cycle: high chance of risk occurring initially (defining & planning) but low cost to fix, both swap by delivering

Risk anatomy: cause (how & why), event (what can go wrong, occurrence, outcome), effects (consequence)

Certainty: knowns, decision-maker aware of alternatives & outcomes

Uncertainty: unknown unknowns, future unknowable to probabilities & consequences unknown

Risk: known unknowns, situation where future can be analysed & planned for

Risk mngt attributes: is a decision-making process (informs decisions), should have structure & formality (helps effective mngt), has to have continuity through the project (iterative, continuous monitoring), has a project focus (for project performance & outcomes, such as time, cost, perf)

Risk mngt benefits: proactive rather than reactive approach, reduce surprises & negative consequences, prepares PM to take advantage of appropriate risks, provides better control over future, improves chances of reaching project perf objectives within budget & on time

Risk mngt process:
Planning & context: defines factors (internal/external) to take into account, risk mngt plan
Risk identification: identify potential risks & causes (list of risks)
Risk analysis & evaluation: analyse risk likelihood & potential consequences, risk evaluation for mngt
Risk treatment: strategies
Implementation & control: implement, monitor, control, review, happens throughout

Risk mngt plan: objectives, methodology, roles & responsibilities, budgeting, timing, risk categories, scoring interpretation, tolerance thresholds, reporting formats, tracking

Context types:
External: environment, such as political, social, legal, financial, geographical
Organisational: culture, values, governance, capabilities, policies, processes, strategic objectives
Project: fill set of objectives & project outcomes

Risk breakdown structure: split into categories (technical, external, organisational, PM), then split to subcategories

Risk evaluation: need to do anything?, classify (how acceptable), determine risk tolerance, know risk appetite

Risk consequence matrix: effect & probability, contents are how important it is (insignificant almost certain is moderate)

Risk assessment form/matrix: columns are risk events, likelihood, impact, detection difficulty, when

Risk severity matrix: impact & likelihood, with zones (red zone for high likelihood & impact)

Failure Mode & Effects Analysis: add detection to severity matrix, risk value does not differentiate between what part contributes most

Risk treatment options:
Avoidance: change plan to eliminate threat, refuse to accept risk
Reduction/Mitigation: reduce likelihood/consequences pre/post risk, contingency plans
Retention: accept with no further action, often for low risk
Transfer: shift responsibility & consequences to another party (contract/insurance) though it still exists

Contingency plan: alt plan that will be used if possible foreseen risk occurs, plan of actions to reduce/mitigate consequences of risk event, having no plan may slow managerial response, decisions made under pressure can be potentially dangerous & costly

Technical Risks: backup strategies if chosen tech fails, assessing whether tech uncertainties can be resolved

Schedule risks: use of slack increase risk of late project finish, imposed duration dates (absolute project finish date), compression of project schedules due to shortened project duration date (crash or shortening project duration using contingency funds, run activities concurrently/laddered)

Costs risks: costs increase then problem take longer to solve than expected (time/cost dependency links), price protection risks increase for long projects, evaluate item by item for cost sensitive projects

Funding risks: changes in supply of funds can dramatically affect likelihood of implementation/successful completion of project

Risk response matrix: columns are risk event, response, contingency plan, trigger, who is responsible

Principles for selection for treatment:
Practicality: realistic, achievable, easy to implement
Effectiveness: rating comparative effectiveness of options
Acceptability: agreement & commitment of stakeholders
Cost: balancing cost of treatment option against benefit
Capability: effective allocation for responsibility
Timeliness: implemented at the time to be successful
Precautions: need to take action as risk event has serious consequences

Time buffers: amounts of time used to compensate for unplanned delays in project schedule, allocate at critical project times (activities with severe risk, merge activities that may become late due to predecessors being late, noncritical activities to stop them from becoming critical, activities that require scarce resources to ensure adequate time to get the resources), if overall schedule is uncertain could add at end of project but requires top mngt & project owner authorisation

Implementation & control: use progress meetings & risk audits to evaluate identified risks remain valid, any changes in level of risk, implementation process, new treatments identified

Risk register: columns are number, risk, probability, consequences, rating, treatment, residual probability, residual consequences, residual rating, who, when, cost, status, contingency reseves through float (schedule) & reserves (financial) to cover/reduce risk, updated at status meeting

Contingency funds: funds to cover project risks — identified & unknown, size of funds reflects overall risk of project, use needs to be closely monitored, independent of original time/cost estimates (risk may not occur so not included in baseline, if occurs then draw and add to baseline, if not take out from reserve)

Contingency fund types:
Budget reserves: linked to identified risks of specific work packages, allocated to specific work packages/activities, communicated to project team but allocated by PM if required
mngt reserves: large funds used to cover major unforeseen risks (ex: change in scope), allocated to entire project, established after budget reserves identified & funded, controlled by PM & project owner (internal/external), may contain technical reserves for project involving highly innovative process/product as fallback plan in case process/product is unsuccessful

Opportunity mngt tactics:
Exploit: seek to eliminate uncertainty associated with opportunity to ensure it definitely happens
Share: allocating some/all of ownership of opportunity who is best able to capture it for benefit of project
Enhance: take action to increase probability and/or positive impact of opportunity
Accept: be willing to take advantage if it occurs but not taking action to pursue

Resource scheduling: used to assign time-phased costs to provide project budget baseline

Time-phased baseline: cost baseline derived from WBS & rproject schedule, budgeted costs are distributed to mirror schedule

Time-phased budgets: planned costs broken down by distinct time periods for work package, provides better cost control

Resource problem:
Resources & priorities: project network times not a schedule until resources assigned, implicit assumption is that resources will be available in required amounts when needed, adding new projects requires making realistic judgments of resource availability & project durations, cost estimates not a budget until they have been time-phased
Resource smoothing/leveling: involves attempting to even out varying demands on resources by using slack (delay non-critical activities) to manage resource utilisation when resources are adequate over life of project
Resource-constrained scheduling: duration of project may be increased by delaying late start of some activities if resources are not adequate to meet peak demands

Project constraint types:
Technical/logic: constraints related to networked sequence in which project activities must occur
Physical: activities that cannot occur in parallel or are affected by contractual or environmental conditions, room cannot hold equipment to test
Resource: absence, shortage or unique interrelationship and interaction characteristics of resources that require a particular sequencing of project activities, types: people, materials, equipment

Classification of scheduling problems: time-constrained & resource-constrained

Resource allocation assumptions:
Limiting: splitting activities not allowed (once started carried to completion), level of resources cannot be changed for activity
Risk: activities with most slack pose least risk, reduction of flexibility does not increase risk, nature of activity (easy, complex) doesn't increase risk

Time-constrained projects: must be completed by imposed date, require use of leveling techniques that focus on balancing/smoothing resource demands, use positive slack (delay noncritical activities) to manage resource utilisation over duration of project

Resource leveling advantages: peak resource demands reduced, resources over life of project reduced, fluctuation in resource demand minimised

Resource leveling disadvantages: loss of flexibility that occurs from reducing slack, increases criticality of all activities

Resource-constrained heuristic: minimum slack, smallest/least duration, lowest ID

Impacts of resource-constrained scheduling: reduces delay & flexibility, increase criticality of events, increase scheduling complexity, may make traditional critical path no longer meaningful, can break sequence of events, may cause parallel activities to become sequential & critical activities with slack to become non-critical

Splitting: scheduling technique used to get better project schedule and/or increase resource utilisation, pause activity to use resources on sth else, feasible when startup & shutdown costs low, considered major reason why projects fail to meet schedule

Benefits of scheduling resources: leave time for consideration of reasonable alternatives (cost-time tradeoffs, priority change), provide info for time-phased work package budgets to assess impact of unforeseen events & amount of flexibility in available resources

Managing multiproject scheduling: create project offices/depts to oversee scheduling of resources across projects, use project priority queuing system (FCFS for resources), centralise PM (treat all projects as part of megaproject), outsource projects to reduce number of projects handled internally

Multiproject scheduling problems:
Overall project slippage: delay on one create delays for others
Inefficient resource application: peaks & valleys of resource demands create scheduling problems & delays
Resource bottlenecks: critical resource shortage for multiple projects

Reasons for imposed project duration dates:
time-to-market pressures, unforeseen delays, incentive contracts (bonus for early completion), imposed deadlines & contract commitments

Options for accelerating completion:
No resource constraint: add resources, outsource work, overtime, establish core project team, do it twice (fast & correctly)
Resource constraint: fast-tracking, critical chain, reduce scope, compromise quality

Cost-duration: direct costs decrease but indirect cost increase with longer duration

Cost-cutting: reduce scope, have owner take more responsibility, outsource activities or whole project, brainstorm cost savings options

Managing: coping with complexity, formulate plans & objectives, monitor results, take corrective action, expedite activities, solve technical problems, serve as peacemaker, make tradeoffs among time, costs & project scope

Leading: coping with change, recognise need to keep project on track, initiate change, provide direction & motivation, innovate & adapt as necessary, integrate assigned resources

Stakeholders: individuals/orgs who are involved in project & exert influence over results (project specialists, professionals who work on parts of project, senior mngt, functional managers/depts, contractors involved, customers, admin, sponsors, government)

Law of reciprocity: one good deed deserves another, same for bad

Quid pro quo: mutual exchange of resource & service (back-scratching) build relationships

Influence currencies: cooperative relationships build on exchange of these or favours

Org currencies:
Task: resources, assistance, info, coop
Position: advancement, recognition, networks, visibility
Inspiration: excellence, vision, ethics
Friendship: acceptance, understanding, personal support
Personal: learning, involvement, gratitude

mngt by wandering around: managers spend majority of time in face-to-face interactions with employees building cooperative relationships

Characteristics of effective PM: initiate contact with key players, anticipate potential problems, provide encouragement, reinforce objectives & vision of project, intervene to resolve conflicts & prevent stalemates

Distinguishing traits of character: consistency, openness, sense of purpose

Qualities of effective PM: systems thinker, personal integrity, proactive, high emotional intelligence, general business perspective, effective time mngt, skillful politician, optimist

Contradictions of PM: innovate & maintain stability, see big picture while getting hands dirty, encourage individuals but stress team, hands off/on, flexible but firm, team vs org loyalties

Suggestions for PM: build relationships before you need them, sustain trust through frequent face-to-face contact, what goes around comes around

Characteristics of high-performing teams:
share sense of common purpose, make effective use of individual talents & expertise, have balanced & shared roles, maintain problem-solving focus, accept differences of opinion & expression, encourage risk taking & creativity, set high personal perf standards, identify with team

5-stage team dev model:
Forming: orientation to project, testing & dependence
Storming: emotional response to project demands, intragroup conflict
Norming: open exchange of relevant info, dev of group cohesiveness
Performing: emergence of colution, functional roles emerge
Adjourning: dissolution of group

Conditions favouring high team perf: ≤ 10 members, voluntary team membership, continuous service on team, full-time assignment to team, org culture of coop & trust, members report only to PM, all relevant functional areas represented, project has compelling objective, members within speaking distance of each other

Creating high perf project team: conduct project meetings, establish team identity, create shared vision, build reward system, manage decision making, manage conflict, rejuvenate project team

Team criteria for success: team composition, shared goals, interdependence, interpersonal skills, open comms & positive feedback, commitment

Synergy: positive if whole greater than sum of parts, negative otherwise

Who to recruit: problem-solving ability, availability, tech expertise, credibility, political connections, ambition, initiative, energy

Recognise individual perf: letters of commendation, public recognition for outstanding work, desirable job assignments, increased personal flexibility

Managing conflict: encourage functional, manage dysfunctional (mediate, arbitrate, control, accept, eliminate)

Managing virtual project teams:
Dev trust: exchange of social info, set clear roles for each team member
Dev effective patterns of comm: keep members informed on how overall project going, don't let members vanish, establish code of conduct to avoid delays, establish clear norms & protocols for surfacing assumptions & conflicts, share pain

Groupthink: members lose critical evaluative capabilities, decisions made quickly with little consideration of alts

Groupthink symptoms: illusion of invulnerability, whitewash of critical thinking, negative stereotypes of outsiders, direct pressure on dissenters

Bureaucratic bypass syndrome: get used to bypassing bureaucratic channels, end up in rejection of them, result in workers bound being alienated

Team spirit becomes team infatuation: can leave broken professional & personal relationships contributing to burnout & disorientation on completion of project

Going native: customer interests take too much precedence over corporate interests

Project control steps: set baseline plan, measure progress & perf, compare plan against actual, take action

Project control tools: tracking & baseline Gantt charts, control charts (how ahead/behind per period)

Progress report format: progress since last report, current project status (schedule, cost, scope), cumulative trends, problems & issues since last report (actions, resolutions), corrective action planned

Earned value cost/schedule sys: integrated PM sys based on earned value concept that uses time-phased budget baseline to compare actual & planned schedule & costs

Cost/schedule variance: EV — AC or PV

BAC (budgeted cost at completion, total PV), EAC (estimated cost at completion, work remaining/CPI), ETC (estimated cost to complete remaining work), VAC (expected cost variance at completion)

Percent complete rule: costs periodically assigned to baseline as units of work completed over duration of work package, most frequently used in measuring project progress

Methods of variance analysis: CV & SV

Performance indexes: CPI (EV/AC), SPI (EV/PV), percent complete indexes (EV/BAC or AC/EAC)

Additional EV rules: 0/100% rule (only count when complete), 50/50 rule (half on start, half when complete), % complete with weighted monitoring gates (subjective estimated % combined with hard, tangible monitoring points)

Revise estimates of future cost: EAC_{re} revised by experts due to new info, EAC_f is ETC+AC

Control issues: scope creep, baseline changes, data acquisition costs & problems

Project closure activities: eval of project goals & perf, dev lessons learned, release resources, preparing final report

Deliverables of project closure: wrap up project, eval of perf & mngt of project, retrosepctives

Project closure types: normal, premature, perpetual (constant change, never ending), failed, changed priority

Close down activities: get delivery acceptance from customer, shut down resources & release to new users, reassign team members, close accounts & ensure full payments, deliver to customer, create final report

Final report: executive summary, review & analysis, recommendations, lessons learned, appendix

Retrospective goals: reuse learned solutions, stop repetitive mistakes, improve org learning

Barriers to org learning: lack of postproject time to dev sols, no post-project direction/support for teams, lessons become blame sessions, lessons not applied in other locations, org culture does not recognise value of learning

Facilitator: impartial, no involvement/interest in project, independent, has org interest in mind, xp