In Response to the September Letter to Editor by Piney referencing Smith[1]

LETTER TO THE EDITOR

23 September 2024

Ref: Piney, C. (2024). On the Subject of WBS or BRM, Letter to the Editor, PM World Journal, Vol. XIII, Issue IX, September. https://pmworldlibrary.net/wp-content/uploads/2024/09/pmwj145-Sep2024-Piney-WBS-or-BRM-Letter-to-Editor.pdf

Ref: Smith, K. (2024). Musing on Milestones: To Weight, or Not to Weight? That is the Question! PM World Journal, Vol. XIII, Issue VIII, August. Available online at https://pmworldlibrary.net/wpcontent/uploads/2024/08/pmwj144-Aug2024-Smith-musings-on-weighted-milestones.pdf

Ref: Xavier Leynaud, Paul D. Giammalvo Ph.D., Jean-Yves Moine, "Multi-Dimensional Project Breakdown Structures – The Secret to Successful Building Information Modeling (BIM) Integration" https://www.amazon.com/Multi-Dimensional-Project-Breakdown-Structures-Information/dp/1948149125

Dear David and Subscribers

I would like to respond to Mr. Kik Piney's "LETTER TO THE EDITOR" dated 26 August 2024 On the Subject of WBS or BRM, Letter to the Editor, PM World Journal, Vol. XIII, Issue IX, September at https://pmworldlibrary.net/wp-content/uploads/2024/09/pmwj145-Sep2024-Piney-WBS-or-BRM-Letter-to-Editor.pdf

While I don't often agree with Mr. Kik's attempts to link project deliverables (more correctly or appropriately known as "Assets") to "benefits" generated or realized from the utilization or implementation of those assets, I found his approach interesting and worth exploring in more detail in the context of the current evolution of "flat file" (hierarchical) Work Breakdown (WBS)/ Cost Breakdown (CBS) structures, to relational or object-oriented WBS/CBS coding schemes.

A BRIEF HISTORY OF WBS/CBS DEVELOPMENT

For a quick overview, there are three common, or popular types of Database Management Systems (DBMS):

1. "Flat File" or "Hierarchical" or "Text Based" where the data consists of a single table

[1] How to cite this work: Giammalvo, P. D. (2024). In Response to the September Letter to Editor by Piney referencing Smith, Letter to the Editor, *PM World Journal*, Vol. XIII, Issue X, October/November.

2. Relational Database Management System (RDBMS), which consists of multiple tables that are linked, and
3. Object-oriented database Management System (OODBMS) that contains the WBS/CBS codes in OBJECTS (i.e., Pumps or Equipment or materials)

Noting the US Military, PMI, and AACE are still advocating using "Flat File" database structures.

Since the 1960s, starting with the Construction Management Institute's (CSI) Master Format and Uniformat, we have been moving away from "flat file" and moving towards relational and object-oriented architecture. CSI's Master and Uniformat was a two-dimensional relational database structure that enabled sorting by ACTIVITIES (Masterformat) and ELEMENTS (Uniformat). During the late 1980s, the Norwegian government, after getting frustrated with their production-sharing partners exploiting oil and gas in the North Sea, each using their own "homegrown" WBS/CBS, the Norwegians commissioned a team to develop a STANDARDIZED three-dimensional model that consisted of three integrated relational databases, and requiring all PSCs to using the same coding structures, which was published circa 1990:

1. Physical Breakdown Structure (PBS)
2. Standard Activity Breakdown (SAB)
3. Code of Resources (COR)

This was known as "NORZOK Z-014" and, in 2016, was adopted by ISO Standard 19008:2016

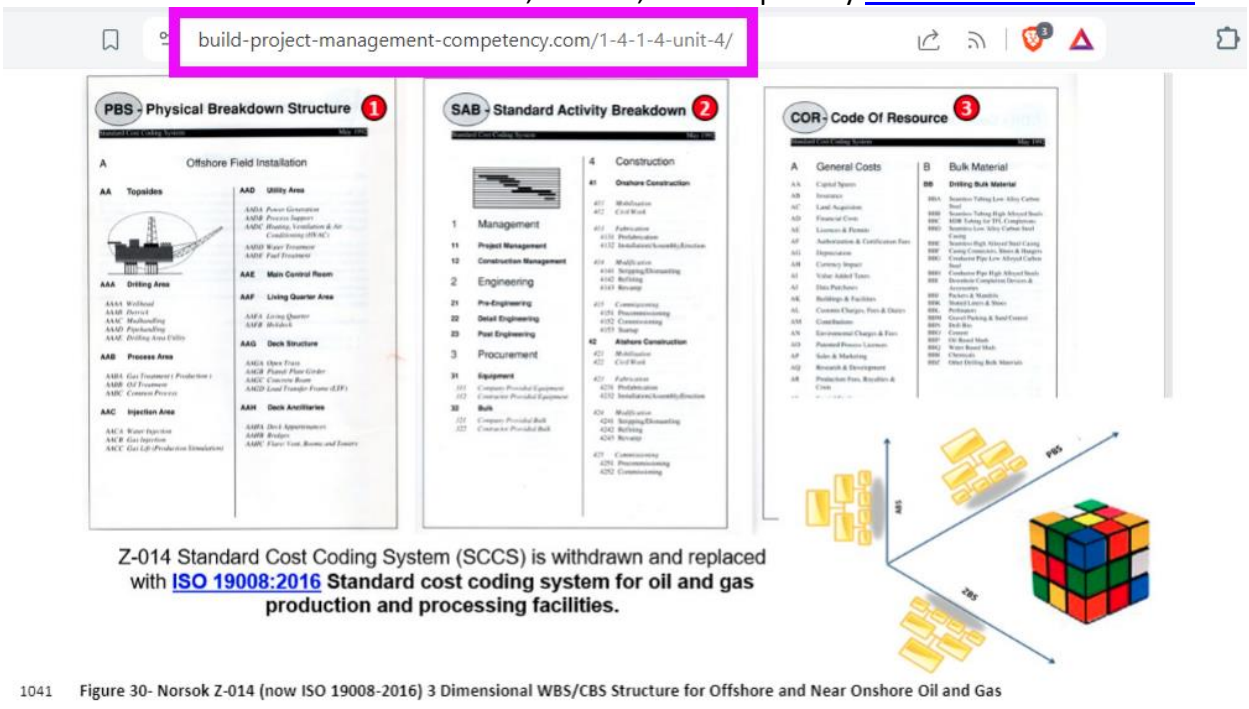

Figure 1- The three Z-014 Tables now ISO Standard 19008:2016

To validate the growing use of MULTI-DIMENSIONAL, STANDARDIZED WBS/CBS coding systems, NASA, in its "NASA Cost Estimating Handbook version 4.0" Appendix B, demonstrates their endorsement and advocating the advantages of using multi-dimensional relational or object-oriented over database architecture over the use of "flat file" design as PMI, AACE and the US DAU still advocates, in its "MIL-STD-881 Work Breakdown Structures for Defense Materiel Items"

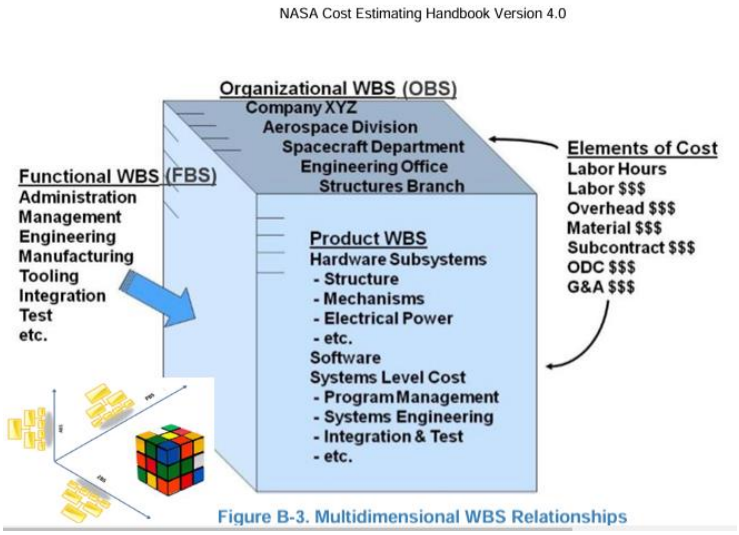

Figure 2- NASA's Multi-Dimensional WBS/CBS

With the growing interest in "Building Information Modelling" (BIM), CSI expanded its standards to include what is called "Omniclass." "Omniclass" consists of 15 tables that enable stakeholders to "sort and filter" the "deliverables" (assets) created or produced by the project in a way that makes sense to different stakeholders.

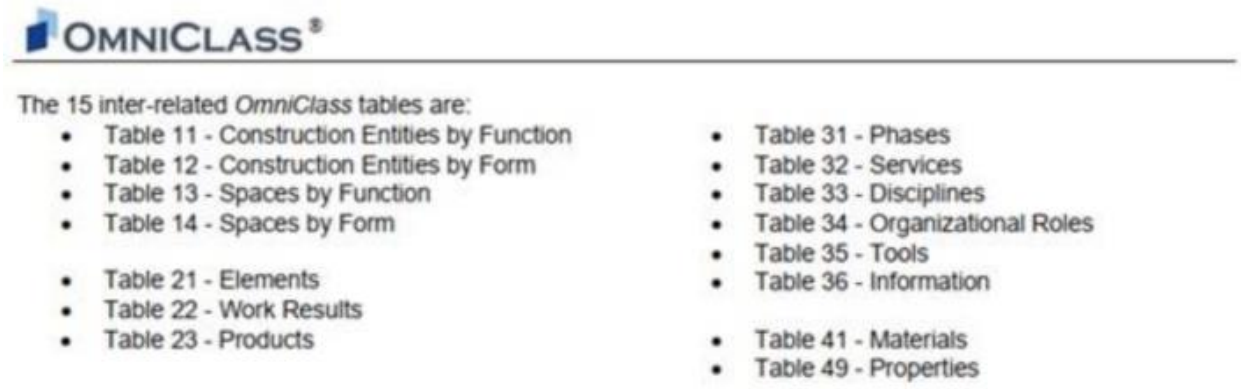

Figure 3- CSI's "Omniclass" 15 Tables for Relational and Object-Oriented Database Design

THE FUTURE IS HERE ALREADY

For an example of how this "Building Information Model" has been designed to work can be seen in this brief 3-minute video. https://www.youtube.com/watch?v=fBbX8IqJAjY What you are looking at has been in use in construction for at least 10 years and is growing in use daily. While the USA and UK are the most sophisticated users, Singapore and Malaysia have recently MANDATED BIM use on all projects funded by government money. (Which means pretty much all projects of any size or complexity)

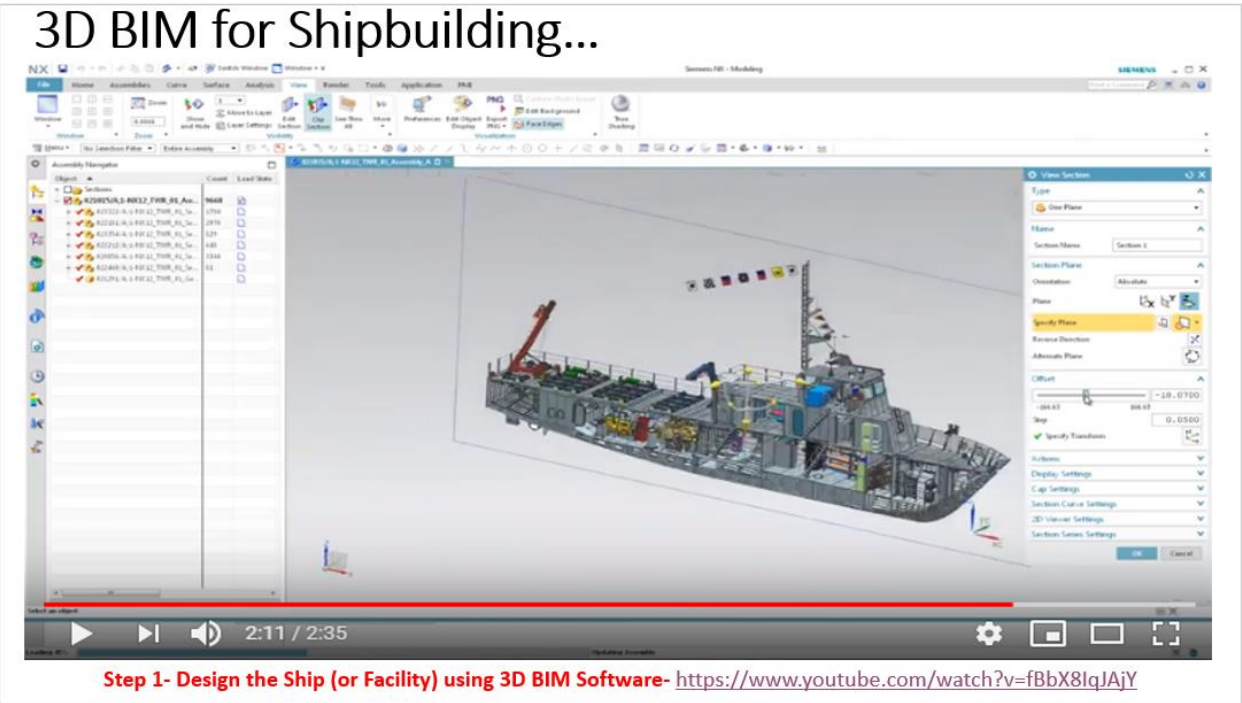

Figure 4- Illustrating how Multi-Dimensional, Object-Oriented Databases are being used

The next step is progressing from relational databases to object-oriented architecture, enabling virtual, augmented, and mixed reality. Using "smart glasses" or "smart goggles," we can actually see the finished products (=ASSETS) before they are constructed or installed. This is available and is in use already. This "AI" technology is going to replace the CPM schedules and what was long known as "blueprints" or paper plans" being used by the field trades to see the sequence of their workflows, using what materials and to what technical specifications.

Figure 5- Illustrating How VR, AR, and MR will replace CPM Schedules and "Blueprints"

To reach this level of sophistication, we need to understand how to move beyond being able to "see" our projects in only three dimensions and being able to look at our projects in 4D, 5D, 6D, or more.

To fully grasp this concept, we need to watch these videos showing the unfolding of a Tesseract or Hypercube.

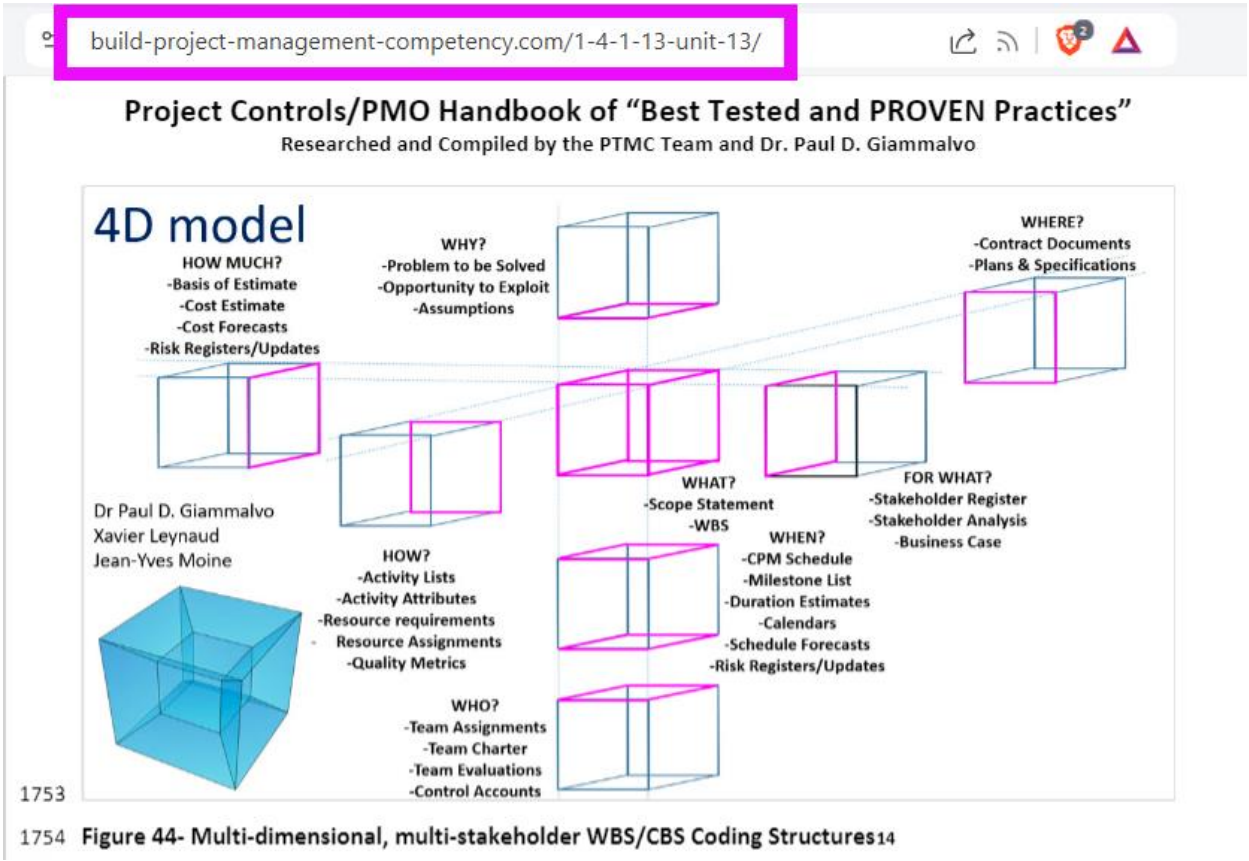

Figure 6- Illustrating How to "UNFOLD" a Tesseract to show the 8 Dimensions of our WBS/CBS

This is why I don't see any rational or logical reason why Mr. Kik Piney or others cannot or should not be able to link your BRM example using Dr. Ken's example, answering the question, WHY are we doing this or HOW MUCH it will cost or save in benefits. But just because you can link the realization of benefits to the WBS/CBS elements does NOT necessarily mean that you can infer that IF you physically complete any of the deliverables (ASSETS), it does not automatically translate into realizing potential future benefits. That is a stretch too far. While there may be correlations between physical progress today and the eventual realization of benefits in the future, there are rarely any DIRECT causal relationships. See previous explanations on why this is true.

https://pmworldlibrary.net/wp-content/uploads/2023/05/pmwj130-Jun2023-Giammalvo-in-response-to-may-Piney-Letter-to-Editor.pdf

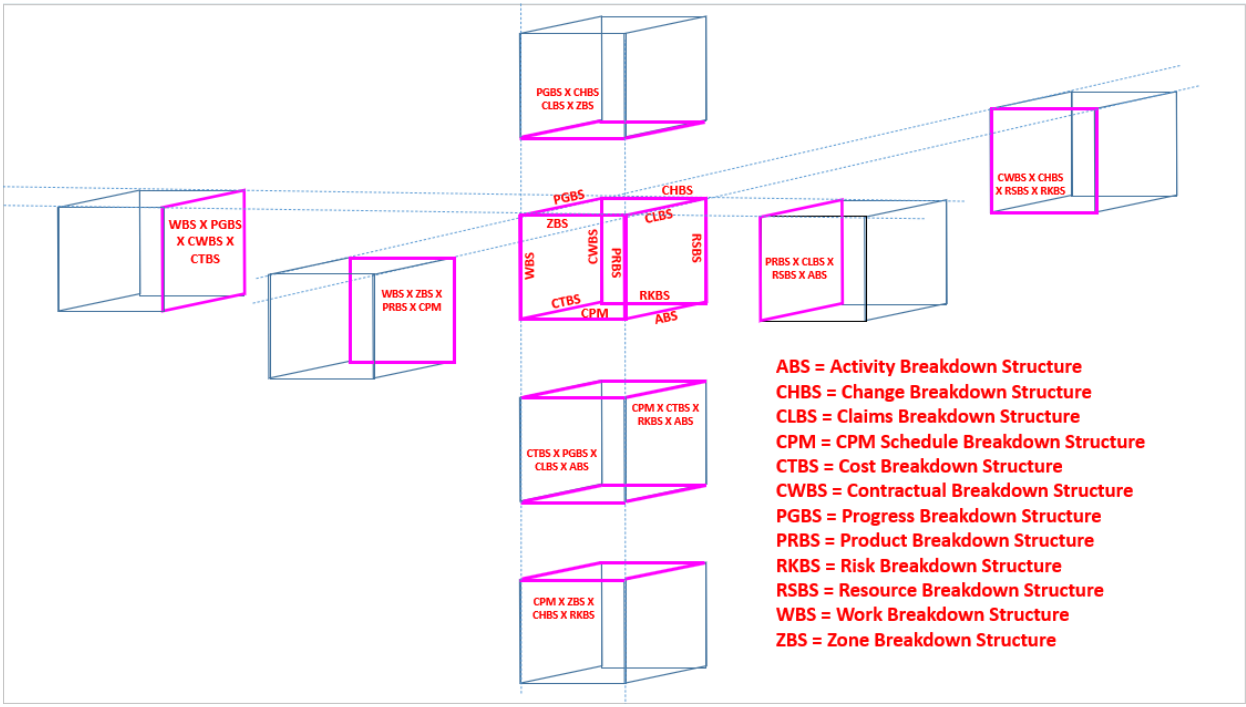

Figure 7- A Detailed Labeling of the Combinations and Permutations Shown in Fig 6.

WHAT ABOUT CALCULATING WEIGHTING FACTORS

And to address Mr. Kik's proposed WEIGHTING, any decent textbook on Engineering Economics (we require our students to learn the tools & techniques shown in Engineering Economics, Global Edition 17th by Sullivan, Wicks & Koelling.)

I also reviewed Dr. Ken's paper from the PMWJ, and while he didn't elaborate on that level of detail, but having worked together for many years now, I know for a fact that he is well aware of the various "Benefit: Cost Ratio" formulas and like me, he too agrees that the "best" or "better" formula are those that take into account BOTH the BENEFITS and DISBENEFITS. Why? Because when faced with OPTIONS, there are rarely any ONLY GOOD or ONLY BAD options. Whenever looking at BENEFITS, there are also NEGATIVE or DISBENEFITS for every benefit; both the "good" and the "bad" should be factored into the equation.

I would urge Mr. Kik to pick up a decent textbook on Engineering Economics and update his model to include both the good and the bad in his weighting factors.

476 CHAPTER 10 / EVALUATING PROJECTS WITH THE BENEFIT–COST RATIO METHOD

10.7.1 Disbenefits in the B–C Ratio

In a previous section, disbenefits were defined as negative consequences to the public resulting from the implementation of a public-sector project. The traditional approach for incorporating disbenefits into a B–C analysis is to reduce benefits by the amount of disbenefits (i.e., to subtract disbenefits from benefits in the numerator of the B–C ratio). Alternatively, the disbenefits could be treated as costs (i.e., add disbenefits to costs in the denominator). Equations (10-5) and (10-6) illustrate the two approaches for incorporating disbenefits in the conventional B–C ratio, with benefits, costs, and disbenefits in terms of equivalent AW. (Similar equations could also be developed for the modified B–C ratio or for PW as the measure of equivalent worth.) Again, the *magnitude* of the B–C ratio will be different depending upon which approach is used to incorporate disbenefits, but project acceptability—that is, whether the B–C ratio is >, <, or = 1.0—will not be affected, as shown in Example 10-4.

Conventional B–C ratio with AW, *benefits* reduced by amount of *disbenefits*:

$$\text{B–C} = \frac{\text{AW(benefits)} - \text{AW(disbenefits)}}{\text{AW(costs)}} = \frac{\text{AW}(B) - \text{AW}(D)}{\text{CR} + \text{AW(O\&M)}}. \quad (10\text{-}5)$$

Here, AW(·) = annual worth of (·);
B = benefits of the proposed project;
D = disbenefits of the proposed project;
CR = capital recovery amount (i.e., the equivalent annual cost of the initial investment, I, including an allowance for market value, if any);
O&M = operating and maintenance costs of the proposed project.

Conventional B–C ratio with AW, *costs* increased by amount of *disbenefits*:

$$\text{B–C} = \frac{\text{AW(benefits)}}{\text{AW(costs)}+\text{AW(disbenefits)}} = \frac{\text{AW}(B)}{\text{CR}+\text{AW(O\&M)}+\text{AW}(D)}. \quad (10\text{-}6)$$

Figure 8- The "best tested and PROVEN" formula to calculate Benefit: Cost Ratios

While there are many formulas you can choose from, we RECOMMEND that you use the formulas that consider not only the BENEFITS but also the DISBENEFITS. As noted above, rarely are there any "perfect" solutions. Most have "pros and cons," and we need to be more realistic, honest, and candid in our evaluations and assessments.

CONCLUSIONS and RECOMMENDATIONS

Mr. Kik (and anyone else interested in this topic), knowing your strong interest in trying to link everything to "benefit realization," I would urge you to contact two of your fellow countrymen, Xavier Leynaud and Jean-Yves Moine. We co-authored the book "Multi-Dimensional Project Breakdown Structures – The Secret to Successful Building Information Modeling" (BIM)

Integration," and I am confident they could give you expert guidance and advice on how to achieve your goals and objectives.

Dr. Paul D. Giammalvo

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