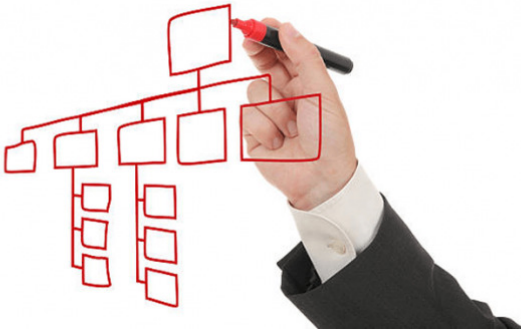# Breakdown Structures Revisited

Breakdown structures are central to the practice of project management and have their origins in the industrial revolution. In the *'Wealth of Nations'* Smith advocated breaking the production of goods into tiny tasks that can be undertaken by people following simple instructions. *'Why hire a talented pin maker when ten factory workers using machines and working together can produce a thousand times more pins than the artisan working alone?'* Similar ideas underpinned Newtonian physics. Newton saw the world as a harmonious mechanism controlled by a universal law. Applying scientific observations to parts of the whole would allow understanding and insights to occur and eventually a complete understanding of the 'clockwork universe'.

These ideas fed into scientific management. Scientific management focuses on worker and machine relationships and assumes productivity can be increased by increasing the efficiency of production processes. In 1911, Frederick Taylor, known as the Father of Scientific Management, published *Principles of Scientific Management* in which he proposed work methods designed to increase worker productivity.

This 'reductionist' approach to complex endeavours, supported by the division of labour is central scientific management as well as to many modern project management processes built around 'breakdown structures'[1].

Some of the types of Breakdown Structure in use today include:
- WBS   (Work Breakdown Structure)
- OBS   (Organizational Breakdown Structure)
- CBS   (Cost Breakdown Structure)
- RBS   (Resource Breakdown Structures)
- PBS   (Product Breakdown Structure)
- FBS   (Feature Breakdown Structure)
- BoM   (Bill of Materials)
- RBS   (Risk Breakdown Structure)
- CBS   (Contract Breakdown Structure)

Their functions can be briefly defined as follows:

Work Breakdown Structure[2] (WBS)
A work breakdown structure (WBS) is a tool used to define and group a project's discrete work elements (or tasks) in a way that helps organise and define the total work scope of the project It provides the framework for detailed cost estimating and control along with providing guidance for schedule development and control.

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[1]   For a more detailed discussion see, **The Origins of Modern Project Management**:
https://mosaicprojects.com.au/PDF_Papers/P050_Origins_of_Modern_PM.pdf

[2]   For more on **WBS and OBS** see: http://www.mosaicprojects.com.au/WhitePapers/WP1011_WBS.pdf

Organisation Breakdown Structure (OBS)
The organisation(al) breakdown structure (OBS) defines the organisational relationships and hierarchy within the project team and is used as the framework for assigning work responsibilities - it is the same as any other 'org-chart' but limited to people working on the project.

Organizational Breakdown Structure (OBS)
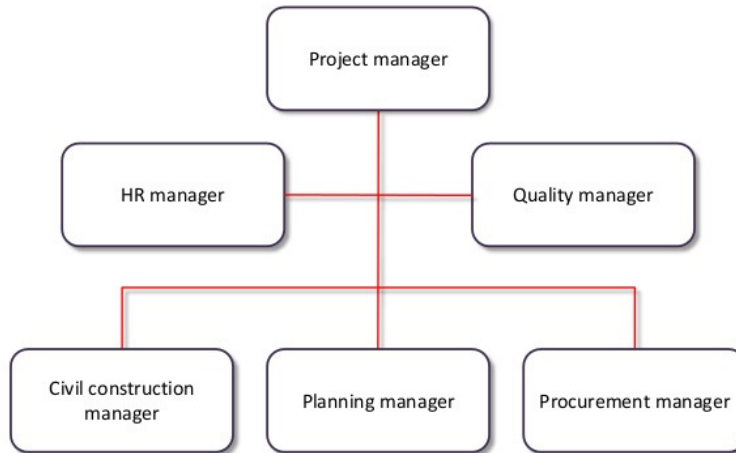
The intersection of the OBS and WBS defines points of management accountability for the work called Control (or Cost) Accounts.
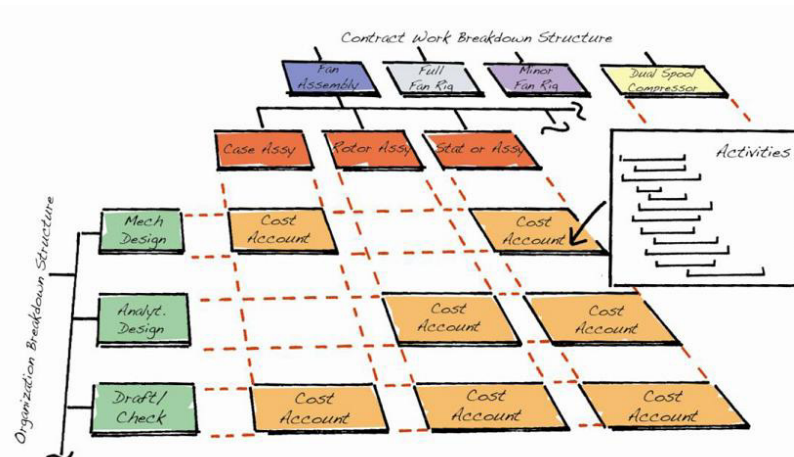
Cost Breakdown Structure (CBS)
The cost breakdown structure (CBS) classifies the costs within project into cost units/cost centres and cost elements/cost types. The establishment of a cost structure aids efficient cost planning, controlling, and the introduction of measures to reduce costs. The CBS and Control Accounts are frequently aligned (see section below).
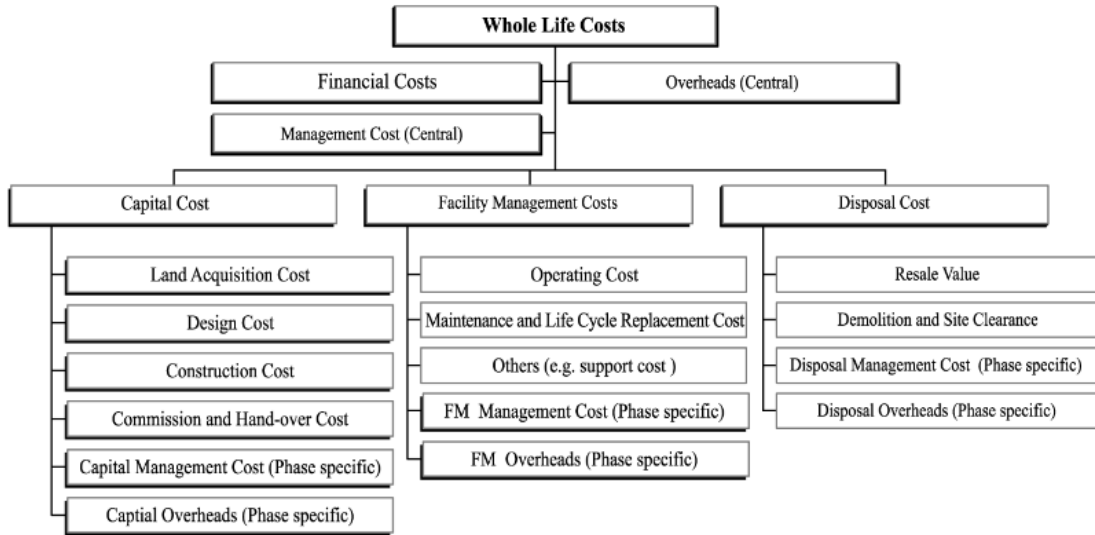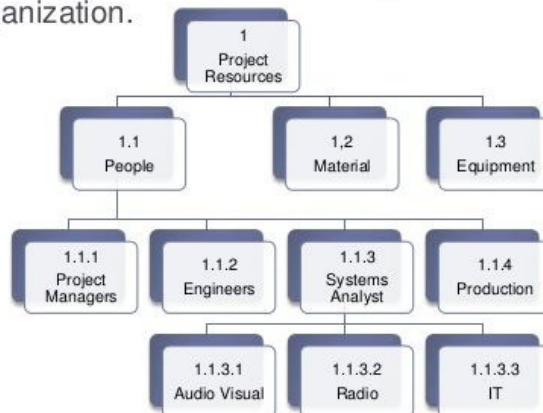
Resource Breakdown Structure 1

The resource breakdown structure (RBS) is usually a standardised list of personnel resources related by function and arranged in a hierarchical structure to facilitate planning and controlling of project work. A RBS is normally organisation-wide and looks at the skills and location of resources potentially available to work on a project and their availability. There's no restriction on doing a RBS just for a project but the purpose is still to identify the availability of people with specific skills (most people will have several) and where they are located so you can identify who's the best person, who's actually available, to be allocated as a resource to a specific task. This type of RBS is frequently set up as a matrix based on skills and location and is common in Enterprise Resource Planning (ERP) systems.

Resource Breakdown Structure 2

The project resource breakdown structure (RBS) shows the relationship between different classifications of resources:


Product Breakdown Structure (PBS)

A product breakdown structure (PBS) is an exhaustive, hierarchical tree structure of components that make up an item, arranged in whole-part relationship. The PRINCE2 project management method mandates the

use of product based planning, part of which is developing a product breakdown structure. In practice there is very little difference between a PBS and a WBS, both systems define the full extent of the work required to complete the project[3].
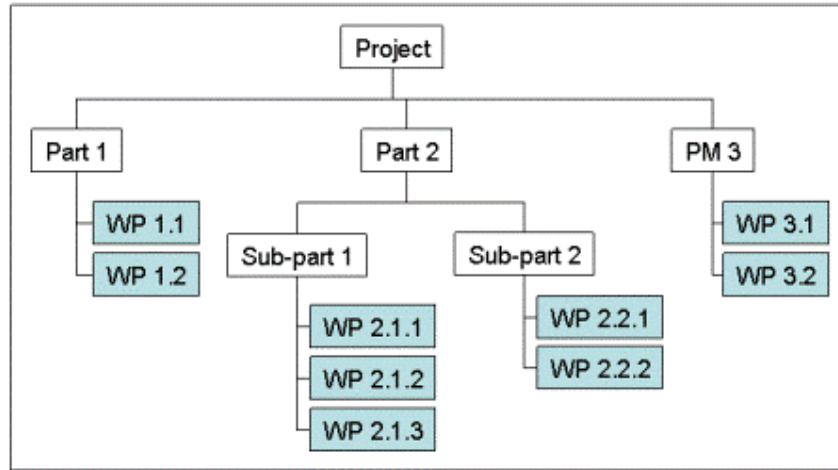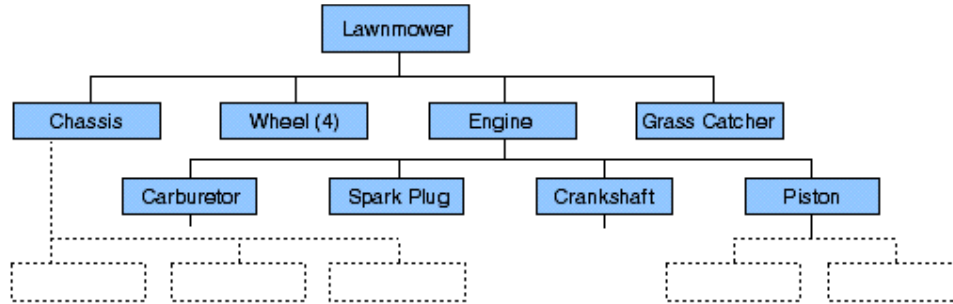

Feature Breakdown Structure (FBS)
Similar to a PBS but decomposes a software product into its individual features to allow the development flow to be planned; used in Agile.
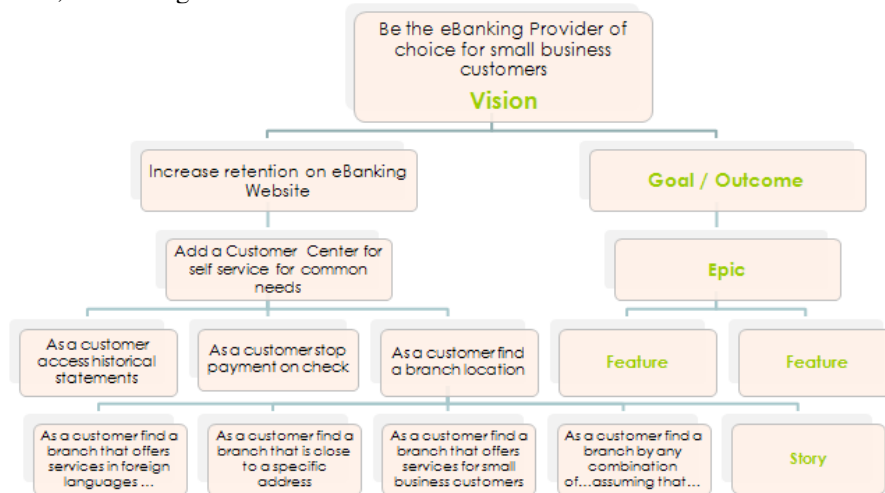

Bill of Materials (BoM)
Decomposes each tangible element of the project deliverables into its component parts (for example the parts of a motorised lawnmower). Common elements from different parts of the BoM can be compiled into a 'parts list' (eg, all of the bolts) and used for purchasing components of the same type from a single supplier thereby increasing the efficiency of the buying processes.

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3 For more on the **difference between a WBS and a PBS** see:
   http://www.mosaicprojects.com.au/Mag_Articles/P028_PBS-v-WBS.pdf

Risk Break Down Structure (RBS)

The risk breakdown structure (RBS) is a hierarchically organised depiction of the identified project risks arranged by risk category. The risks are placed into the hierarchical structure as they are identified, and the structure is organized by source so that the total risk exposure of the project can be more easily understood, and planning for the risk more easily accomplished.
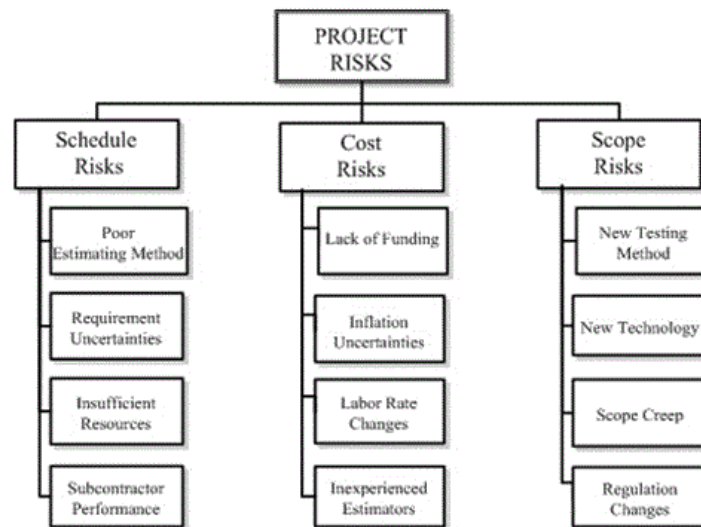
Contract Breakdown Structure (CBS)

A hierarchal arrangement of head contractors, subcontractors, suppliers etc., to show the overall supply chain feeding goods and services into the project. The efficient functioning of the overall supply chain is critical for project success.

Aligning Cost Breakdown Structures and control Accounts

As projects get larger it helps to have the overall budget broken down into smaller allocations. Cost accounts can be used to allocate the budget at a lower level and provide integration between the WBS and the cost control system. The budget is allocated to each cost account and the actual project expenses are reported at that same level.

Cost accounts can be established in different ways (not all of which tie into the WBS).

- **By WBS work package**. Theoretically you could set up a separate cost account for each WBS element, but that does not make practical sense. Usually a number of work packages are assigned to a Control Account and cost management is undertaken at this level.

- **By resource type**. In this approach, you may have a cost accounts for: internal labour, external labour, equipment, training, travel, etc.

- **By WBS by resource type**. If you set up cost accounts for work packages on the WBS, you can also track the resource types within each work package. Each resource types can be tracked with sub-account numbers within the overall cost account (and consolidated separately is the code structure is consistent).

The more detailed your cost accounts are, the more work you will have setting up, allocating and tracking the cost account budgets, but the greater the potential for insight and control. For example, one area of the project could be over budget, but masked by another area that is under budget.

Probably the most significant element in applying Earned Value Management (EVM)[4] to a project is deciding the number and location of control accounts. How many? How large (budget)? Who will be the CAMs?

There is no clear cut process or algorithm. It depends on the work, the organization, the culture, the finance system, subcontract relationships, the scheduling system, the degree of risk in any one part of the project, the design for the WBS and OBS, and the project manager's style and preference.

More Control Accounts means more EVM cost, more time collecting data, more detail, and maybe more accuracy. More Control Accounts also can mean more time spent in authoring, reviewing, approving, recording, and filing in forms. Less Control Accounts means less EVM cost, less time collecting data, less detail, maybe more accuracy, fewer forms and less time processing those that remain.

So what is the right number of Control Accounts? It is a complicated and multidimensional problem with no 'right answer'. The only certainty is one size does not 'fit all' – pragmatic common sense is preferable to arbitrary rules.

Do all of these breakdowns really help?

Traditional project management is based on these concepts. However emerging disciplines, particularly complexity theory suggest that self organising systems such as a project team cannot be understood by studying the individual parts of the team[5].

As the late Douglas Adam once said *"I can imagine Newton sitting down and working out his laws of motion and figuring out the way the Universe works and with him, a cat wandering around. The reason we had no idea how cats worked was because, since Newton, we had proceeded by the very simple principle that essentially, to see how things work, we took them apart. If you try and take a cat apart to see how it works, the first thing you have in your hands is a non-working cat."*
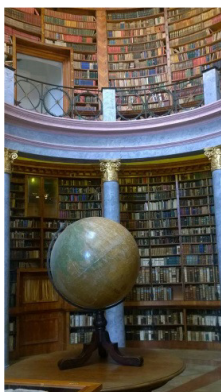
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4   For more on **Earned Value Management** see: https://mosaicprojects.com.au/PMKI-SCH-040.php

5   For a brief **overview of complexity** see:
https://mosaicprojects.com.au/PDF_Papers/P070_A_Simple_View_of_Complexity.pdf

The way complex entities work cannot be understood by breaking them down into parts. Even at the simplest level, studying a fish cannot explain how a shoal of fish work; at a complex level understanding a project task in isolation will not explain the dynamics of a major project and its team of resources.

My personal view is the 'breakdowns' are still helpful ways to develop insights – but they no longer offer viable answers (if they ever did). The path to increasing project success lays in the way the insights are interpreted and used within the complexity of a dynamic project delivery system.

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