PROJECT MANAGEMENT

MODULE 4 – Winter 2023

HUMBER

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Agenda:

- **Project Planning**
  - **Estimating techniques**
  - **Agile Estimating**
- **MS Project**
- **Lab #2– Introduction to MS Project**

Estimating

- What is Estimating?
  - The process of developing an approximation of the resources needed to complete project activities.

- Determines the amount of cost, time, or resources required to complete project work.

***Source**: A guide to the project management body of knowledge: (PMBOK® guide)* (6th ed.). (2017). Newtown Square, PA, USA: Project Management Institute. Page #240

Inputs for Estimating

- Project Management Plan
- Cost Management Plan
- Scope Baseline
- Project Schedule
- Resource Requirements incl. human resources
- Risk Register
- Policies, templates & processes
- Lessons Learned
- Historical Information
- Understanding of Company Culture

Estimates

- Predictions based on information known at a given point in time.

- Reviewed/refined during the course of the project to include additional details and test assumptions.

Guidelines for Costs Estimating

1. Use those responsible to do the project work for estimates at the work package level.
2. Use several people to estimate.
3. Estimates should be based on normal conditions.
4. Cost/time units – being consistent.
5. Treat each task as independent of other tasks integrated by the WBS.
6. Contingencies.
7. Risk considerations.

Estimation Techniques

- Expert Judgment
- Analogous Estimating
- Parametric Estimating
- Three-Point Estimating
- Bottom-Up Estimating
- Reserve Analysis
- Cost of Quality
- Vendor Bid Analysis
- Group Decision-Making Techniques

Estimation Techniques

- Expert Judgment

Use of Subject Matter Experts!

- Analogous Estimating

Uses an analogy / comparison of a past similar project to your current one

Parametric Method

- Uses numerical characteristics to estimate project costs (and times).
- Applied to entire project or segments of project.

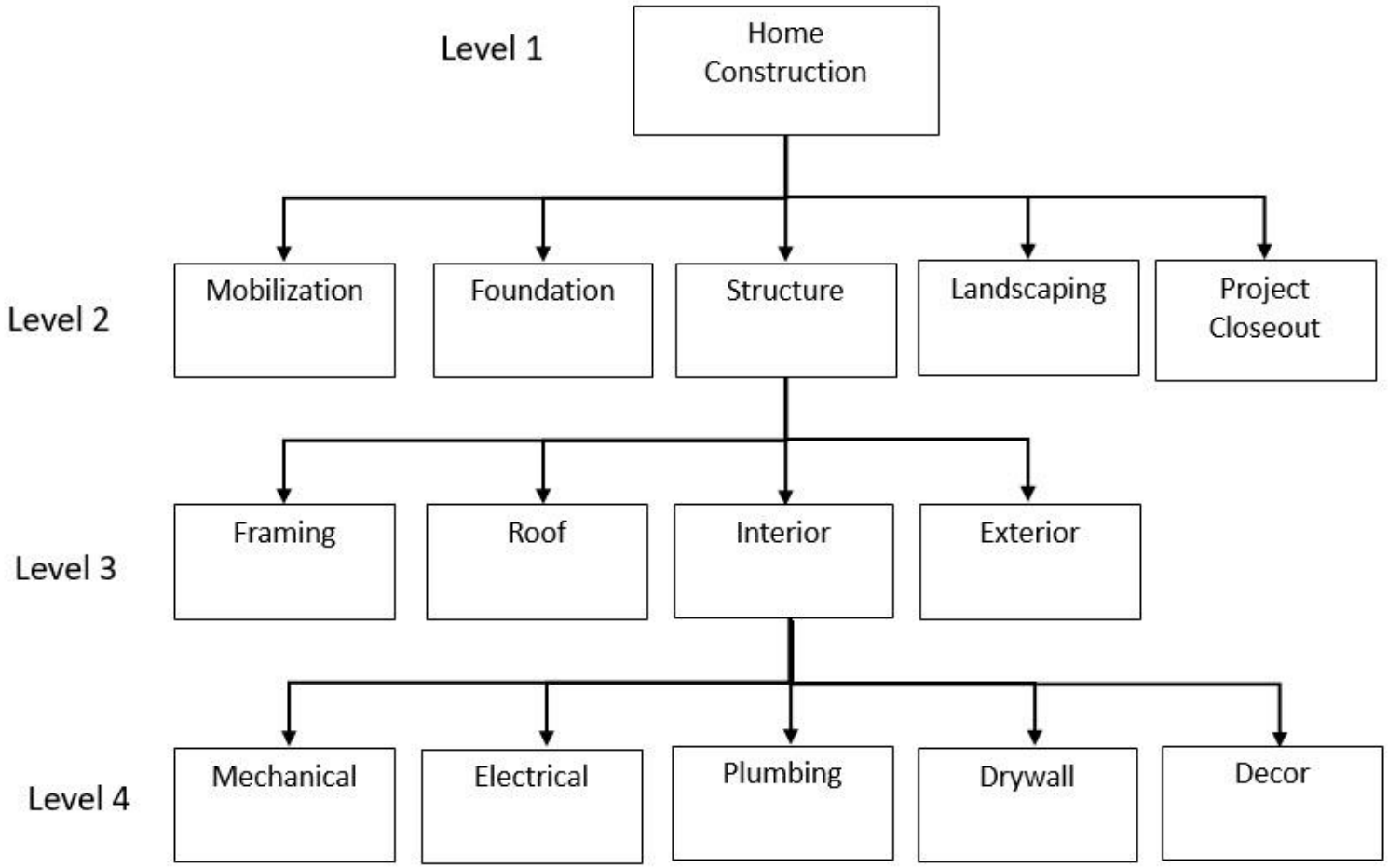
Examples:

- Construction – square footage
- Software – features and complexity
- Manufacturing – capacity size

Bottom-Up Estimating

- Starts with estimate of work packages in the WBS.
- Cost is rolled up to higher levels
- Conditions for preferring bottom-up method:
  - Cost / time important
  - Fixed-price contracts
  - Customer wants details

Bottom-Up Estimating – WBS example



Bottom-Up Estimating

- PROS?

- CONS?

Three-Point Estimating

- Used when work packages have more uncertainty.
- Defines an approximate range for an activity using three estimates:
  - Most-likely (normal effort): *cM*
  - Optimistic (best-case scenario): *cO*
  - Pessimistic (worst-case scenario): *cP*

Triangular Distribution: ***cE = (cO + cM + cP) / 3***

Beta Distribution: ***cE = (cO + 4cM + cP) / 6***

Three-Point Estimating

Triangular Distribution: $cE = (cO + cM + cP) / 3$

Beta Distribution: $cE = (cO + 4cM + cP) / 6$

Estimation Techniques Summary

- Estimation techniques always involve assumptions and qualified guesses, so it is important not to rely on solely one source for any estimate
- Obtain estimates from multiple sources and, if possible, utilize different estimation techniques
- These techniques can be used for all Project Development Methodologies (e.g., waterfall, iterative, agile, etc.)

Technique	Description	Pros	Cons
Top-Down	• Often estimates large, high-level, chunks of work, usually at the feature or function level • Often performed in the early stages of a project before detailed information about the project work is known • Provides more of a "ball-park" estimate • Only used to provide an early perspective into the amount of potential project work • As work is broken down to smaller, more manageable pieces, different estimation techniques are used and estimates often vary drastically from the initial top-down estimate	• Fast and cheap • Doesn't require extensive documentation	• Low accuracy
Analogous/ Comparative	• Uses expert judgment and historical information of similar activities as the basis for estimating future schedule activity • Uses a similar past project to estimate the duration or cost of current project • Used when there is limited information regarding current project • Similar to "top-down" technique	• Fast and cheap	• Requires strong comparison attributes and historic data
Parametric	• Uses independent variables to estimate expected project work • Determined by identifying the unit cost or duration and the number of units required for the project or activity ***Example: if the construction cost for a house is roughly $300 per square foot, a 3000 square foot home construction will cost about $900,000***	• More accurate than top-down or analogous techniques	• Significantly more time and effort than other techniques

Estimation Techniques Summary cont'd

Technique	Description	Pros	Cons
Bottom-Up	• Estimates detailed pieces of work until it is possible to estimate each of them • Knowing how much time, efforts, resources or money are required for a certain component, and those estimates are then aggregated into a total estimate for the entire project	• Most accurate technique • Provides traceability for estimations	• Significantly more time and effort than other techniques
What-If Analysis	• Used to evaluate the effects of changing selected factors within the project schedule such as resources, scope and quality to determine what effects those changes may have on the outcome of the project ***Example: An estimate for drywall installation is 250 hours utilizing 4 installers. What if the activity utilized 5 installers? The duration estimate would be 200 hours. What if 6 full-time installers were used? The duration would be 167 hours.*** Note: adding more resources doesn't necessary shorten task duration; it all depends on the tasks and other dependencies	• Analyzes project details and, makes adjustments to see how changes impact time and cost	• Useful only after detailed estimates have been completed
Three-point (PERT)	• Known as Program Evaluation and Review Technique (PERT) • Uses a mathematical formula to determine a weighted average of three types of estimates: ***Estimate= [Optimistic + [4 * Most Likely] + Pessimistic] / 6***	• Reduces the scenarios with too optimistic and inflated estimates	• initial subjective estimates may not reflect the amount of work required for the task

PERT Example

Estimator	Best Case	Most Likely	Worst Case	PERT Estimate
John	80	95	125	98
Jane	65	110	150	109
Bobby	85	105	140	108
			Average	**107**

Optimistic An estimate that is based on the best-case scenario for work completion, such as low risk, small chance of risk occurring and low impact.

Most Likely An estimate that, given the resources available to do the work, is the most realistically expected.

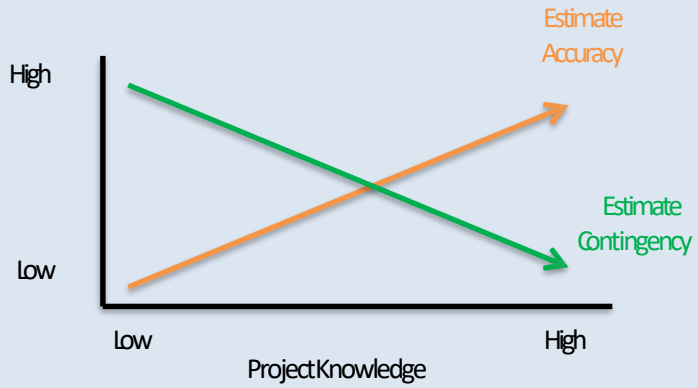
Pessimistic An estimate that is based on the worst-case scenario for work completion such as high risk, greater chance of risk occurring and high impact.

Best Practices for Estimation- General

- A good WBS is needed as an input to project estimates
- Use at least two techniques to obtain estimates (refer to techniques)
- Involve various people in the process:
  - Those who will be doing the work (e.g., gain input, commitment and agreement from the project team for their task estimates), or those with the skills to do the work if resources have not yet been allocated
  - The people who require the work done
  - Assess cost categories and external costs considerations (e.g., the need to inquire about tax rates and/or foreign exchange, suppliers/vendors preforming work)
- Each estimate must be independently derived
- Review the estimates and rationalize the differences
- Document all assumptions made
  - Assumptions are usually requirements or risks and need to be treated as such and revisited
- Add contingency based on the level of uncertainty and risk (refer to contingency best practices
- Review and refine the estimates as the project proceeds, based on progress
- Search the Lessons Learned Repository for similar projects upon which to base initial estimates
- Less effort/time is often allocated to early stage estimates; as the estimate accuracy increases, more effort/time is required
- Judgement is required in estimation based on knowledge and experience; there is no precise “answer” for every situation

Best Practices for Estimation- Contingency

- Contingency estimates evolve with the level of project understanding
  - As the knowledge and details of the project increase, the estimation accuracy increases, and the contingency decreases
  - Project knowledge and detail are typically correlated to the stage of the project (e.g., less is known in early stage vs. more being known at a later stage)



- Contingency is not intended to cover project scope changes; it is intended to cover project uncertainties and risks, in relation to the assumptions at the time the estimate is made
- Careful consideration must be given in assessing the contingency amount:
  - An estimate which does not contain enough contingency may result in a project proceeding without adequate budget, jeopardizing the success of the project
  - An estimate that contains too much contingency is overpriced, and can negatively impact project 'go/no-go' decisions
- Contingency should be:
  - Presented on the estimate as a separate line item
  - Expressed in terms that can be easily understood
  - Based on analysis of the uncertainty and risks
  - Reviewed and updated as each new estimate is prepared through the project life cycle

Estimation for Agile Projects

- Agile projects specifically following scrum methodology are founded on empirical process control theory (“Empiricism”)
  - Empiricism: knowledge comes from experience and making decisions on what is known.

- Hence, agile projects do not focus on predicting a highly accurate estimate; they work with relative estimates (in “points”) and refine it based on learning from each iteration, or cycle, or sprint, etc
  - Relative Estimating vs. Absolute Estimating

Relative Estimating Example – Cost Class Evaluations

What is the RELATIVE level of **EFFORT** for each of these evaluations?

Use a scale of: *Very Small, Small, Medium, Large, Very Large*

- Labs
- Group Assignements
- Mid-term Exam
- Final Exam

Adaptive Estimation Techniques

- Following are some of the commonly used estimation techniques for Agile projects:
  - Planning Poker
  - The Bucket System
  - Affinity Grouping, Big/Small/Uncertain, T-shirt Sizes
  - Dot Voting
  - Ordering Protocol

Planning Poker

Participants use specially tailored playing cards (eg. Fibonaci) to vote and determine the estimate for an item in the backlog.

Each participant places a card covering the number based on their belief of the estimate; participant with the highest number and the lowest number explains the rationale to the team and continue the game until a unanimous estimate or consensus is reached.

This method is good when there is a minimal number of backlog items.

https://www.youtube.com/watch?v=hON0i_ChFKo

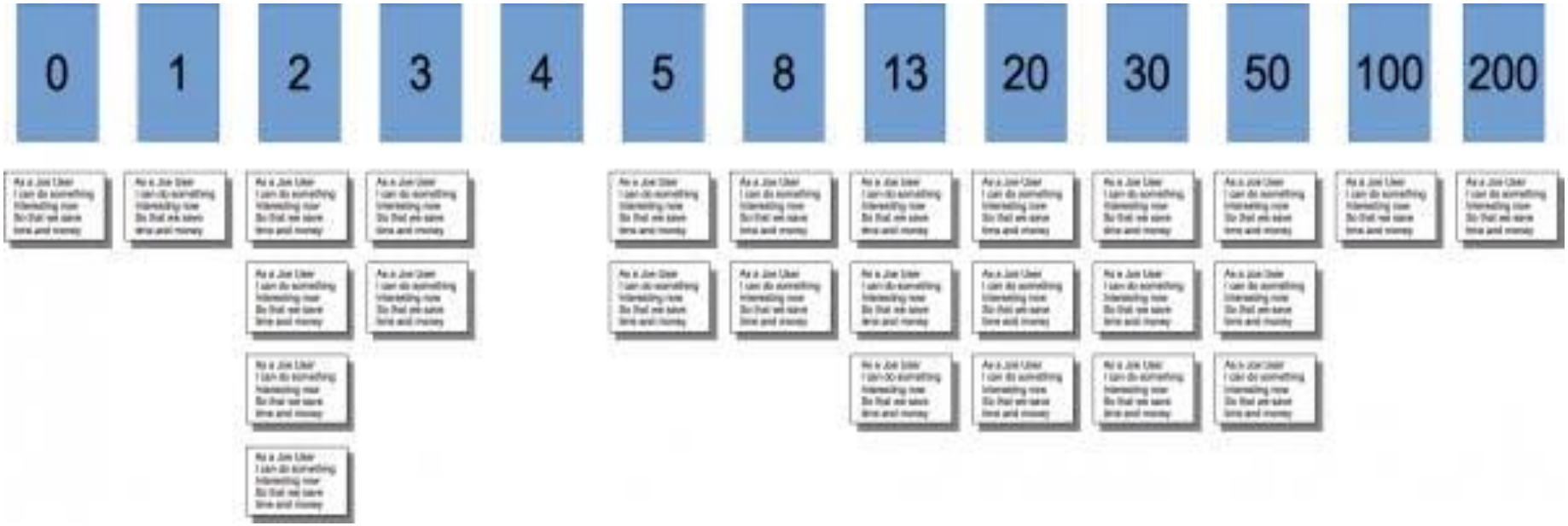
The Bucket System

This is a good technique to use for large number of backlog items which involve a significant size of team. A similar numbering scheme to planning poker is used here and each participant is handed a number of stories/items to be estimated.

Numbers are spread in a table or on a board / wall; participants look at each story and place it against one of the numbers.

E.g.: Randomly pick any story and place it against “8”; after that first placement, pick any story and compare against the first and place it accordingly; i.e., if the second story is considered half as complex as the first, place it against “5”

The Bucket System

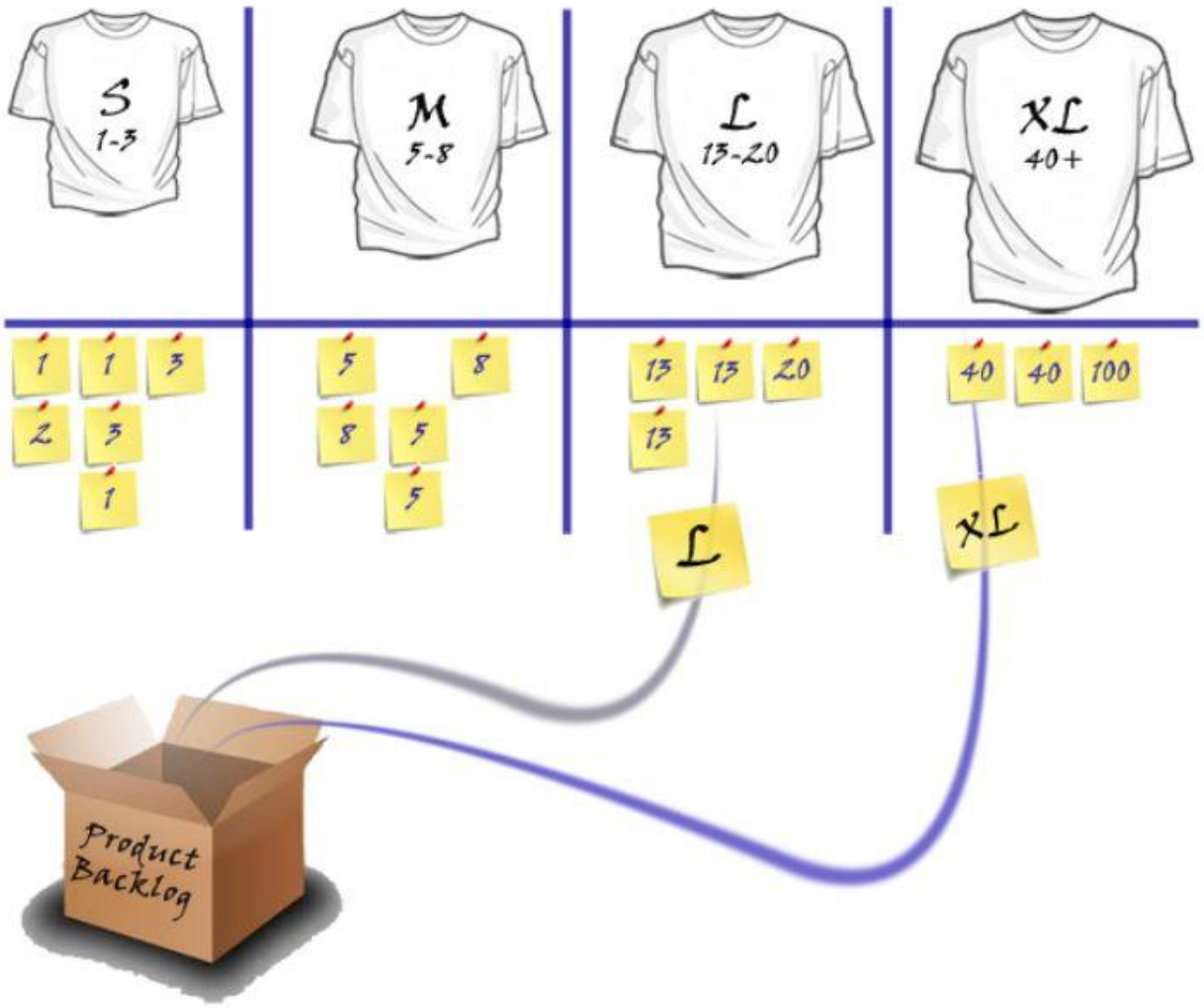


T-Shirt Sizes

T-Shirt sizes estimation method works the same way as the bucket system, but instead of using numerical value, t-shirt sizes (XS, S, M, L, XL, XXL, etc.) are used. This is because, human minds tends to over-analyze when numerical values are in-place but, forgo the requirement for accuracy when a non-quantitative system is put in-place.

However, at some point, t-shirt sizes will be converted into points for tracking purposes.

T-Shirt Sizes



Big / Uncertain/ Small

This is one of the fastest estimation techniques. Items are grouped into 3 categories:

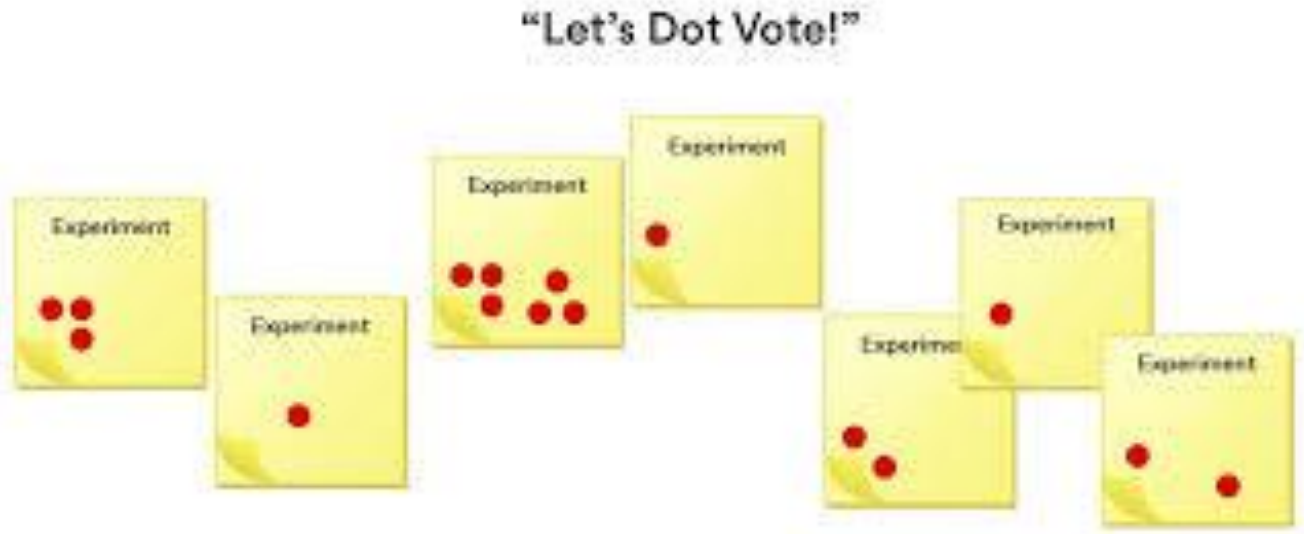
- Big
- Small
- Uncertain

Stories that are clear are quickly divided as big or small; ones that are ambiguous are placed into “uncertain” and discussed in detail afterwards.

Dot Voting

Dot voting is usually considered a decision-making technique than an agile estimation method; but this can still be used in agile estimations for a small number of tasks.

Every participant is provided with a number of dots and they are asked to place the dots in each of the tasks based on its size; more dots indicate that the task is larger effort.



Ordering Protocol

A scale ranging from low to high is placed and tasks are randomly placed against each value in the scale. Every participant is asked to move one item; they can move either to one spot lower (left) or one spot higher (right) or can pass the turn. This continues until no member wants to move anything and passes their turn.

This method works best with relatively small number of people, but large number of tasks.

LOW **MEDIUM** **HIGH**

Velocity

- **Velocity** is a measure of the amount of work a Team can complete during a single Sprint.

- Velocity is calculated at the end of the Sprint by totaling the Points for all fully completed items.

Velocity example

2 week sprint results

Item	Point Value	Completed
1	3	YES
2	8	YES
3	5	YES
4	3	YES
5	8	NO

What is the team's velocity?

MS Project Tutorial (Optional)

For those that are not familiar with MS Projects, this is an excellent overview to learn more about using MS Project to create a schedule.

- If you are familiar with MS Project, please proceed to Lab #2 on the following page

https://www.youtube.com/watch?v=A-yPSJGY-_Y

LAB 2: MS Project

MS Project:

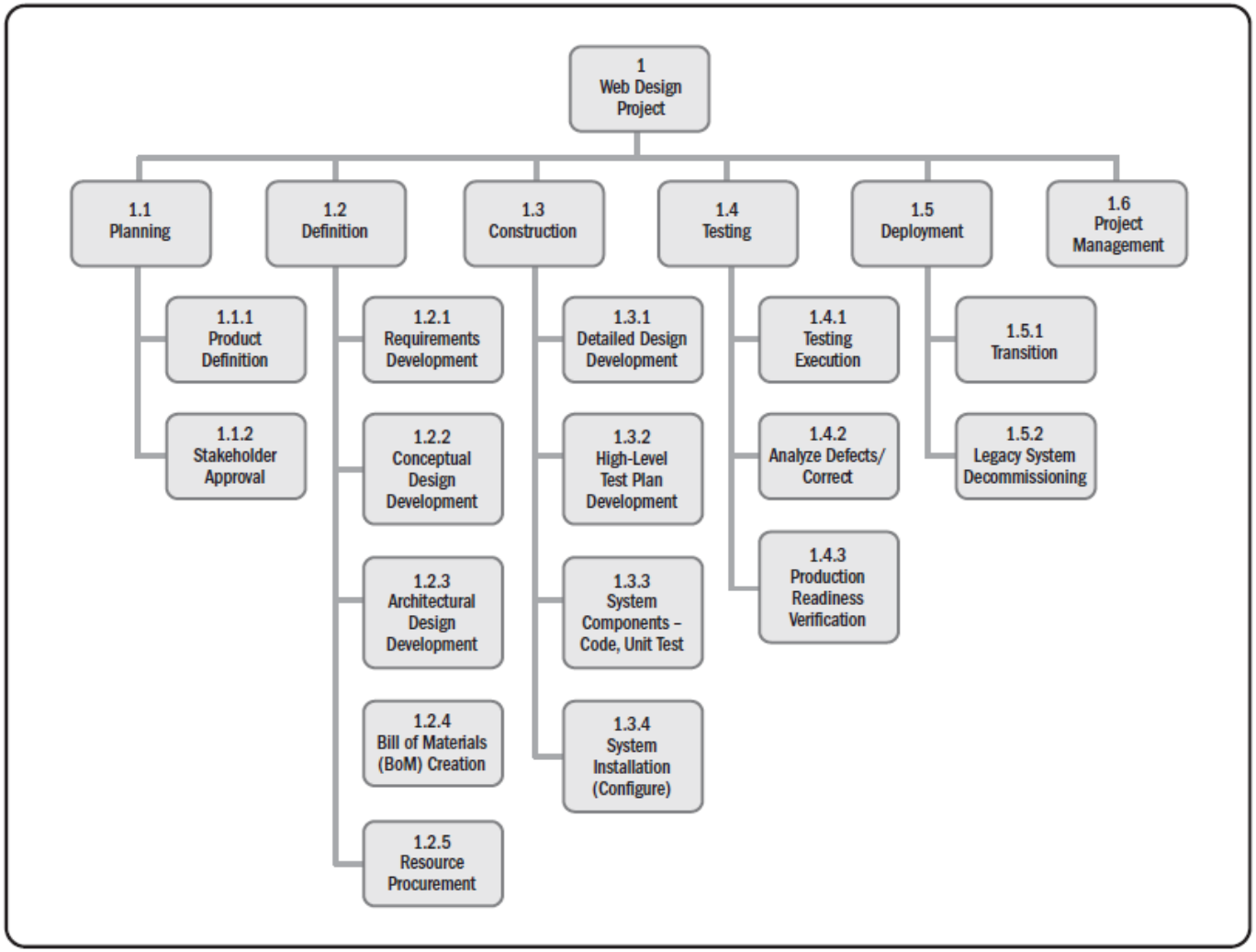
1. *Create a schedule using MS Project – use the WBS on next page or create your own (e.g. house construction, planning a wedding, Vacation, etc.)*
2. *Add Tasks and subtasks to your project to define the complete scope*
3. *Add dependencies/constraints*
4. *Add resources (e.g. Sponsor, PM , Business Analyst, Solution Architect, UI/UX Designers, Content Specialists, Developers, QA / Test Leads, etc.)*

- *Use the lab time explore MS Project, test its features/functionality.*
- *You can't break it, have fun with it!*

Submit via Blackboard / Assignments / Lab #2

- naming convention: "Last name.first name – lab2"

LAB 2: Sample WBS



Source: PMI Practice Standard for Work Breakdown Structures 3rd Edition

THANK YOU.

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