

The GDC logo is positioned at the top center of the slide. It consists of the letters 'GDC' in a bold, white, sans-serif font, set against a dark blue triangular background that points downwards. The entire slide has a teal-to-blue gradient background with a subtle geometric pattern of thin lines and small diamond shapes.

# A Cost-Benefit Analysis : Is that new tech worth it?

Ben Laidlaw  
Technical Director @ LaidlawFX

**GAME DEVELOPERS CONFERENCE**  
MARCH 16-20, 2020 | #GDC20

Hello Everyone,  
It is a bit of a crazy new world out there today,  
but I'm happy to be bringing to you this talk virtually.

Welcome to my Virtual  
GDC 2020 talk  
A cost-benefit analysis : Is that new tech worth it?  
My name is Ben Laidlaw



## about me LaidlawFX

A technology company designed to solve your problems with a creative and technical mindset in order to get the job done right.



Ben Laidlaw



Seattle, WA USA



MFA, Academy of Art University



Technical Director



I consider myself a Technical Director  
I have multiple Art degrees including an Master in Fine Arts.

I've worked the gamut of 3-D from Commercials, to Features,  
to AAA Games, to XR and Virtual Production, including now in software  
development  
on multiple continents, and at a wide variety of studios.



## What makes **GDC** great?



I'll start this talk off by asking what makes GDC great?  
What are we missing out on this event.



## What makes **GDC** great?

Connecting with old and new **friends**



**GAME DEVELOPERS CONFERENCE**  
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Meeting up with your buddies from across the industry?



## What makes **GDC** great?

Advance your **career**



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Looking for that next leg up in your career?



## What really makes **GDC** great?

Discovering and learning about **new** methods and **technologies** to implement in your pipeline



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I'm willing to bet most of you.  
Especially the people that describe themselves as Tech Artist

That you go to GDC to discover and learn about what your competition is doing  
and how you can improve your own pipeline.



All technology  
is **not** created **equal**

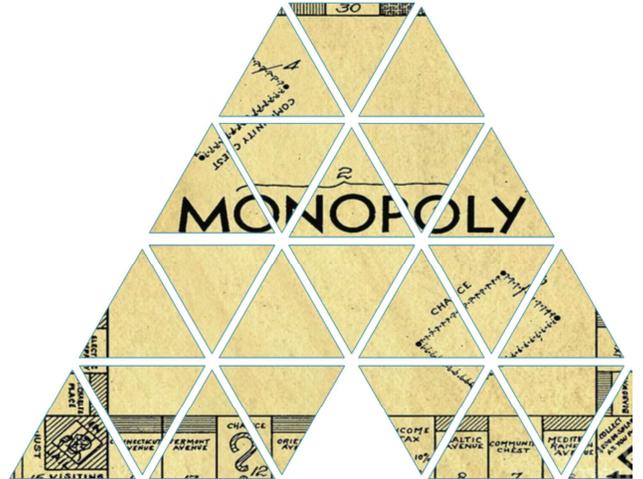
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Some of the tech out there is freaking amazing  
and others you know you can just shrug your shoulder at.

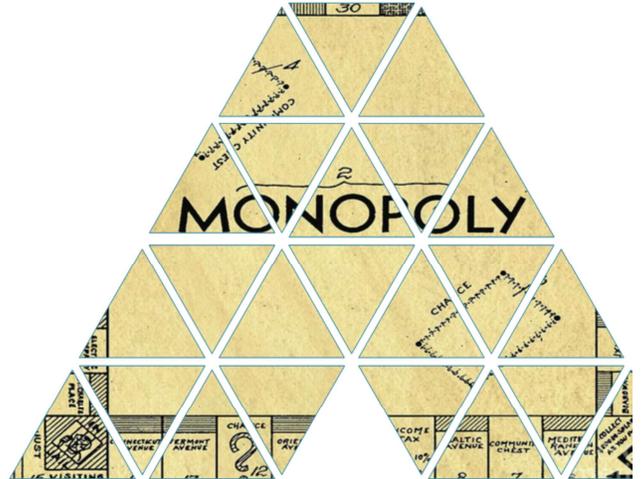
Back at your studios you want to be able implement the good viable tech.

Some of you may be lucky and you can just dive in coding and creating art to glory.  
For the rest of us who have managers and investors you need to sell it to them.



So, what will convince the investor to come running to you with their money?

Often it is the case they are not specialized in what you do.  
They work in a different business.

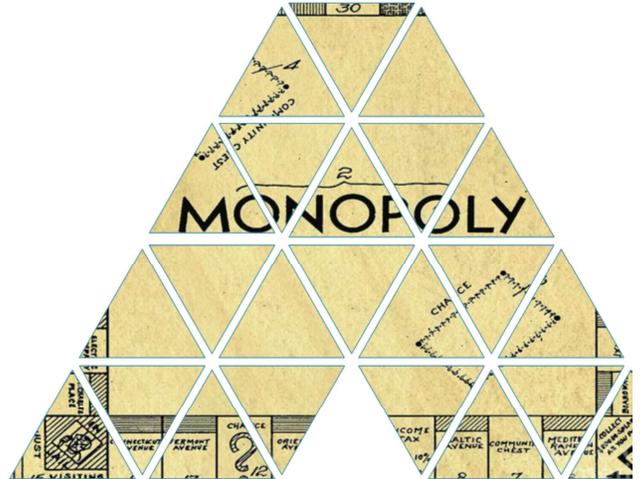


Their language is not I trust you, go make art.

Their language is WHY



CBA



Your answer is a three letter reply  
CBA



Investor



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Your investor should hopefully come running to you at that point with money,  
or they may actually rain on your parade and say there is no money for that

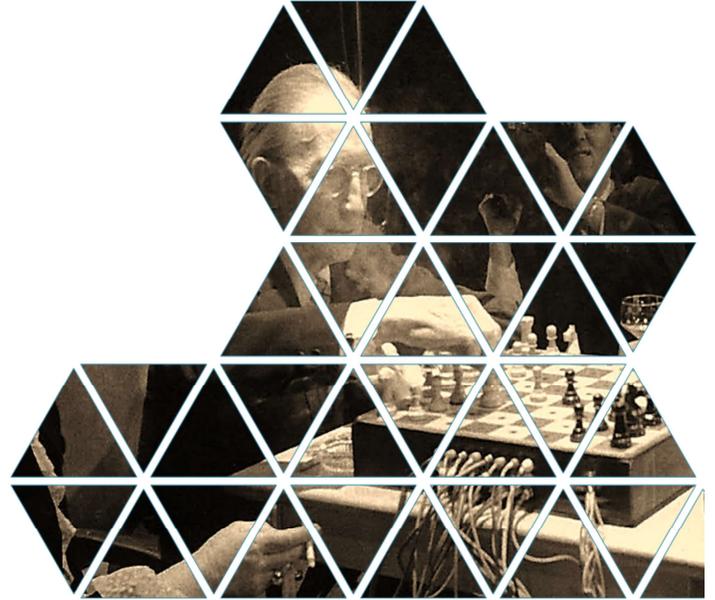
Trust me, you want the smart investor, no matter how much it may suck if they say  
no.



# CBA

## Cost Benefit Analysis

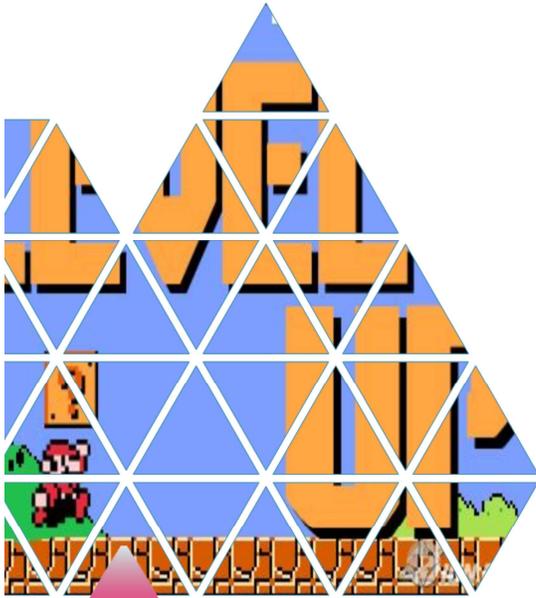
A systematic approach to estimating the strength and weaknesses of alternative methods to define the best approach



So a CBA is short for

Cost Benefit Analysis

Wherein you can appropriately analyze the human factor of an investment



# ROI Return On Investment

A ratio of the net profit over the cost of investment

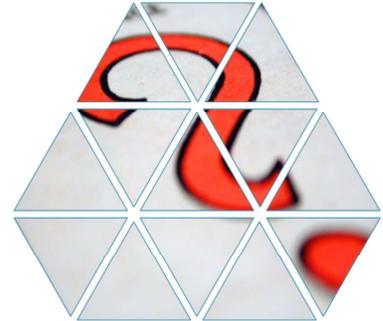


Which is a method of showing the return on investment, ROI, for the investor of what you are about to do minus the intangibles.

This is in the simplest of terms, how much your investor is going to profit.



... Is that **tech** worth it?



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What both of these equate to,  
is this tech worth it?

It doesn't matter if the whole industry is singing it's praise.  
That you are going to save the hearts and souls of your company  
That the artist will love you and dance in the aisle.  
While all very heartwarming  
and maybe if you had a bit of the force it could be enough.

What the CBA allows you to do is put actual numbers behind that tech's worth

## SF's Parks Provide Economic Benefits Approaching \$1 Billion

By Jennifer Warburg, Special Projects Manager  
December 3, 2014



## SF's Parks Provide Economic Benefits Approaching \$1 Billion

Value of San Francisco's parks: priceless?  
Actually it's about \$1 billion per year, according to a new report from the Trust for Public Land and the SF Parks Alliance.

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You might wonder why CBA are effective in analyzing art.

From a historical point of view and even to today CBAs have been crafted and applied to large public works projects

with large societal cost and benefits that are more difficult to quantify than “hard” technology costs.

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Who would have thought the value of the parks you may walk around in this week are worth so much.

## Virtual Audience Value



However really we are not putting an arbitrary value on ART

ART has a real cost. For instance worker time alone is a simple value.

In the 30 minutes of this talk, with will say 200 people in attendance at an average of 100K annual total cost is \$50 an hour,  
Which makes this \$5,000 worth of people sitting in attendance.

Sometimes what we are hoping for is to just get rid of the more expensive cost of idle time.

So now that I have burned \$4 dollars of your time,  
lets go onto the guts and glory of the CBA



# How to make a CBA

## Alternatives

Introduction  
Cost  
Benefit  
Analysis  
Presentation



how to make a CBA

As a quick primer, for this is the outline for the talk as we dive in.

I'll refer back to this from segment to segment as we progress.

Depending on the scope it may be a day or more of work to modify and create this document.

For extremely large initiatives with tens of millions of dollars on the line this could take quite a while even a month or more to do the proper due diligence.



## Comparison of Alternatives



before you even put your fingers to the keyboard to work on your  
CBA

you need to know a CBA is a comparison of alternatives

this is where the CBA gets its greatest strength from,  
the same as any scientific comparison

finding relevant comparison is key  
luckily the first two are always the easiest



## Comparison of Alternatives

Buzz worthy



I generally start with what I call the buzz worthy new tech,  
this is the tech you see at GDC and catches the most buzz



# Comparison of Alternatives

2 Buzz worthy



I classify this actually as my 2nd alternative  
the first alternative may be a bit scary



## Comparison of Alternatives

- 1 Do nothing
- 2 Buzz worthy



The first is what if you do nothing and keep the existing workflow

In any good scientific analysis you need your baseline and your alternate method.

You can not define value for one without the other.

More importantly for us when pitching why you should implement the new tech

You need to define why the other is so bad.



## Comparison of Alternatives

- 1 Do nothing
- 2 Buzz worthy
- 3
- 4



To make a rock solid CBA however you should consider a few other alternatives  
This is what gives the CBA it strength and validity.

Whether it is 2, 3, or 4 alternatives matters more to the type of tech you are comparing.

If you are choosing DCCs it more important to list all the relevant ones than just the top 2.

This is consider doing your due diligence, and research.



## Comparison of Alternatives

- 1 Do nothing
- 2 Buzz worthy
- 3 That other possibility
- 4 A little outside the box



The best thing is to consider other realistic possibility, or even something everyone talks about, but you may know is not related. This should help smooth out confusion.

I do have to say a little secret...

The scariest thing of all these alternatives and the analysis is that they have the power to prove what is actually good or bad, whether you intended it to or not.

Sometimes there is a real reason why you are still working with that outdated engine and pipe.

The bleeding edge, does not have as solid as a foundation as something that a few other studios have worked out.

As you walk around, see if anyone else is talking about the same tech today.

Odds are if multiple studios are talking about it this years and not just one, the tech is maturing.

The studio cutting the edge may not really be telling you the true story.

I have been on the bleeding edge and I have scars to prove it.

Now that you have your list of alternatives

I generally work on the buzz worthy option first,  
and I fill up my do nothing as I lament about the first  
then I cross check myself with my alternative options.  
This keeps me excited and focused

I will often fill these alternatives out of order with the template laid out.  
Because as you research it's easier to look up the answers for A vs B.  
Then to do each question in sequence.

In reality the priority doesn't matter,  
The biggest key is to treat all the options as equal.

So now we are ready to work on our CBA

For each alternatives you need to do a short introduction  
then you calculate the cost and benefits

finally you compare your alternatives with your analysis  
defining the best method.

So when talking to your investor you need to prepare a series of elevator pitches to explain what each option is beyond just a buzz worthy title.

Describe how the method/function works. Trust me no one will understand this more than you, you are becoming the paid expert. Keep it Simple, Laymen Terms

Goals, the unique elements of this method. What makes this alternative special from the other.

How does it resolve the current problem. What are you really trying to fix, the cause not the causality.

State the expected performance and outcomes. Duration, or calculations

Reference/Feedback who else is using this method, did you contact them, what were their comments or concerns. Has anyone else used this in production or called BS on it.

Do not make this a 20 page product summary. It is awesome to include references to other documents, or web links, but remember keep it simple.

No one has ever read all of Game of Thrones for this reason.

For those at indies or small studio you might not have to worry about these much  
for larger studios you may want to take these more seriously  
They may be outside your purview depending on your level  
so make sure you talk with the correct stakeholders.

We never work in a vacuum there are upstream and downstream dependencies,

so identify who cares about this work, and if you change stuff who and how will it affect them

Identify who will review the changes. Think of this as code flow or signoff.

You don't check in your code at Friday on the way out the door.

This may already be a standard document at the studio you can just link to it.

Acquisition Strategy,

Can you just buy the tech and plug it in?

What is the process to get approval.

Where is the money coming from?

This could be a standard studio process you can share a link with. I hate to say confluence is amazing for this.

Does it need a few tweaks to get it integrated. Houdini Engine is great but on a custom engine it means a whole different thing

How will the project be managed?

Who is the lead or the project owner?

There could be multiple owners for different parts of this tech.

High Level Milestones. You don't need to break out jira yet.

Is this a 5 year project or a 5 week project?

This may show, for example, that lower cost trades off against longer schedule.

Now we are ready to define the actual cost of this new tech by looking at several types of cost.

direct cost are the easiest to calculate

The amount of time you work on it is the gold standard

Photogrammetry has a lot of hardware and software cost for setting up the rigs and processing that massive amount of data.

Acquired assets can be turbosquid models, or api frameworks or patents you may need to license.

Indirect cost are not for the faint of heart,  
often they are calculated in lump sum adjust values by a studio.

The number of a 100K annual value I tossed out earlier is one of these.

It's different for each business, however 100K was the assigned cost at the R&H bankruptcy for the average wage of an employee from intern to senior, plus the cost of their benefits, workstation, the kitchen such as soda machine and tea.

The microsoft and google may calculate that at 250K even.

A good way to practice this is to figure out do you need a full time or part time producer? do you need studio based IT? How many people do you pull into the big fancy meeting and burn their time? How often do you go to the coffee machine?

Intangible cost cut at the heart of the matter

Does your tech take 3 to 5 minutes to iterate on 1 128x128 tile in a 10K world

causing your artist to press a button and watch youtube & netflix

does your tech stink so bad, the artist hate working with it, because they can draw it in photoshop in 5 minutes, yet it takes a day to do it in the engine

does the ability to make quality art stink soo bad that you can only produce art like it is 2010 and not 2020?

did you make such as bad decision as to why there are no female characters in the game, because you made a "male specific" rig. Causing your studio to receive blow back, and needing to spend hundreds of thousands on marketing and internal team meetings because of a rig...

Perhaps your pipeline is so bad you need to work stupid crunch in order to ship, then the rest of the indursty knows your a crappy studio to work for, rising cost in hiring to replace all the people you burned out.

This is the long term outlook on this tech, especially the do nothing approach.

What does it cost to add additional features

Can third parties integrate into your API. Do you even have an API? Will your pipeline slowly rot, or do you need a babysitter to maintain the tech into infinity.

Is this 1 year old, 5 year old, or a decade old tech? Are you just patching an engine way past it's prime.

Benefits is the human factor that separate a CBA from a ROI

Art and quality of life are very subjective and human factors,

You can not define them directly, but you can appropriately define their value by looking at external factors.

At a small studio some tech changes can make huge increases. The bigger the studio a lot of people do not have an oversized impact in direct benefit.

Did you go procedural and were able to create more content?

Did you change how microtransactions work to get higher click through?

Maybe your engine change so you can hit more platforms, or you change your renderer to hit Universal or HDR content?

Indirect benefits in tech art are sometimes the most measurable for us

This is often tech that can create more content.

Did you increase worker productivity 10x so they can create more assets each week.

Did you decrease the amount of work so much you don't need the extra artist or the out source company?

Did you take that 3 minute per tile cook down to seconds? eliminating hours of youtube time?

Of all the intangible benefits I prefer the Thank you to me that is priceless. Someone makes a change and they say thanks

Also you fixed that annoying bug, and customer are happier

Your tech changed the playing field and now you took over larger market share

Or you reduced crunch and can pop off games faster now.

Analysis is the last part of the CBA.

This is where through simple graphs due to all your background work that you compare apples to apples

With all your questions answered,  
you can take those findings and add them into a spreadsheet.

This is the same task as a producer scoping a sprint, but with time being converted to money in the end.  
Make sure you compare alternatives across a relevant time period.  
Work done in the past does not count beyond the start.

This could be something as simple as making sure the cost of plugin are all in USD

Time and discounting are for longer term projects with significant costs

This applies a rate to the cost to normalize them to the present value

In short it is a check on inflation.

Say you implement a HDRP pipeline now as opposed to URP, but the tech won't be used until the next console.

You may have increased the number of consoles you sell in the future

but you need to compare that cost to the number of consoles you sell now.

For instance the cost of a gigabyte of ram now is significantly less than ten years ago, so you are adjusting for that change.

Calculating risk is another big studio long term project outline.

With all big choices there is a level of uncertainty in the task.

Say your lead programmer leaves that was working on your buzz worthy tech,  
and it will take a few months to replace them, or you have a dark horse programmer in the wings and don't skip a beat.

The longer and the bigger the problem the higher this chance is. Sometimes it is better to take a less risky option with lower returns than a high one.

Maybe don't rely on one golden programmer, use two or there you might add to your cost, but you can eliminate the risk.

You can even go to the point wherein you can do a sensitivity analysis on this risk.

My favorite, is if you are going real deep in to calculating risk is you can apply the Monte Carlo method, to get a great distribution of risk falloff.

Watch out for the Fake news.

Once a CBA becomes a series of numbers it can be easy to swing the values to a predetermined opinion.

I would encourage the stakeholders to define all their biases up front.

For instance in one case I was told on a project our team lost a company 7.5 million over the course of a project. You could tell this number was BS because first they did not want to show you the analysis. If someone ever hides the analysis you should be cautious right away.

Also if we only cost the company a certain amount how much was the benefit weighed against.

There are legitimate reasons to not show a CBA to just anyone, for instance if they accurately report worker wages, but in most studios this is an aggregate value.

For instance one company quotes a \$250,000 per a year cost for any staff because it includes all employee benefits and the cost of your desk and all incidental cost like HR, cafeteria subsidies etc.

So if you just do a simple calculation of a team of 6 for 5 years working full time that number adds up. Also if you consider there was no benefits then it would be a total loss. However if you consider that maybe they never had 6 people working on it at one time and some people only worked on it for say a year or a few months. Then you can call BS on that figure.

The simplest way to evaluate the total benefits versus cost is a simple ratio

I recommend using a percentage based pie chart as a visual guide.

Benefit over cost, if it's higher than 1 it is good.

The highest value is often better when the comparisons are similar, or if money is no option to the investor

so make sure to look at the total investment needed.

The benefits cost ratio has identified that the buzz worthy tech as the best alternative.

However, cost of opportunity identifies what you are missing out on.

In a sense it contextualize what you are missing out on by choosing one option.

Perhaps you have another product down the road that this may not be good for

Perhaps the staff is best used elsewhere

Say you have two choices with GPU purchase plans,

one buys them now at brand new cost,

the other waits a year for the price to drop

Was the work you could have done worth the price of that drop

You can look at this as a final self check, that you can roll back into your decision tree.

This is the simplest analysis extract of the CBA.

This is a summary in review that is presented to start the discussion.

It is a 1-4 rank of each alternative and the reason for ranking.

This does not necessarily line up with the BCR, because we checked against opportunity cost and found that outside the box tech is not necessarily for this brand of product.

Based on your analysis you now have to make the best choice.  
You need all parties to agree in writing what that choice is.  
If they don't agree on certain points write it out.

A CBA can be very fragile as it is built on a lot of assumptions as  
you have not actually done the work yet.  
So if info comes in that changes the factors then update it.  
Say a company buys that plugins and gives it for free,  
or instead increases the cost 10x.  
or buys a plugin and shuts it down like stingray, or fabric engine.

In order to get this stakeholder buy in there are three main ways to present it

First is to get local buy in from all the stake holders. Do the eg work talk to each person in person or virtually before hand.

Second is the CBA document that represents your data

The third is a presentation of this data, because very few will read the actual CBA.

The CBA document itself is your research. This is the actual proof to show.

It should be shown to as many people as it came be.

For some larger corporation due to the dollar figure placed on people this may be kept about a certain level.

There is a lot to be said about truth in transparency, but there is also a lot to be said about keeping the secret sauce in house.

However the CBA document itself will honestly not be read by many.  
How many people actually, Read the Docs?

The slide deck version is how you actually present this research to the most people at one time.

Do this after the leg work of each stake holder. Do not surprise them in a meeting.

When you actually present, present it in reverse of you researching it.

Present your discovery first. In science this would be the hypothesis, but we are going to throw that out for the sake of presentation, people only care about the facts and why at the end of the day, not how you got there.

Make sure as all ways Keep it simple with lots of lovely graphics  
If you are working on a visual technology show it.

For anything important like product specs include a reference in a pdf version.

Never show any lines of code, that is the death of most presentations.

I would like to thank you for watching my virtual GDC talk.

If there are any questions feel free to reach out to me with e-mail or slack.