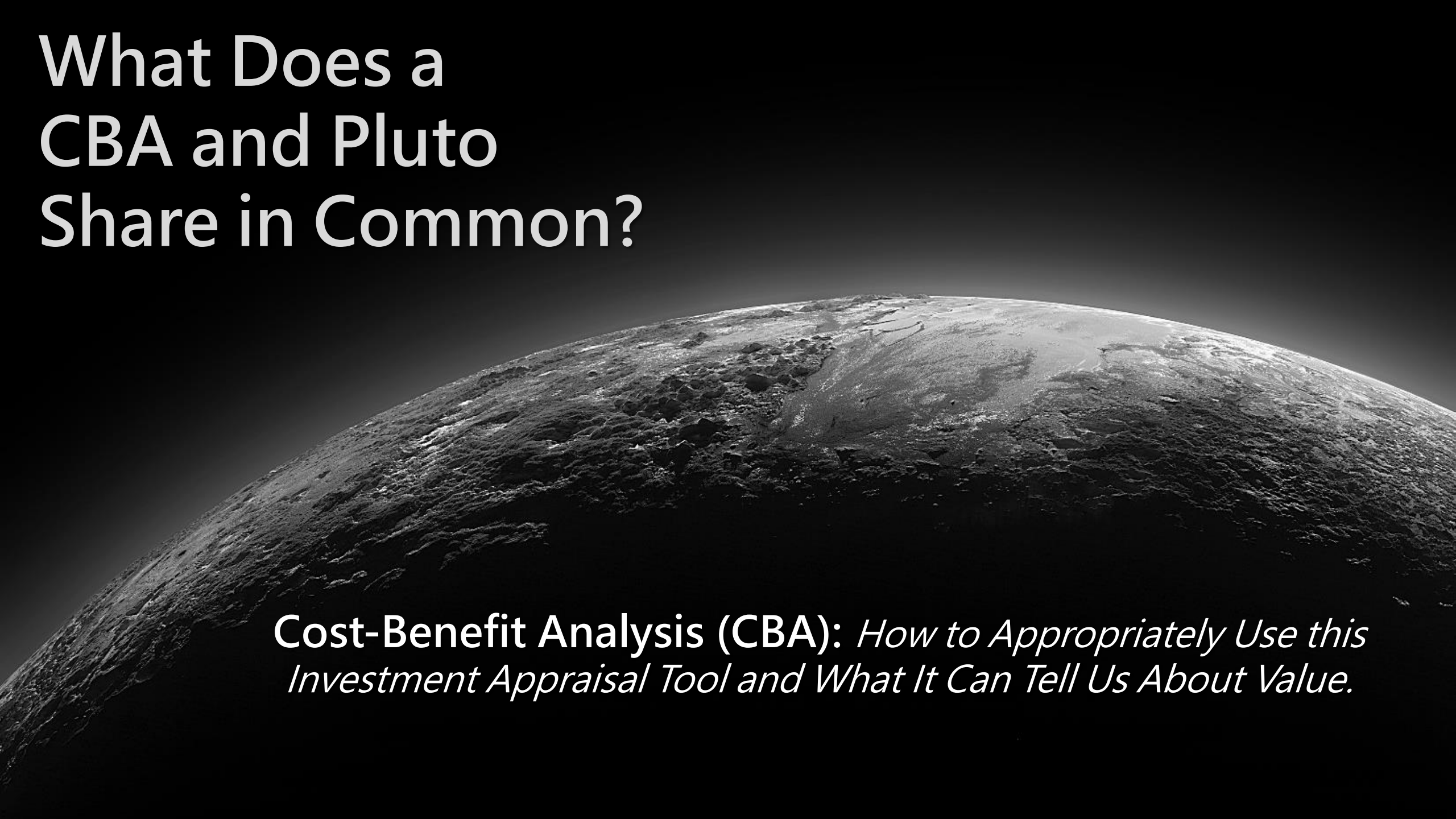
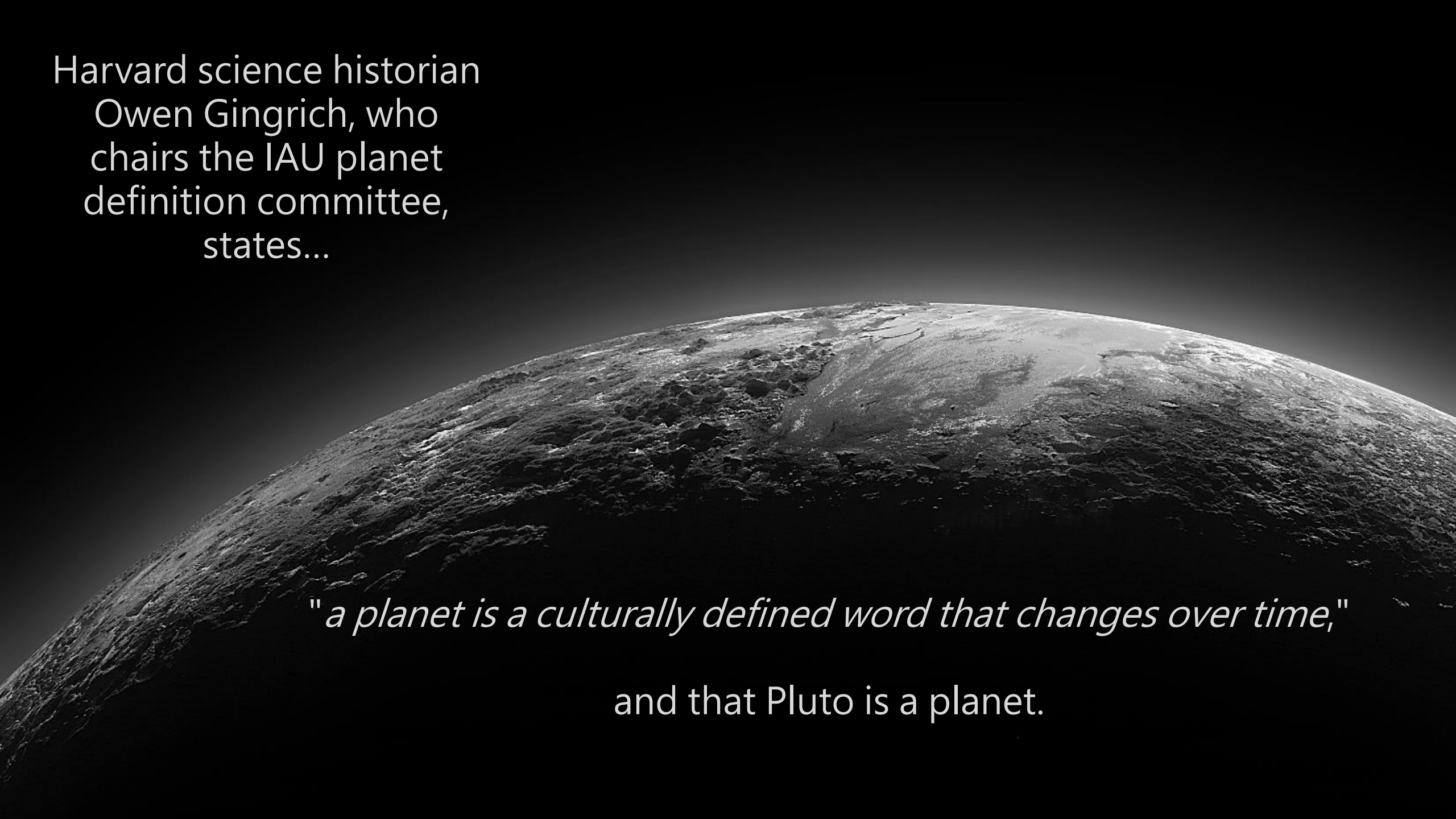
What Does a CBA and Pluto Share in Common?



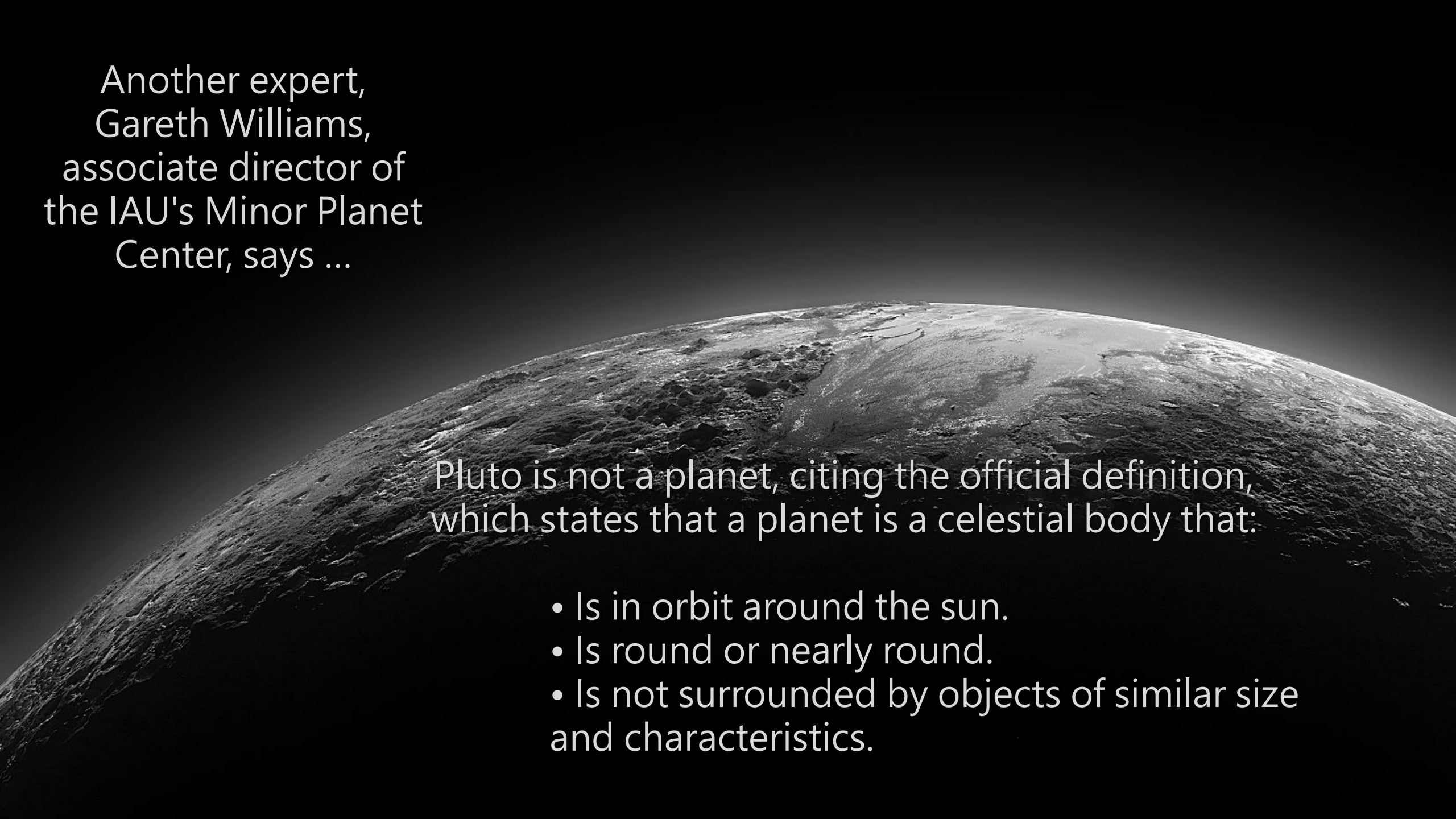
Cost-Benefit Analysis (CBA): *How to Appropriately Use this Investment Appraisal Tool and What It Can Tell Us About Value.*

Harvard science historian Owen Gingrich, who chairs the IAU planet definition committee, states…



"*a planet is a culturally defined word that changes over time*,"

and that Pluto is a planet.



Another expert, Gareth Williams, associate director of the IAU's Minor Planet Center, says ...

Pluto is not a planet, citing the official definition, which states that a planet is a celestial body that:

- Is in orbit around the sun.
- Is round or nearly round.
- Is not surrounded by objects of similar size and characteristics.

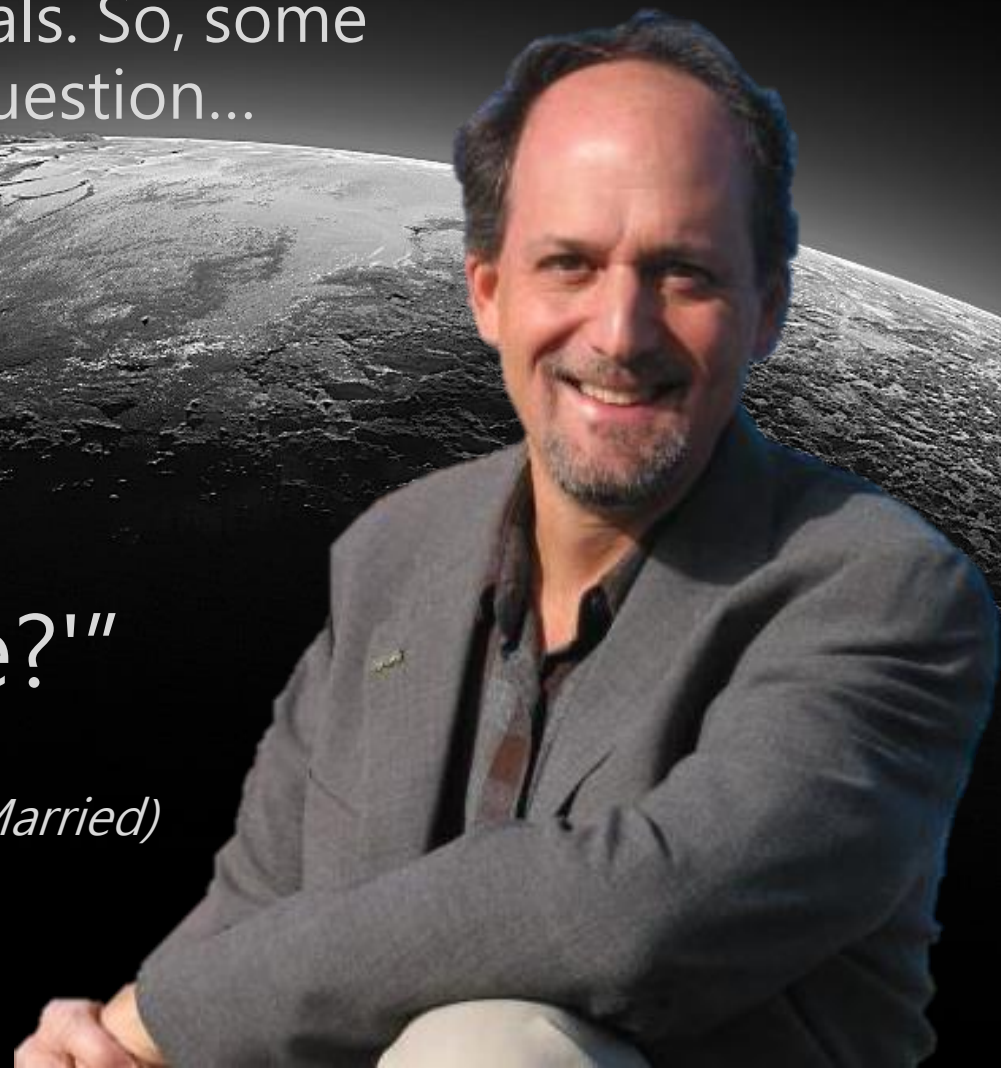
Robert Britt, Senior Science writer for Space.com, posed a series of questions about the new definition of a “planet” and its merits and shortcomings to several astronomers,

… among them Geoff Marcy at the University of California, Berkeley.

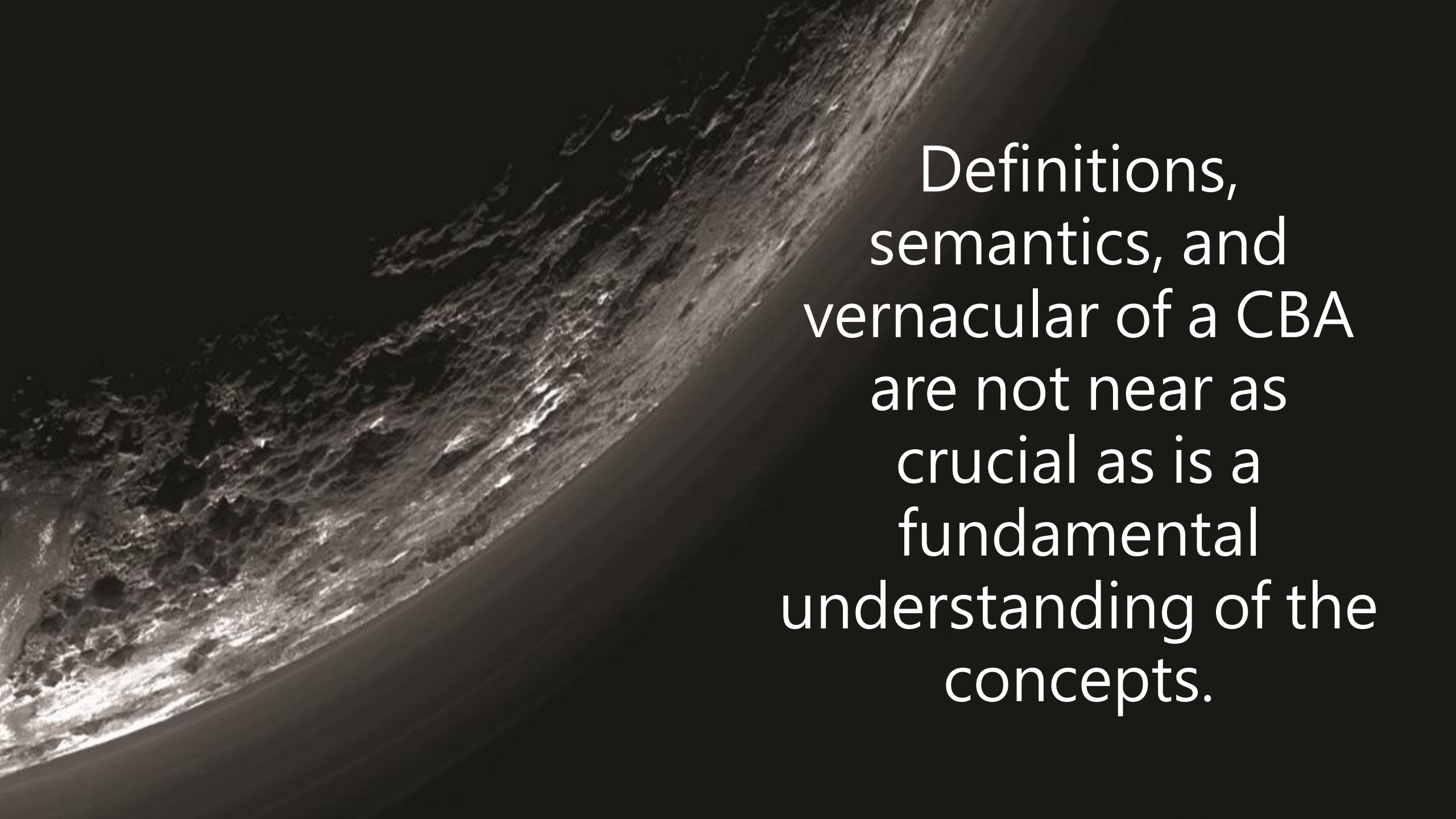
“Your questions imply that a definition of the word 'planet' is useful scientifically. That is a view not shared by many professional planetary scientists. The astrophysics of planetary bodies is so rich and complex that defining 'planet' has never been an issue under discussion among professionals. So, some of your questions read to me like the old loaded question…

'When did you
stop beating your wife?'”

(Loaded question… Dr. Marcy has never been Married)




Pluto is SO a planet
SAVE PLUTO
size doesn't matter
... you wanna bet?.
Pluto got what it deserved
AW, LET PLUTO BE A PLANET
PLUTO IS PRICELESS
PLUTO, The tribe has spoken.
HE'D BUY PLUTO!
ALL WE ARE SAYIN
IS
GIVE PLUTO A CH


Definitions, semantics, and vernacular of a CBA are not near as crucial as is a fundamental understanding of the concepts.

Gathering the data to support a CBA may take considerable time. However, the utility depends as much on the analysis carried out on the data as it does on the figures themselves.

A cost-benefit approach is a method for organizing thought rather than substituting for it.

Objectives

- Develop general consensus on CBA and terminology
- Understand to what extent we use a CBA for our IT projects
- Discuss methods for monetizing costs and benefits
- Discuss methods for monetizing soft (Intangible) benefits

Consensus on Some Common Terms

CBA is both a theory and a practice or a practice that is an applied theory.

- From a **theoretical** perspective, CBA is **ideas, principles, and techniques** that are applied to a subject, especially when the results of the CBA are seen as distinct from investment decisions.

CBA is both a theory and a practice or a practice that is an applied theory.

- From a **theoretical** perspective, CBA is **ideas, principles, and techniques** that are applied to a subject, especially when the results of the CBA are seen as distinct from investment decisions.

- For an **economist**, CBA is a **mathematical tool** used in decision making for determining if the perceived benefits outweigh the expected costs and for extending that determination to the social welfare of a community.

COST-BENEFIT ANALYSIS

- **Analysis**... (understanding and explaining is as important as measuring and calculating)
- ...**of the flows** (inputs and outputs) (Activities undertaken and Results that emerge)
- ...**in terms of costs and benefits**... (carefully distinguishing between those flows which are costs and those which are benefits)
- ...**which are valued**... (defined in monetary units of measurement)
- ...**and are then compared and combined**... (Using mathematical methods to provide synthetic information and estimates of the project's return on investment.

Costs and Benefits

Types of Costs:

- **Non-Recurring:** Defined, one-time costs to the project.
- **Recurring:** Costs to the project that are incurred periodically or over a set period of time.

Costs and Benefits

Types of Benefits:

- **Quantitative**: e.g., reduced need for clerical staff and file storage, improved staffing utilization, increased collections.

- **Qualitative**: e.g., improved benefits integration, improved response times to reports, automated forms generation, better decision making.

Present Value Discounting (PV)

- Equalizes comparison of alternatives when expenses and benefits are distributed unequally over time
- Typically use CPI as present value factor. 3% - 5% is a typical range absent required Internal Rate of Return (IRR).
- Typically Present Value Discounting is NOT required once the State has selected its alternative.

Present Value (PV)

The **present worth** of **future sums of money**. PV is calculated by discounting the future sum using a discount rate.

The **Discount Rate** takes into account the Time Value of Money, e.g., Inflation. It may be based on the organizations Cost of Capital, which takes into account the amount of acceptable risk of capital and **required rate of return** for investments.

At the current time, the **OIT CBA** uses a simple inflation projections as the discount factor **(CPI = .021 or 2.1%).**

$$\text{Present Value} = \frac{\text{Cash Flow}}{(1 + \text{Discount Rate})^n} = \frac{\$100}{(1 + .021)^3} = \frac{\$100}{1.064} = \$93.55$$

Net Present Value (NPV)

The **difference** between the present value of **Benefits** and the present value of cash **Costs** after they **are discounted** by a specified rate of return.

NPV > 0 is acceptable.

Future inflows (Benefits) are discounted to derive Present Value (PV)

NPV = Present Value of Cash **Inflows** - Present Value of Cash **Outflows**

Benefit Analysis: Types

- You need to identify and characterize **all benefits**.
  - Increased collections/revenue
  - Program cost savings
  - System cost savings
  - Program cost avoidance
  - System cost avoidance
  - Qualitative (Soft Benefits Monetized)

Caution

Time “Savings”

- Time savings through productivity improvements alone is **not** a viable benefit.
- Consider in your analysis what **useful purpose** was that time savings directed toward.

Caution

Avoid **common errors** such as:

- Double Counting
- Counting Sunk Costs
- Omitting Costs
- Productivity Improvements Alone

Quick Example of CBA

Proposed Solution
for
Increasing Child Support Collections of Foster Care Children

Baseline: Based on a current population of 1000

- **75%** of foster care population **could be referred** to child support.
- Currently, only **20%** of eligible cases **are referred**.
- We know that **20%** of all cases referred **are collected**.
- The average collected payment is **$76.40** per month.

Measurement Plan:

- Actual collections will be measured.
- Estimate **75%** of **Year 3** population of 1000 **could still be referred** to child support.
- The proposed solution **will result** in **100%** referral rate.
- The same 20% collected with an average payment of $76.40 per month.

Comparison of Baseline to Proposed

	Current Solution (Baseline)	Proposed Solution (Estimate)
Child Welfare Population	1,000	1,000
75% Could Be Referred	1,000 x .75 = 750	1,000 x .75 = 750
Cases Referred	**750 x .20 = 150**	**750 x 1.00 = 750**
Cases Collected	150 x .20 = 30	750 x .20 = 150
Avg. Monthly Collection	30 x $76.40 = $2,292	150 x $76.40 = $11,460
Avg. Annual Collection	$2,291.70 x 12 = $27,504	$11,450.50 x 12 = $137,520
Net Annual Benefit	$137,520 - $27,504 = **$110,016**	

Project Values for Each Period of Time

System Life Benefits Baseline						
Description	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Benefit 1	0	0	110,000	110,000	110,000	330,000
Benefit 2	25,000	65,000	70,000	80,000	85,000	325,000
Benefit 3	10,000	15,000	20,000	50,000	70,000	165,000
Benefit 4	0	5,000	15,000	30,000	50,000	100,000
Total Projected	35,000	85,000	215,000	270,000	315,000	920,000

Projected Breakeven in Year 5

Cumulative Cost Benefit Profile						
Description	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Cumulative Total Projected Benefits	35,000	120,000	335,000	605,000	920,000	N/A
Cumulative Total Projected Costs	450,000	570,000	670,000	770,000	870,000	N/A
Difference	(415,000)	(450,000)	(335,000)	(165,000)	50,000	N/A

Must be able to describe and defend

Suggest creating a narrative description of costs and benefits, including how they were derived

- There are **no automatic disapprovals** for cost benefit analyses that fail to breakeven.
  - If the analysis will not breakeven, you may be asked to **prove** that the measurable outcomes are **worth the cost** of investment, and that those costs are reasonable.

Monetizing Soft Benefits

The boundary between these types of benefit is not always clear and **depends on the judgement** of the analyst.

Sometimes, "**experimental" evaluations**, involving partial methods for valuing benefits, may be used.

You, as the **subject matter expert**, are familiar with the micro effects of your process. Your **judgment, historical knowledge, and expertise** will likely be the **best tools** for identifying value.

Based on these tools, you construct a **defendable rationale**.

Quantify Intangible (Soft) Benefit

Example: Improved Customer Goodwill

Monetary Value = ???

Without tangible facts and figures, you must make **supported estimates** based on your **knowledge, experience, expertise, and any research data** available to **communicate** the most **realistic and accurate** business case possible.

Please keep in mind: Even **hard** Costs/Benefits estimates based on tangible facts are **still estimates** for a yet-to-be determined **future**.

Both hard and soft benefit estimates are **based on the same thing**:

An acceptable and trusted rationale

Fictitious Example

You are nearing your 7th year as Director of the **only** Highly Fictitious Business Card Printing Division for the State of Alabama. Your division **specializes in the design and printing** of business cards for agencies, colleges/universities, and other state government related entities. Your entire operating budget is **funded by the fees collected** from state entities that request business cards for their employees.

Annual revenue generated by the division has **remained steady at $150,000** for the past seven years, with just enough year-over-year revenue growth to fund the budget and keep up with rising material and equipment maintenance costs.

Fictitious Example

Over the **past three years**, you've **researched various emerging technology** trends that have the potential for **luring away** some long-time customers.

While some technologies are impressive, they offer **no significant advantage** over traditional business cards. They are **both equal** in meeting the customers needs.

Fictitious Example

Based on your **budget analysis**, you are very aware that **losing customers** would create a **funding shortfall** that could not be recovered.

Based on **recent customer surveys**, you are also aware that without some **compelling reason** to change, your **customers are content** with using business cards.

Fictitious Example

During a recent meeting, you received **feedback from customers** about it taking **so long to complete** an order online, oftentimes getting timed out resulting in reentry of data.

You explained that the problem was because of an **old database server** that had very few resources for processing the volume of requests.

Fictitious Example

You further explained that you reviewed the **cost/benefit analysis performed by your management staff** which concluded the department wouldn't gain enough in **added benefit** to justify the cost (**$45,000**) of replacing it.

Fictitious Example

Your customers responded by saying that it would certainly be of tremendous benefit to them.

You agreed but added that the overall cost cannot be justified.

Your previous **analysis** to justify the cost of upgrading the database server fell **just below the line** to produce a **positive return on the investment**.

Based on your **spending plan**, **proceeding with the upgrade** would mean that you wouldn't be able to make another planned investment that **does** promise **a positive return**.

Investment: **Automatic Card Sorter *8000e*®**
Life of Solution: **10 Years**
Costs: **$30,000 Purchase + $2,000 per year Maintenance x 10 yrs. = $50,000**
Benefit: **Reduction of labor required to manually sort cards**
Benefit Value: **Hr. Rate x Number of Hours per Month = $500**

Cost of Card Sorter: $45,000 Life of Solution: 10 years

Automatic Card Sorter *8000e®*

$$\text{Payback Period} = \frac{\$50{,}000 \text{ (Cost)}}{\$500 \text{ (Monthly Benefit)}} = 100 \text{ Months (8 years 4 mos.)}$$

$$\text{Benefit Cost Ratio (BCR)} = \frac{\$60{,}000 \text{ (Benefits)}^{\,10 \text{ Years}}}{\$50{,}000 \text{ (Costs)}} = \$1.20 \text{ in Benefit for each } \$1.00 \text{ invested}$$

Looks like a fairly solid project.

But What About the Database Server?

Improved Customer Goodwill

How Do You Monetize
a Soft Benefit Value?

Without tangible **facts and figures**, you must make **supported estimates** based on your **knowledge, experience, expertise**, and the **data available** to communicate the most **realistic and accurate** business case possible.

- Leverage the **expertise** of others in your division.
- Review **historical data** if applicable.
- Solicit **feedback** from stakeholders.
- Conduct a **survey** of constituents.
- Gather insights from **similar research** or case studies.

Use what is available to you and apply your professional judgement.

If you apply all the **knowledge, expertise and data available** and your analysis is refuted by someone…

There is a good chance that person **will have less** knowledge, expertise and data **than you**.

What Do We Have to Work With?

Knowledge
You've gathered feedback from

revenue figures

Knowledge
You've done customer surveys

Experience
You are a 7-year

Expertise
Your Division specializes in this industry

Insight
You've spent 3 years researching technology trends

Insight
Your customers have told you of their needs

There is a good chance that most people will have to defer to your judgement when it pertains to soft benefit estimates in the business card industry.

Another option is to just guess and hope no one questions you.

One Technique for Our Example

Using your **knowledge and expertise**, or knowledge and expertise leveraged from other sources as supporting evidence…

… you estimate the **most likely** future result and **remain open** to making adjustments should **new evidence** be made known to you.

First: Examine **all** of the potential impact **scenarios.**

Second: Access the **probability of each scenario** and derive the **most likely** future result.

Rather than asking

“What can I gain from Improved Customer Goodwill”?

Reverse the Question

Question: What is the result of customer **“ill” will** (or doing nothing to improve customer goodwill)?

Answer: The customer will submit **fewer (or no) orders**.

Question: To **what degree** will an average customer reduce orders?

Answer: **You know** your business **better than anyone**. Use your knowledge and expertise to make an **informed prediction** of the **most probable scenario**.

Based on what you know as a 7 year veteran of the Business Card industry and knowing what you know **about your current customers**, what is your opinion on the likelihood of the **average customer**…

- **Trying out** one of the new technologies for a few of their employees, thereby, reducing their business card orders by **10%** or less?
    - What do you think is a **realistic probability** of that type of reaction from the average customer?
- Experiencing enough "ill" will to send you a strong message of their dissatisfaction by converting **50%** of their employees?
- Experiencing enough "ill" will to only use you as a last resort, resulting in a loss of **90%** of orders?
- Dropping you altogether, resulting in a loss of **100%** of orders?

Establish Some Justification for the Estimate

Percentage of Orders Reduced		Probability of Occurring		Weighted Value Percent of Orders Reduced	
10%	X	50%	=	5%	← Highest Probability – Least Impact
50%	X	20%	=	10%	
90%	X	10%	=	9%	
100%	X	5%	=	5%	← Lowest Probability – Greatest Impact
				29%	

Best Estimate

Close to 1/3 of Annual Revenue is Tied to the Benefit of Improved Customer Goodwill

Remember this…

*"Your previous **analysis** to justify the cost of upgrading the database server fell **just below the line** to produce a **positive return on the investment**."*

Lets take another look.

Estimate the Future Value of a Soft Benefit

Improving Customer Goodwill

Annual Revenue: $150,000

Potential Loss of Revenue for Doing Nothing: 29%

$$\$150{,}000 \times .29 = \$43{,}500$$

$$\frac{\$43{,}500}{12} = \$3{,}625 \text{ per month}$$

Estimate the Future Value of a Soft Benefit

Improving Customer Goodwill

Improving Customer Goodwill Actually Does Have a Monetary Value

It is worth $43,500 Annually to your program

Cost of Database Server: $45,000 Life of Solution: 6 years

$$\text{Payback Period} = \frac{\$45{,}000\ \text{(Cost)}}{\$3{,}625\ \text{(Monthly Benefit)}} = 12.4\ \text{Months (1 year 3 mos.)}$$

$$\text{Benefit Cost Ratio (BCR)} = \frac{\$261{,}000\ \text{(Benefits)}^{\ 6\ \text{Years}}}{\$45{,}000\ \text{(Costs)}} = \$5.80\ \text{in Benefit for each \$1.00 invested}$$

Cost of Database Server: $45,000 Life of Solution: 6 years

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Cost of Card Sorter: $45,000 Life of Solution: 10 years

$$\text{Payback Period} = \frac{\$50{,}000\ (\text{Cost})}{\$500\ (\text{Monthly Benefit})} = 100\ \text{Months (8 years 4 mos.)}$$

$$\text{Benefit Cost Ratio (BCR)} = \frac{\$60{,}000\ (\text{Benefits})^{\ 10\ \text{Years}}}{\$50{,}000\ (\text{Costs})} = \$1.20\ \text{in Benefit for each \$1.00 invested}$$

Which is the better choice?

Questions?