



**CG Production Principles:  
Keeping Your Money On The Screen & Off The Floor**

Kevin Geiger  
 President & CEO  
 Animation Options LLC  
*kevingeiger@animationoptions.com*  
*www.animationoptions.com*

## **COURSE DESCRIPTION**

How much of your money makes it onto the screen? Got a leaky pipeline? Is your workflow trickling? Does your team approach their work like a film, or like a science project? Are you paying your brain surgeons to dig ditches? Can you roll with last-minute story changes? What economies of scale do you employ? Are you satisfied with your production environment in terms of relationships, communication, adaptation and high-quality delivery?

The global animation industry is as competitive as ever, with merciless markets, unforgiving audiences and increasingly lean profit margins. Yet independent and major productions alike seem content to burn through money (and people) as though they have resources to spare. This sort of waste is so pervasive in our industry that it is routinely acknowledged with a winking “you-know-how-production-is” acceptance. However, it is not only irresponsible... it is unsustainable. It is also easily addressed through insightful, considerate and fearless assessment and action.

*"CG Production Principles: Keeping Your Money On The Screen & Off The Floor"* squarely addresses common production motivations and pitfalls. The course first examines the human factors and organizational considerations that are the foundation of all production (dys)function. It then proceeds to cover workflow considerations and strategies, the establishment (and erosion) of balance, common heuristic assumptions/errors, and the importance of clarity and adaptation within the studio environment. A series of “Golden Rules” for production lead into the characteristics of a balanced pipeline, an overview of a flexible and robust non-linear production pipeline, and specific departmental examples. Finally, asset management is reviewed with an eye towards organization, flexibility and transparency.

The presentation concludes with a micro/macro view on the production paradigm, and the synergistic orchestration of these parts into a transcendent whole.

You will never look at your pipeline or your studio the same way again. You have options.

## **PREREQUISITES**

A working understanding of CG production processes and terminology.

## **INTENDED AUDIENCE**

Artists, supervisors, managers, producers, and executives.

## **SYLLABUS**

### **Welcome (1 minute)**

A general welcome to the course.

### **Introduction (4 minutes)**

The introduction addresses the common production motivations and pitfalls that serve as an impetus for this course, and also provides an overview of the course structure.

- Motivations & Pitfalls
  - Money, and how to burn it
- Course Structure
  - Overview

### **Human Factors (25 minutes)**

This section addresses the human factors and organizational considerations that are the foundation of all production (dys)function.

- Organizational & Team Balance
  - Systemic organizational imbalances
  - Team balance characteristics
- Human Resources & Stresses
  - The pressure/performance curve
  - The counterintuitive benefits of breaks
- Leadership Considerations
  - The problem with control
  - Leadership vs. “management”
  - Ships, and how to sink them

### **Production Principles (35 minutes)**

This section covers workflow considerations and strategies, the establishment (and erosion) of balance, common heuristic assumptions (and errors), and the importance of clarity and adaptation, followed by a summary of “Golden Rules” for production.

- Workflow Considerations
  - What is “workflow”?
  - Workflow balance characteristics
  - Unfortunate workflow variants
- Strategy, Balance & Breakdown
  - S.M.A.R.T. goal assessment

- The blame game
- Deadlock & “Livelock”
- Surviving adversity
- Heuristic Pros & Cons
  - The benefit of heuristics
  - Common heuristic errors
- Clarity & Adaptation
  - The Porsche assembly line
- “Golden Rules”
  - “It’s a film, not a science project.”
  - “Don’t pass crap downstream.”
  - “No treasure hunts.”

### **Production Pipeline (35 minutes)**

This section outlines the characteristics of a balanced pipeline, provides an overview of a flexible and robust non-linear production pipeline, and then proceeds to delve into specific departmental examples and coverage of asset management.

- Balance Factors
  - Pipeline balance characteristics
- Non-linear Production Pipeline Overview
  - Serial vs. non-linear
  - Comprehensive non-linear production schematic
  - Variants
- Asset Management
  - Data and “meta” files
  - “Publishing” paradigm
- Departmental Examples
  - Layout
  - Animation
  - Character Setup

### **Conclusion (5 minutes)**

The conclusion summarizes the presentation with a micro/macro view on the production paradigm, and finishes with an example of the synergistic orchestration of these parts into a transcendent whole.

- Part Reflects Whole (Micro/Macro)
- Orchestration

### **Q&A (as allowed)**

## INTRODUCTION

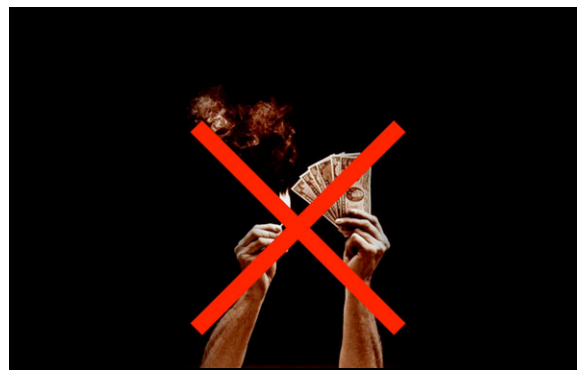
When embarking on a CG production, what we all want is to create a great work of art, but also to have some coins in the coffer when we're done.



All too often though, this is what happens: we burn through cash – not intentionally, of course – but often quite unintentionally.



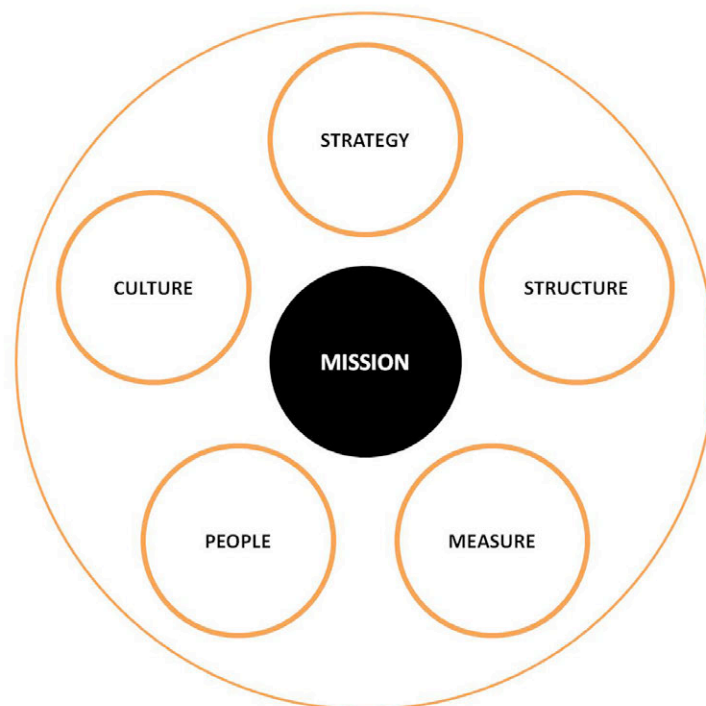
Clearly we want to avoid this as much as possible. To do so, there are certain principles to keep in mind as we undertake the journey of making a digitally animated film – most of which have nothing to do with CGI directly, but everything to do with the people undertaking the work.



## HUMAN FACTORS

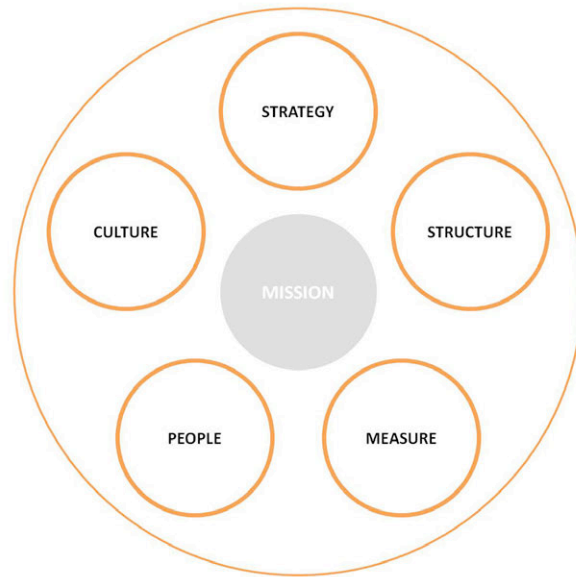
The great businessman John Foster Dulles said, “*The mark of a successful organization isn’t whether or not it has problems; it’s whether it has the same problems it had last year.*” How true. This isn’t about never making mistakes, and it isn’t about never getting into trouble. Rather, it’s about being clear-minded and insightful about the situation you’re in, in order to avoid *repeating* problems year after year. It’s about placing your organization on a highly productive vector.

We can think of a balanced organizational system (adapted from Yamashita & Spataro) as consisting of a central *mission* supported by the following aspects: your *strategy*, your *structure*, your *metrics* (for success and for growth), your *people* (human resources), and your institutional *culture*.

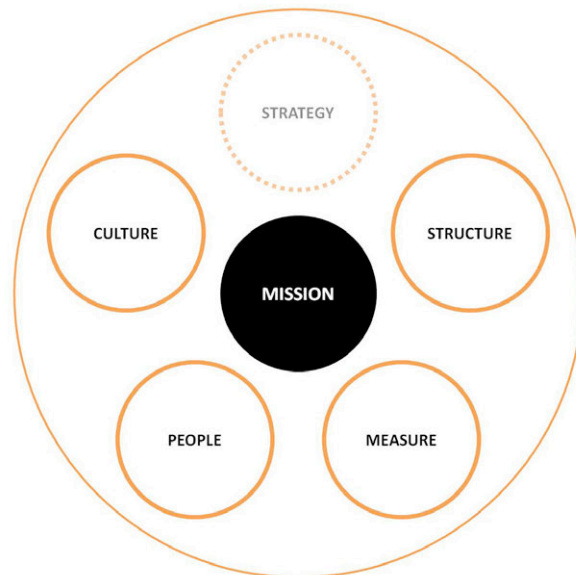


When these aspects are out of balance or are absent, companies and organizations can find themselves in various unproductive states.

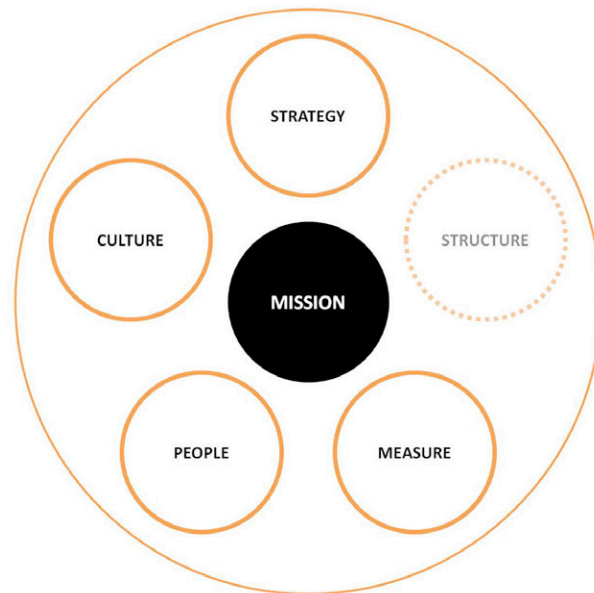
For example, if your central mission is absent, you have a state of *lifelessness* within the organization.



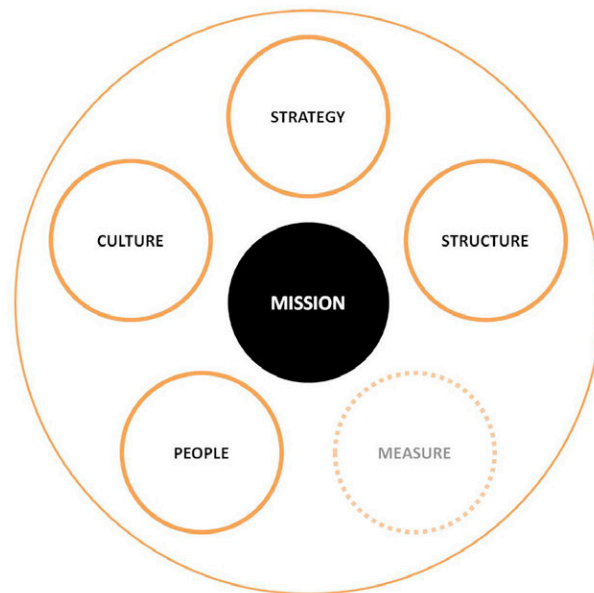
If you don't have a strategy (or if your strategy is weak) you're definitely in an *aimless* situation.



*Shapeless* is when there is no structure to your company. The other components are present, but disorganized. The structural bones are not in place for your organization.

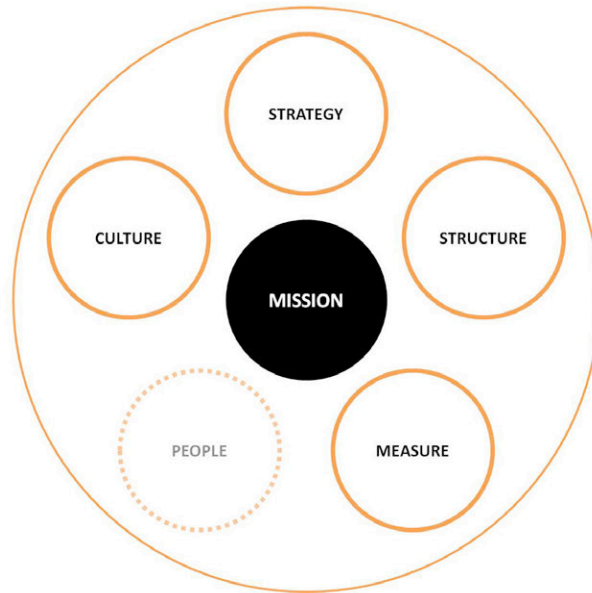


If there's no way of measuring not only the success of your films, but also of measuring how well people are doing within the organization (for compensation and advancement), your team may develop a feeling of *worthlessness* due to lack of appreciation.

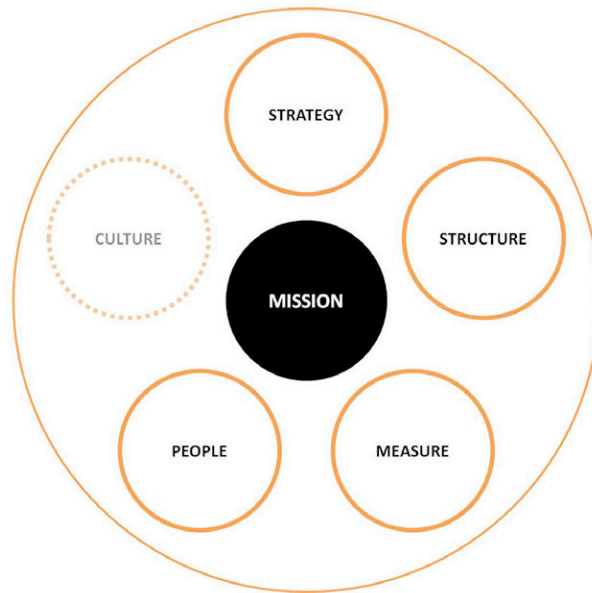




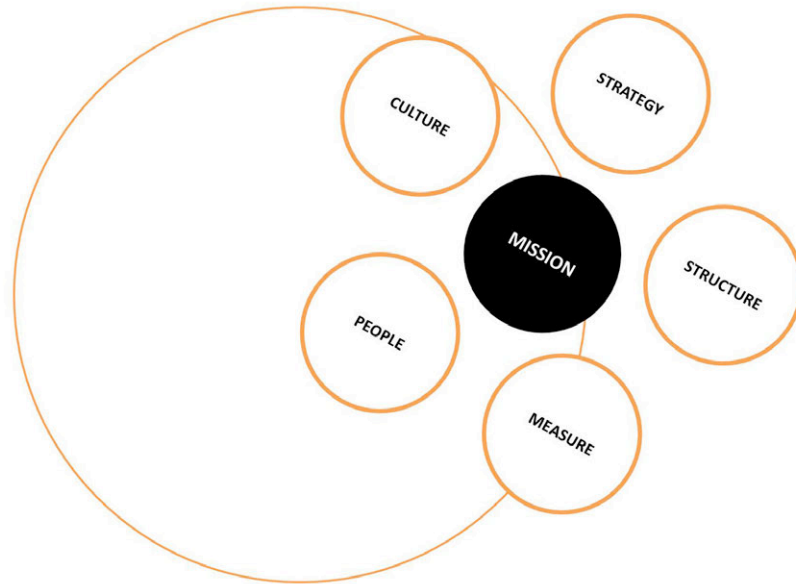
Where clear metrics are absent, we often see that problem. And if there is unrest within the ranks, you probably have human *resource* issues.



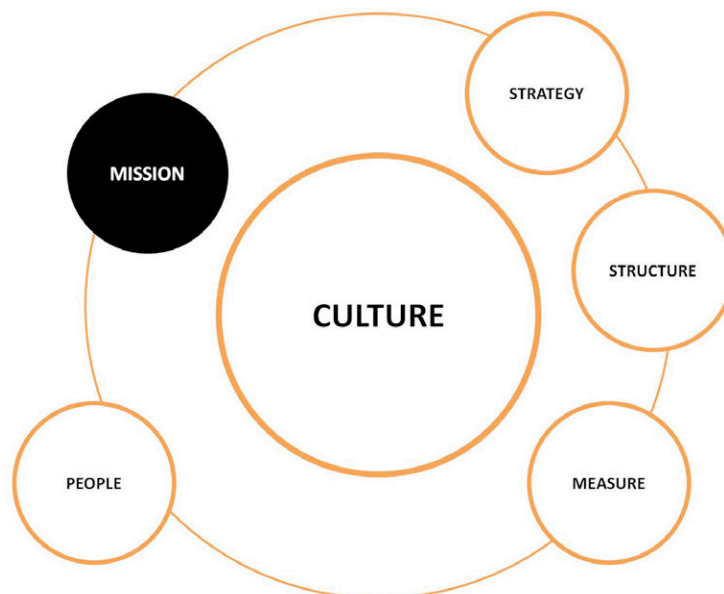
Finally, if there's no sense of institutional culture, (i.e. – “What is the identity of our company? What are we about?”), then you have the issue of *facelessness*. Pixar is a great example of a company that cultivates a very appealing institutional culture (at least to outsiders).



You also find situations where all of these elements may be present – and may even be in proper proximity to each other – but the entire organization is out of sync with the rest of the world. Perhaps it’s simply exhausted, having “done its duty”, and is now *adrift*.



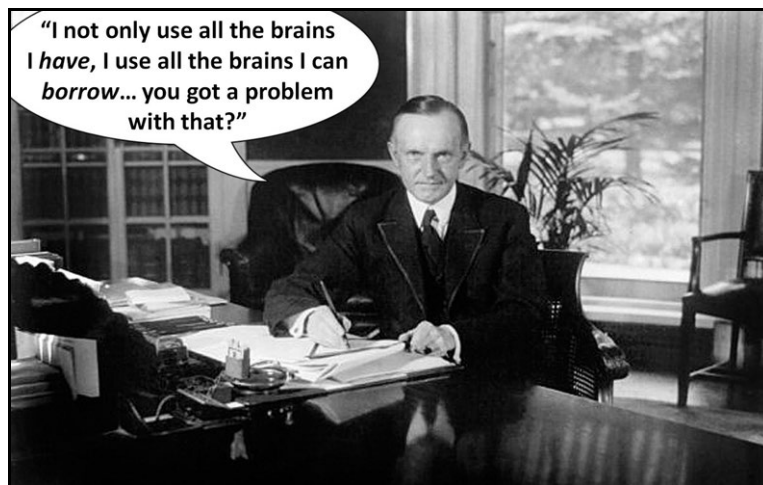
Finally, if one component becomes outsized and unwieldy, this can pose problems within the organization due to the resulting imbalances and constraints.



In any enterprise, PEOPLE are your most *expensive* and your most *valuable* asset. So, it's good business to cultivate them, support them, and utilize them well. Unfortunately, *this* is how many studios and production houses treat their workers:

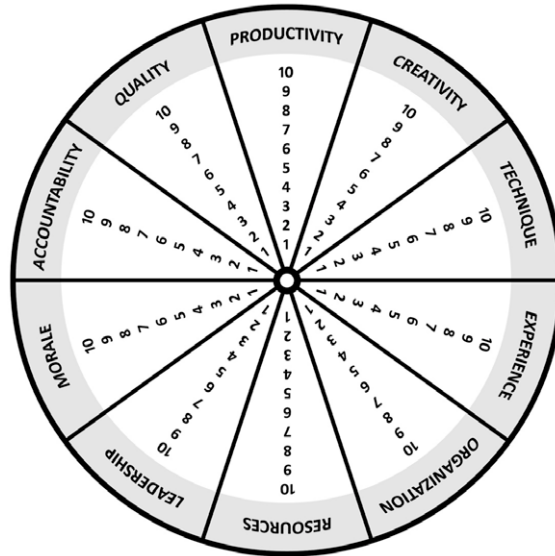


Like resources on an assembly line, the attitude is often that when they burn out you can just “pop ‘em out” and pop a new one in. It's in everyone's direct interest to avoid this as much as possible, and treat their crew members like the talented collaborators that they are. Woodrow Wilson, the great American president, once said famously:

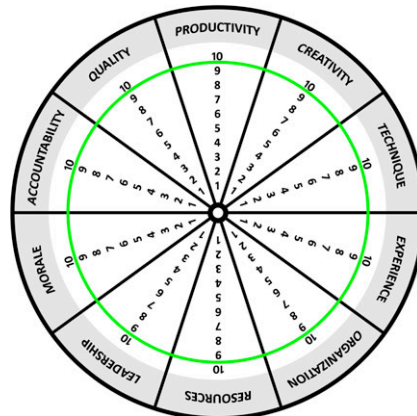
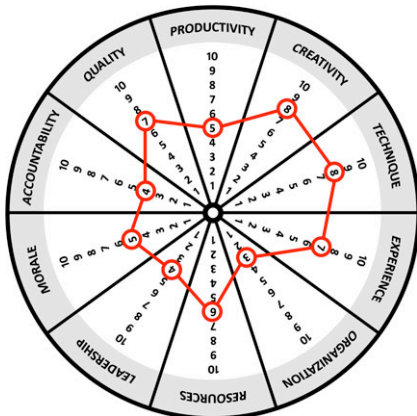


This is a very enlightened philosophy (even though I added that last part myself). As CG supervisor, I was never concerned with being the smartest guy in the room. My job was to facilitate productive interaction within my crew and coordinate the brains on my team (mine included) towards the objective at hand.

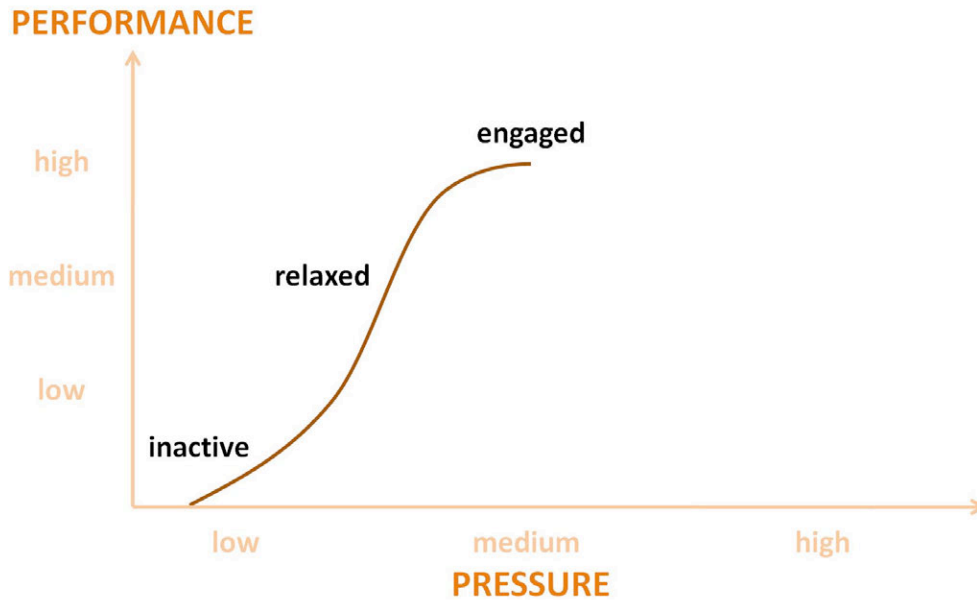
Here is a team balance wheel, a deceptively simple but extremely powerful diagnostic tool that I use with my consulting clients. This pie consists of little slices: *productivity, creativity, accountability...* all aspects of a healthy team. You can use this wheel to rate your team on a scale of 1 to 10 in terms of where those factors lie for you. In doing so you get a “vector scope” on the current health of your crew and your company.



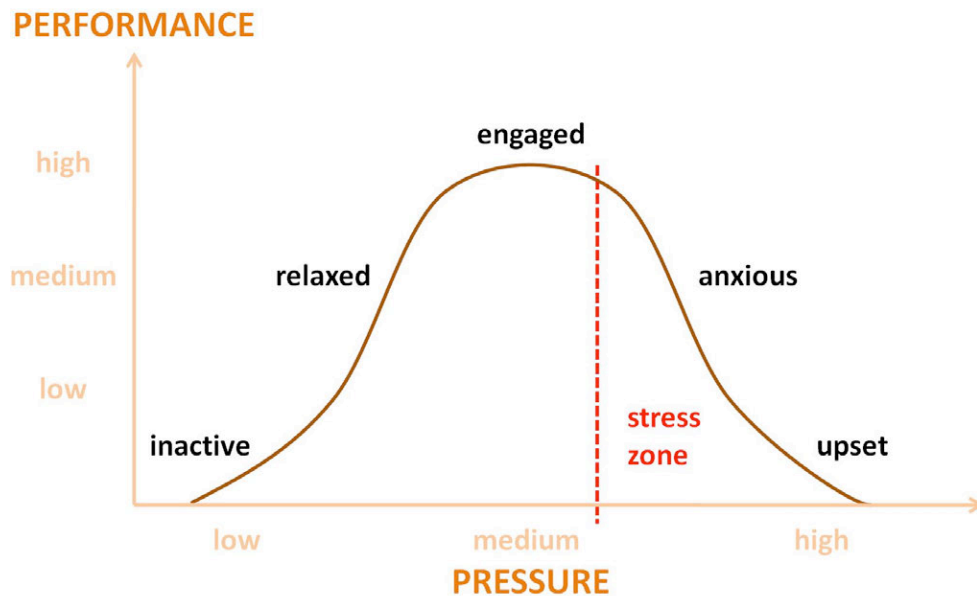
Ideally, you want the resulting shape to be a nice fat, round circle such as that on the right – pushed out towards the 9’s and the 10’s - as opposed to the irregular “clover” shape on the left. But there’s nothing to be ashamed of if you evaluate yourself and you’re “in the red”, as long as you know that the green is your goal. Awareness is the first and most effective step in transformation.



There's an interesting phenomenon where as pressure increases in any endeavor (in our case, digital production), productivity actually goes *up*. A little bit of pressure is healthy. It motivates us to pay attention, to apply ourselves, and that's all to the good.



Unfortunately, when pressure increases *too much*, we get anxiety, people become upset, and the performance curve begins to fall off as we move into the “stress zone”.



That's the place where *this* happens...



...where people get completely fried, fed up, and lose it. Anyone who's worked in production has seen this sort of this happen... or perhaps has done it themselves. ☺

Although cultural problems are the “cheapest” to address (you don't have to buy hardware and software to address them) they're ironically the most daunting due to the ingrained attitudes and paradigms we cling to. Here's a good example. Let's say you have an eight-hour work day (a fantasy, I know, in animation and VFX): four hours before lunch and four hours afterwards.



A study was conducted in which two crews of laborers were pitted against each other, performing the same task (moving bricks, in this case). One group worked straight through the day with a break for lunch, while the other group took ten-minute breaks every hour.

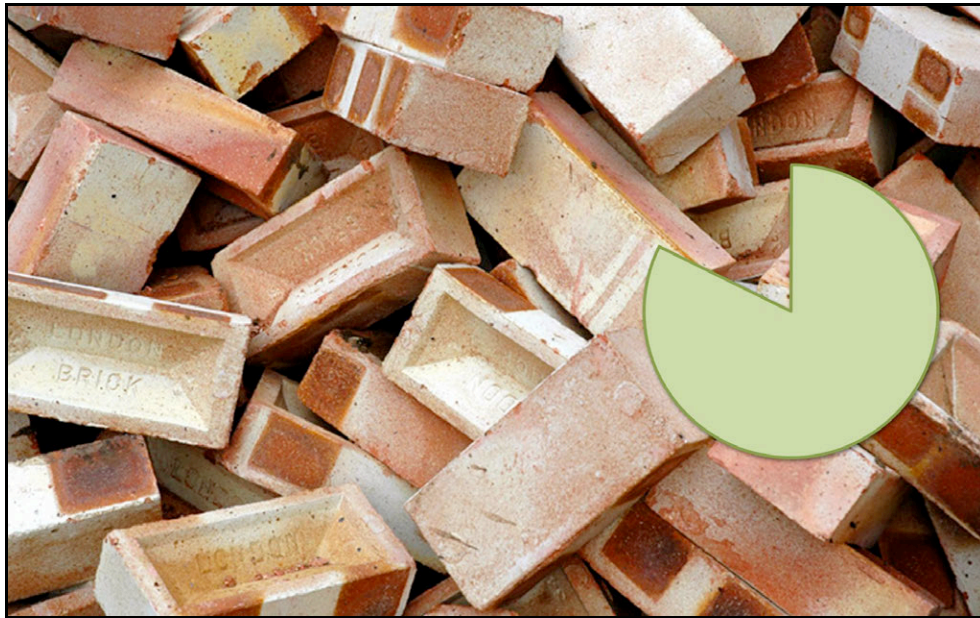




The crew that worked straight through the day moved a certain amount of bricks.

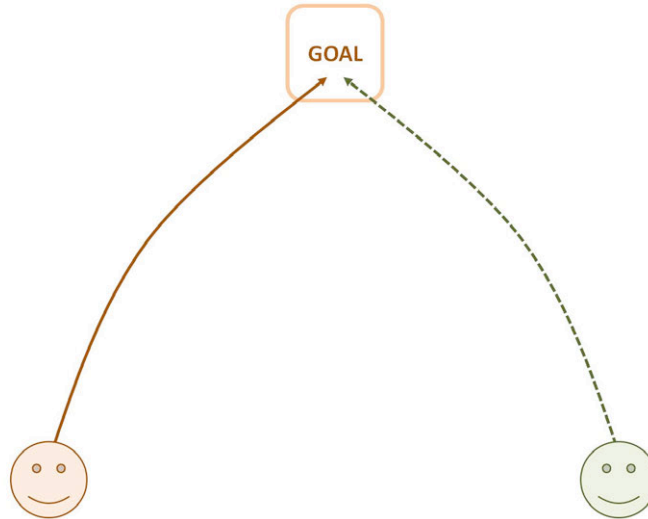


Remarkably, the crew that took ten-minute breaks every hour *moved more bricks* by the end of the day than the group that took no breaks, because they had time to replenish themselves. And this has been found to apply not only to physical labor, but also to people engaged in mental work.

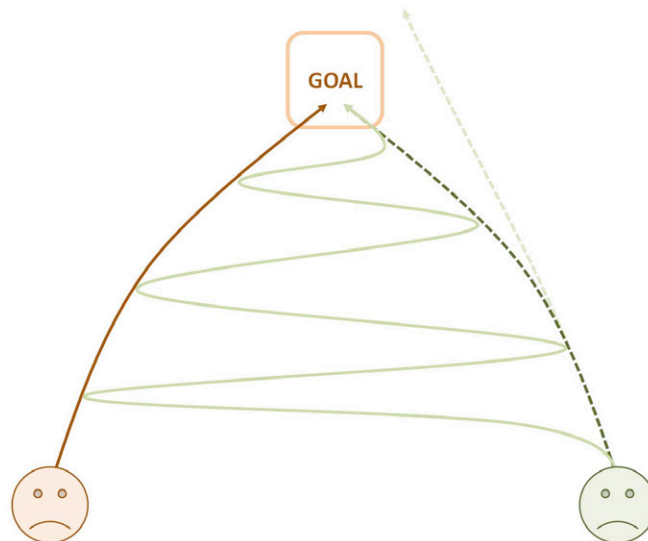


Nevertheless, when you present these examples to managers and producers, you run into those more often than not who reply, “I’m not paying people to do *nothing* for ten minutes every hour!” Even though the overall productivity as demonstrated is *higher*, they can’t get their heads past their preconceived notion of the need for their crew to be “busy” every minute. So, this is what we face.

Another issue is on the dynamics of collaboration when working towards a common goal. Our team leader is over on the left, and he's working with one of his crew on the right. They're both trying to achieve the same objective, but let's say that the crew member has a different way of seeing it, a different way of getting there.



If the team leader insists upon his own approach throughout the process, more time can be wasted through back-and-forth oscillation than if he trusted that individual to get there in his own way (perhaps even more effectively).



Of course, what the supervisor is worried about is his guy overshooting the moon – missing the target – or else falling short. So, a balance must be maintained between extending that trust and also making sure that the person who is charged with doing the work has a clear understanding of what needs to be accomplished, and when.



Otherwise, you have *this* on your hands. This is an intersection in Shanghai, and it represents how disorganized a show can become when there's not effective leadership.



So, let's examine the concept of leadership for a moment, in particular, the difference between being a "manager" and being a *leader*. By this comparison, I don't mean to declare that management is categorically "bad" – far from it. If you're reading this and you are a manager... great! We need good managers. But are you a *leader* as a manager? Or are you a "bean counter"? That's the question.



**A "manager"...**

- Controls
- Delegates
- Dispenses data
- Self-assesses
- Reacts
- Is emotionally disconnected
- Uses left-brain analysis
- Focuses on problems
- Reaps rewards



**A LEADER...**

- Encourages
- Collaborates
- Shares information
- Utilizes feedback
- Responds
- Is emotionally intelligent
- Uses whole-brain thinking
- Addresses opportunities
- Shares rewards

Cicero sums it up best:

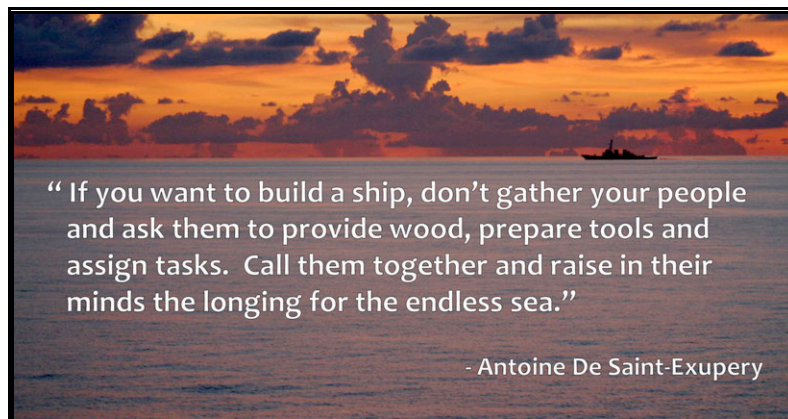
*“Be a pattern to others, and then all will go well: for as a whole city is affected by the corrupt passions of great men, so it is likewise reformed by their moderation.”*

Otherwise, you’ll have people saying this about you:

*“He’s some respected shithead dork guy.”*

(An actual reference to a well-known VFX supervisor, who shall remain anonymous.)

I hate motivational posters, but I ended up making a few for this presentation. Go figure. This is a really great quote though, because the *least* effective way to inspire people is to talk about the nuts and bolts of what has to be done. The *most* effective way to inspire people is to illustrate the mission and the vision.



Of course, poorly-built ships are indistinguishable from well-built ships in calm waters.



When you're setting up a production pipeline, you don't really know what you have on your hands until you're *in* production – when you're in the midst of things, a ton of data starts flowing through, and the pressure's on - much like the situation with London Heathrow Airport's computerized baggage handling system. They said, "Hey, we've got this great new system for baggage, it's going to work like a charm!" And as soon as they started running the goods through at full tilt, the whole thing broke down and sent luggage every which way. They thought it was a well-built ship, but found out otherwise... the hard way.

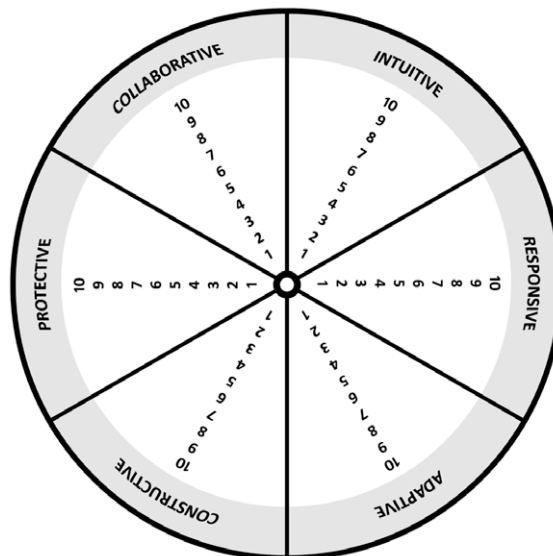
## PRODUCTION PRINCIPLES

A production is about *relationships, communication, adaptation and high-quality delivery...* and so are a pipeline and a workflow. The PART reflects and influences the WHOLE.

The word "workflow" is a combination of "work" and "flow":

$$\text{WORK} + \text{FLOW} = \text{WORKFLOW}$$

This concept is simple, yet so many workflows don't work, and certainly don't flow. There are six key aspects to a healthy workflow.



A good workflow should be *intuitive*. It should be *responsive* to the artist. It should be *adaptive* (able to accommodate different approaches). It should be *constructive* (wherein data is

constantly building on itself). It should be *protective* (meaning that there are backups and safeguards for keeping artists out of trouble). And it should also be *collaborative*, allowing artists to work together well.

There *are* some unfortunate workflow variants, however:

- CORK flow:** hampered by bottlenecks
- DORK flow:** non-intuitive and over-engineered
- FORK flow:** confusing choices
- MURK flow:** disorganized and opaque
- QUIRK flow:** idiosyncratic and unstable
- PERK flow:** benefitting some at the expense of others
- PORK flow:** bloated and inefficient
- JERK flow:** designed by knuckleheads

When working on a film, it's not usually clear exactly what you're going to face. So how do you plan for uncertainty? It seems inherently illogical. But there are three aspects with which to get a handle on this: *anticipation* – what might happen, *preparation* for what might happen, and then *action* – saying, "Here's what we think is going to be the case. Here's our plan. Here's our backup plan. We're all holding hands on this. Let's go!"



Now there are some people who are gifted with great resources, but make horrible choices. Production studios by-and-large have all the resources they need: they've got the hardware, the software, the people and the money. But the choices being made are not necessarily the



wisest or the clearest. It's really important to think those choices through, and also to prepare for the fact that you may not be right. And what is your fallback plan going to be if you are *not* right? In short, you need to:

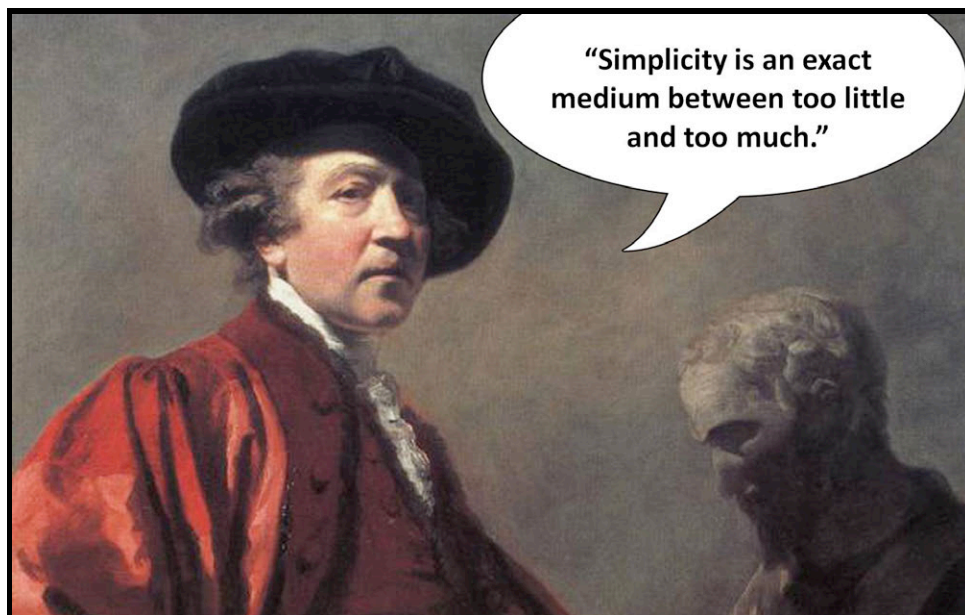
**Begin with the end in mind.**

Think about what you want to achieve, and then work your way back from that. There's a system that is used in performance coaching called the "S.M.A.R.T. goal checklist":

**S.M.A.R.T. goal checklist**

- ✓ Specific
- ✓ Measurable
- ✓ Achievable
- ✓ Reasonable
- ✓ Timely

With any undertaking you want to determine: do we have a specific goal in mind? Is it something we can measure? When we get there, will we know it? Is it something that's achievable? Is it something that's *reasonable*? (The difference between "achievable" and "reasonable" being this: "Can we get this film done by March?" "Yes, that's achievable." "Can we get this film done by March without killing everybody on the crew?" "No, that's unreasonable.") And finally, your goal must be *timely*. Working towards a deadline focuses the mind.



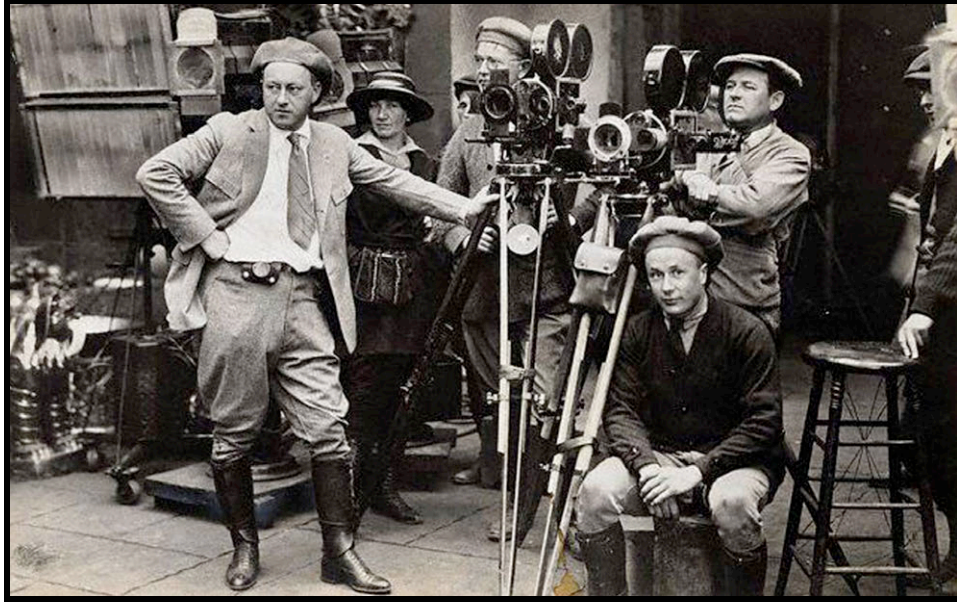
An efficient pipeline is clean, balanced and well-regulated, with work flowing smoothly from end to end.



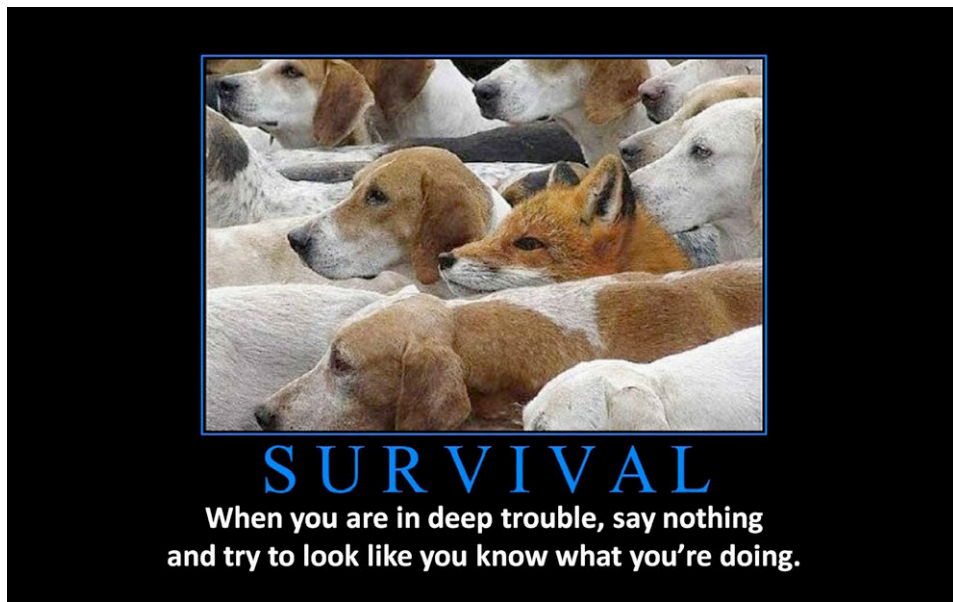
When a pipeline breaks down, the first thought in people's heads is usually this:



Meanwhile, production is at a standstill waiting for you to solve the problem, and the pressure can be extremely intense.



Here is a great take on the situation:



Hey, it worked for Frodo and Sam in Mordor. ☺ And it is all too often the reaction that people have in the midst of production “disasters”, finding themselves in this state “frozen” state:

**DEADLOCK**  
**Can't move.**  
**Can't think.**



But what is even more common in production is *this*:

**“LIVE” LOCK**  
**Moving...**  
**...but can't think.**

With livelock, you're under pressure to do *something*, so you just start acting. But you're not processing anything at this point, you're merely churning... and this is where the money can really start to burn.



So it's really important to keep cool and concentrate on the three points of surviving adversity:



The first is *centeredness*, collecting yourself and thinking, "Ok, I'm trained for this. I'm a professional. I've been through it. Even if I haven't done this *exact thing* before, I can face this.

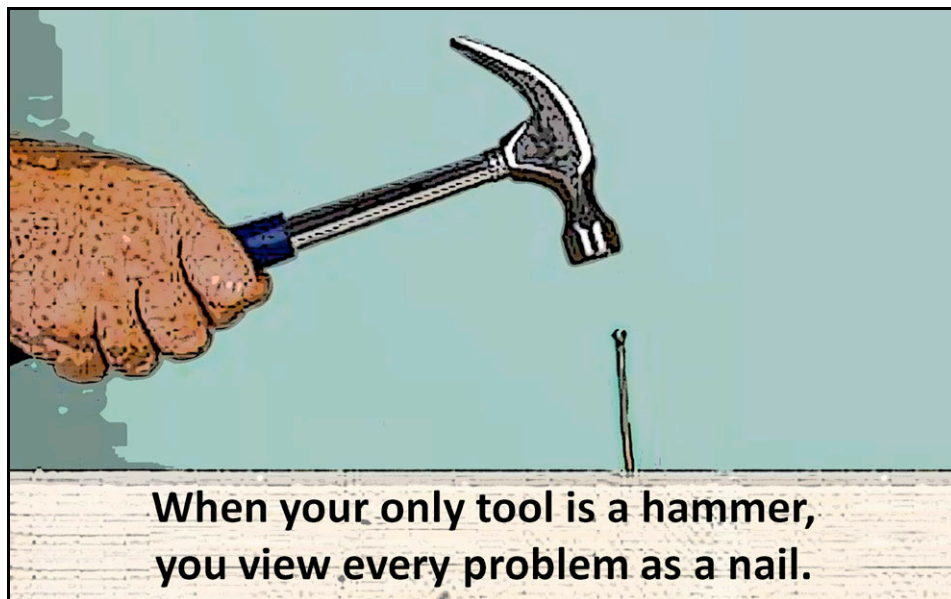


I'll figure it out." *Alignment* is making sure that you're aligned not only within yourself, but also with the people on your team and with your production in general. And finally, a good sense of *humor* never hurts. In fact – a "bad" sense of humor doesn't usually hurt either. 😊

Being fearless is pretty scary, and when you jump off that cliff it's important to leap together, with faith in your preparation, your team and your objective.



Now let's address some issues on the front of perception, or *preconception*.



If you have certain ways of approaching things, you tend to view the problem at hand as being related to your tried-and-true solution. Here is a great example of how we can get stuck in our preconceptions. Can you tell what the relationship is between these numbers?

**8 5 4 9 7 6 3 2 0**

You might look at these numbers for a very long time before you arrive at the answer (or at least, *this* answer): they are in alphabetical order. While people usually attempt to divine some mathematical relationship between the numbers, once you make a lateral move to another logic system, the “non-intuitive” suddenly becomes obvious.

This brings us to *heuristics*. Heuristics are simple rules for making decisions and solving problems – “shortcuts in thinking”, essentially. Heuristics are generally good: we utilize them, and they have their place. They can be inherent or learned, and they work well under most circumstances. But they can unfortunately result in systemic cognitive biases (which is a fancy way of saying “preconceptions”).

Some common heuristic errors...

**The anchoring error:** drawing premature conclusions based on the first piece of information, and holding to those even when contradicted by subsequent findings

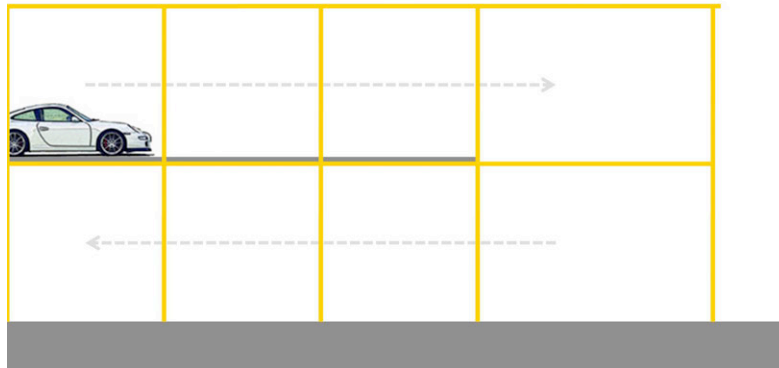
**The availability error:** mistakenly applying mental models and conclusions from apparently similar previous situations, based upon findings in the new situation

**The attribution error:** using the information to make gross generalizations confirming what you already “know”

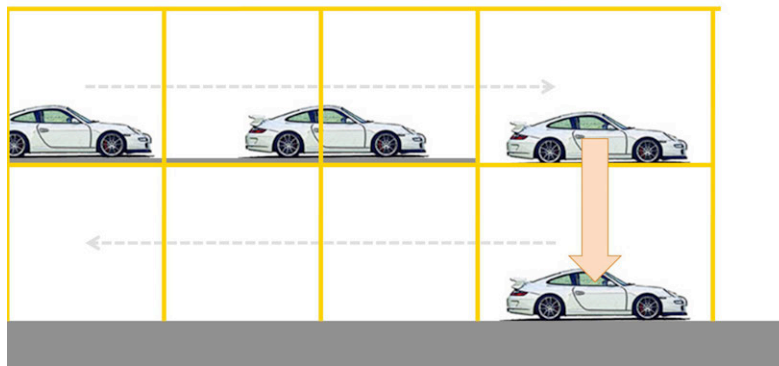
I often see these in action with my consulting clients. Some will say, “We know what our problem is. It’s *this*,” and they’ll haul out data to back up their conclusions (which they may seem to be more interested in validating than challenging). While this might be comforting on some level, it is ultimately a disservice to the goals that they are trying to achieve.

So, it’s really important to be clear-minded on the following: what you *want*, where you *are*, the resources you *need*, and the need to *adapt*... to keep changing, moving and growing.

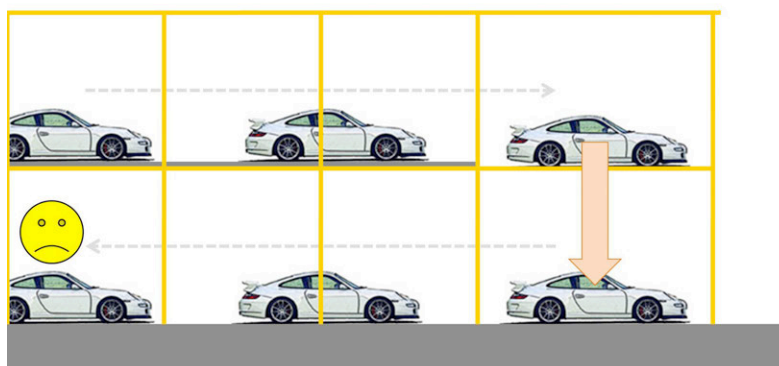
At the Porsche factory in Germany they have a remarkable two-story production line.



The cars move forward on the upper track, they drop down...

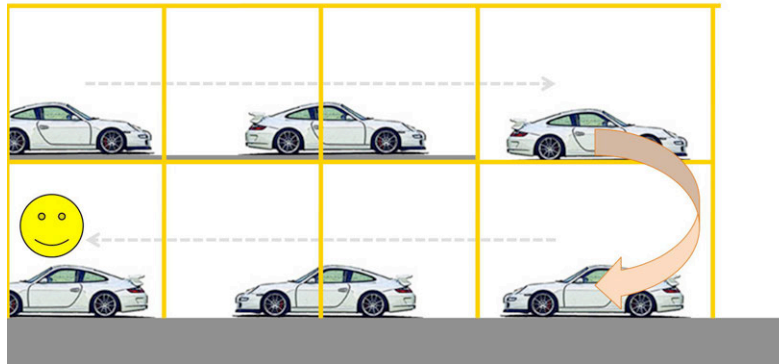


...and then move backwards along the lower level.



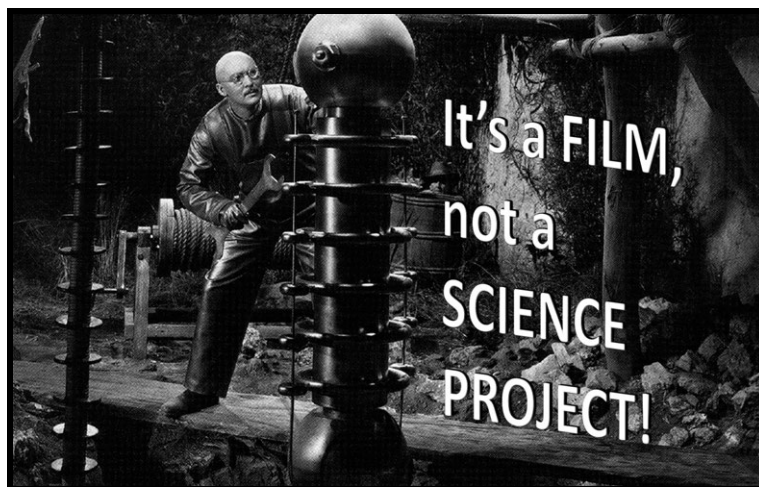
The reason for the unhappy face is that, on the portion of the line where the cars are moving backwards, more mistakes are made on each vehicle than on the portion of the line where they are moving forwards. The workers are more likely to get out of kilter with the orientation of their work.

What Porsche did is very smart, very simple, and works very well: *they turned the car around when they lowered it.* When it descends from the high level to the low level they actually *rotate the vehicle.* Now as it's moving on the lower part of the track, the car is facing the "correct" direction, and there are fewer mistakes.



Now, it takes 5 minutes to rotate the car. Porsche makes about one vehicle an hour, and each car is worth on average around \$100,000 USD – so that 5 minutes is expensive. But the overall savings of rotating the vehicle and having fewer mistakes on the backend outweighs the short-term hit Porsche takes in one part of the production. Similarly on a film, there are cases where a sacrifice in one area is to the greater benefit of the production as a whole.

At this point, I'd like to cover three principles regarding digital production. The first of these is that...



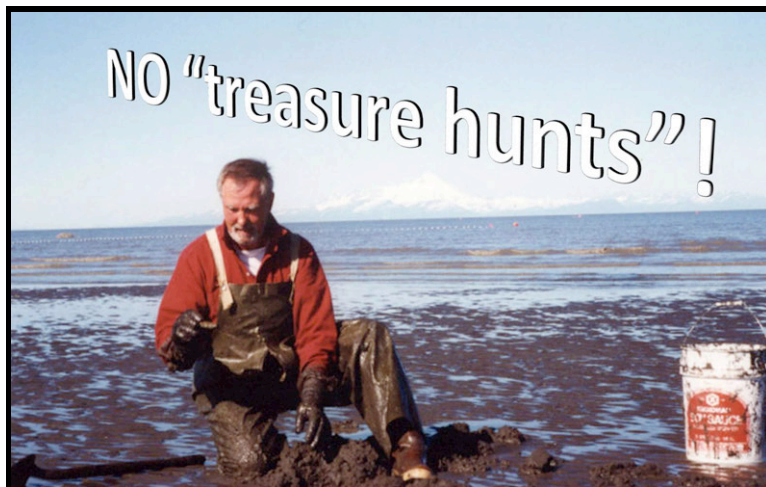
It's easy to get caught up in the minutia: "Oh, I've got this really great forearm roll - you've gotta see it! I've been working on it for months." That's great, but if things are looking good onscreen, the over-engineering that sometimes takes place is *not* necessary. It may make a

cool SIGGRAPH paper, but it's a waste of money if you're getting the results you need in other ways. There's a great history in live-action filmmaking of "cheating": hanging a sheet in the background, painting it to look like the street, and you're done. It's ironic how often that simple principle is not followed in CGI by folks who will create massive simulations to do something that a simple card could be utilized for, or that a more direct "hand-made" effect could achieve.

The second principle is...



Such a basic concept, yet violated constantly due to pressure, laziness and/or incompetence. Make sure that the work going from your department to the next department is sound. Have the folks in the downstream departments set the criteria for the technical checks on the data of the upstream departments. These simple measures have a major impact. And finally...





Proper asset management – making sure you have a system so that you know where everything is and people are using the right data – is crucial. You never want to be in a situation where your artists are wondering, “Where was that version of that thing that we had that time? Where’s my low rez proxy? Which one am I using again?” We want to eliminate that wasteful nonsense.

So, our pipeline needs to be *robust, flexible, efficient* and *transparent*. We want to make sure that we can accommodate story changes until the last minute. This makes some people shudder, but there *will* be story changes, even if you have a “locked” script. When you have your first public screening, you’re going to get notes and you’re going to want to address them if your film is to be marketable and do well. So we want to make sure that we can accommodate story changes on the fly without killing the schedule, the budget and the crew. Can we alter this character? Can we create a new character? Can we pull something out or put something in without having it devastate the production and people are running around with their hair on fire? Yes, yes and yes.

There must be *contingencies* at every phase, on every front. What is your “Plan B”? What is your “Plan C”? The head of digital production on “Chicken Little” would routinely ask me this. I’d say, “Well, I think we should do this.” He’d say, “What’s Plan B?” I’d reply, “Plan B is this.” He’d say, “What’s your Plan C?” I’d say, “I don’t have one.” And he’d reply, “Well, get one, because we’re probably going to end up going through Plan A and Plan B.” It always works out that way. Or, you end up with some combination of the three, so it’s a good idea to have those options. Just the discussion of “A”, “B” and “C” with your group gets the brain working in a way that will probably make “A” more successful.

Will your pipeline efficiently accommodate *re-do* and *same-as* shots? A re-do is, of course, a shot that needs to be re-done. And a same-as is a shot that is “the same as” another in some notable respect, within one or more departments. When you have a number of shots with the same lighting paradigm, the same camera work, etc... you want to blast those through your pipeline, leverage efficiently on the similarities, and use the savings elsewhere. So, if the director has a shot that he’s really in love with – where he wants the feather that is falling from a character to be *just so* – you’ve got the time and money to do that for him, as opposed to saying, “Sorry, but we burned it unnecessarily on something that doesn’t add screen value.”

This brings us to asset re-use and economies of scale. You’ll often find boutique studios that have done very successful short films and are embarking on their first feature, with the view, “Hey, how hard can it be? We did a 5-minute short, so it’s just 5 times 16... there we go!” They

don't necessarily anticipate or think through the economies of how that production pipeline is going to scale in a way that stays efficient as it grows larger.

Digital productions *incur costs which are equal to or greater than live-action* when assets are created without being deployed. When you create a model and that character gets pulled from the film, you've burned time and money on that. When you create a set in CGI, it's very similar to building a live-action set, and then having the director say, "Oh... we're not going to use that mountain top, we're going to use this one instead. Sorry." However, digital production *facilitates efficiencies that are equal to or greater than live-action*, when these are properly exploited. We're all familiar with CG characters whose topologies are kept the same but then reshaped and combined with different "accessory kits" in order to create a varied cast, leveraging heavily on the common base. This is the power of the computer at its best.

It's important that everyone in production understands how *the same decisions can become more expensive* later on in the process. The most important lines of communication on this front are the vertical ones: the executive, the producer, the supervisor, the manager, the artist, the assistant. Is everyone working together? Is everyone communicating and achieving a common understanding? If we do decide to march down the road of late-game changes, does everyone fully understand the impact and the consequences from top to bottom.

To this end, it's important to be able to evaluate work in rough form. Many studios are very smart these days about utilizing proxies, using 2D cards, leveraging on gaming engines to evaluate ruff environments – and then building only what is required so they're not over-engineering, over-constructing, over-painting and over-animating.

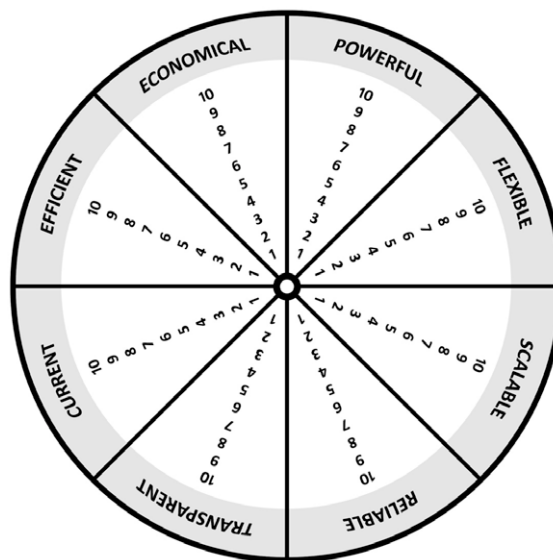


And this is ultimately so we can keep the “golden eggs” in the nest where they belong. It’s not just how much you make... it’s how much you spent making it.



## PRODUCTION PIPELINE

Let’s talk about pipeline balance. Your pipeline should be *powerful* and *flexible*. It should *scale* well. It needs to be *reliable* – something that won’t fail. (Or when it does fail, has a mechanism for recovery that gets you back on your feet quickly.) *Transparent* simply means that it’s clear: everybody has an unobstructed view on the pipeline at every level. The pipeline should be *current* and up-to-date... ideally cutting-edge. It needs to be *efficient*, where work flows through easily, and *economical* – inexpensive to implement, use and evolve.

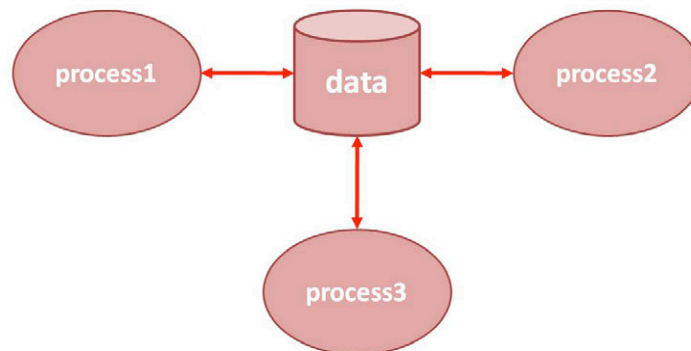




*Serial pipelines* are those in which one process passes data off to the next process, and then that data is in turn passed to the next process. A modeler builds a character and says, “Here you go, character TD.” And the character TD rigs it and says, “Here you go animator.” But each person waits in line for that piece of data, incurring idle time and a management nightmare.

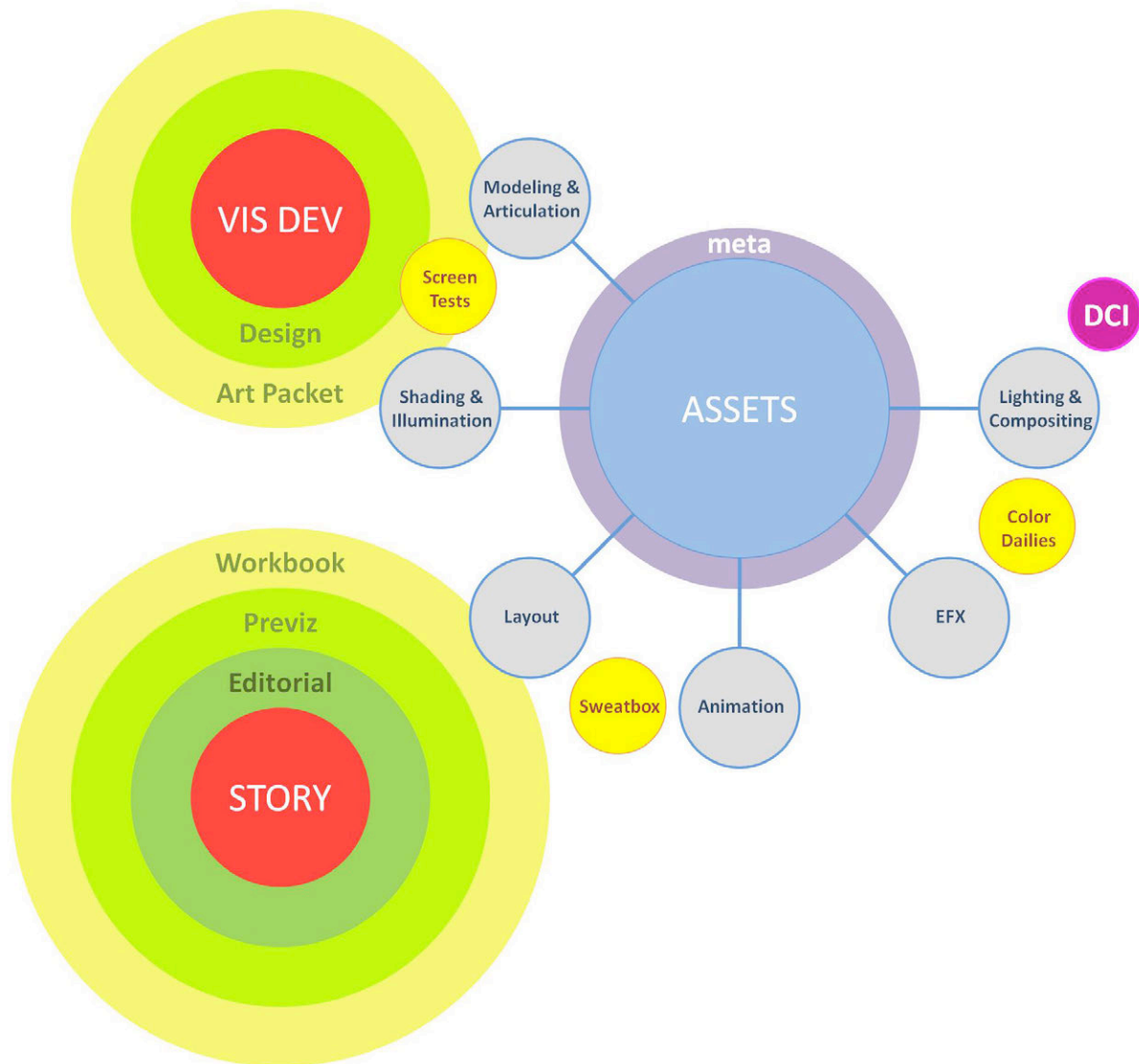


What's far more efficient is a *parallel pipeline*, where people working on those various processes are writing and reading data to and from a central repository - so production artists are working simultaneously. This concept is nothing new, and hopefully everybody reading this is at least familiar with the notion of a parallel pipeline, if not already using one. But I think it's a paradigm that can be exploited even more effectively and extensively than it has been.



On the following page, we're going to outline an entire non-linear digital animation production in one slide, rooted in the dual cores of *story* and *visual development*.



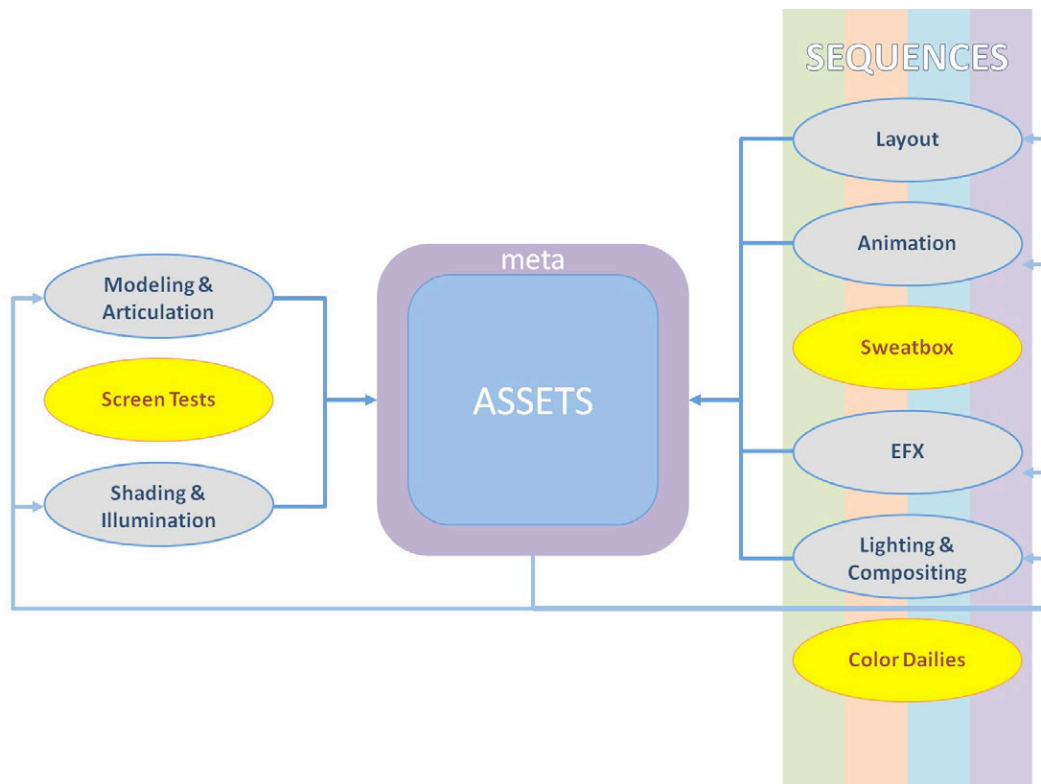


Rippling out of vis dev we have *character/set design* and the *art packet* (created for artist reference), and radiating from story we have *editorial*, *previz* and *workbook* (camera instructions, etc...). With respect to production departments we have *modeling & articulation* (rigging), *shading & illumination* (surfacing, lighting rigs, illumination models, etc...), then *layout*, *animation*, *EFX*, *shot lighting & compositing*.

These all feed into and draw upon a *central asset repository*, with a handy coating of *meta* around the “chew asset center”. 😊 The meta file is a text file that regulates, among many things: the proxies that you may be using, the different versions of data, the different levels of detail, different asset states, and so forth.

Interspersed you have your *screen tests* (a CG screen test is basically an asset test: you build your model, you rig it, you have the animator apply a little bit of acting to it, the director looks at the result and says, “That’s it. That’s my character. Good.”), *sweatbox* (the “hot little room” in which the director approves final animation), *color dailies* (where everything comes together: final color, EFX, etc...), and then *DCI*, (digital cut-in).

Because some folks have trouble mapping this non-linear representation against their traditional gestalt, I’ve supplied a more “linear” version of the production core below. You still have modeling, articulation and surfacing feeding into the asset core. These assets are read in by the shot departments. The shot departments write data back to the asset repository, and that in turn is drawn into the asset-producing departments. For instance, if the skinning team has built a physique for a character, and the animators find that the bicep is breaking down, it’s helpful for the TDs to pull those shots in and use them as a proving ground for fixing the problem. Production artists and technicians can read & write data simultaneously, building the show up together in a concerted fashion.



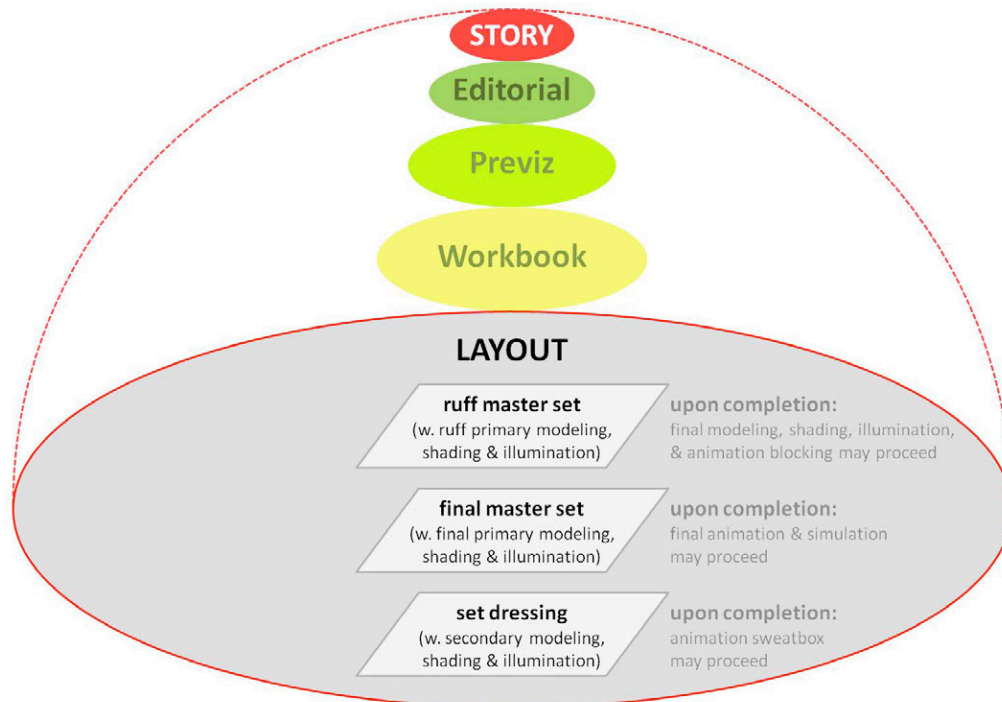
You’ll notice that there is indeed a linear progression that can be mapped to the departments on the right, and if your facility has the concept of “sequences” (groups of shots organized under a given aspect and/or supervisor) you can see how they would apply across those departments (each stripe representing one).

As far as file management goes, I referred to the meta which controls the data. Data are your asset files, while the meta are what we would refer to as “configuration” files: how that data is being configured, organized and mediated across the production. The meta files do *not* contain the assets. Let’s say you have a low rez and a high rez character, an old tree shader and a young tree shader, a morning lighting rig and an evening lighting rig, and so forth. The meta file tells your scene which of those assets to draw upon. So your animator can load a scene which the meta file configures to have the low rez character next to the old tree in the morning. What the meta allows you to do as well is make changes without opening scene files. So if you’re a layout artist, and you have 50 shots that you need to make a simple change to, a meta file affords you the leverage to do so quickly and easily (conceptually similar to file referencing). The meta file provides a flexible, compact, text-based means of addressing issues one level up. With meta files, an entire scene can be assembled automatically from scratch, or *re-assembled* as necessary.

There are different ways to label and track your work in your asset management system. Using a library metaphor, *draft* would be a work in progress – something that isn’t finished yet, but can be logged into the asset repository and utilized to the extent possible. *Review* means that the artist is saying, “I think this is ready.” So when the modeler puts a character into the repository tagged as “review”, she’s saying to her lead, “Please review for approval.” *Publish* is when the lead has approved that model as production-ready data. *Read* refers to the process of bringing that data into a scene through import or reference, and then *editions* are simply different versions of the data.

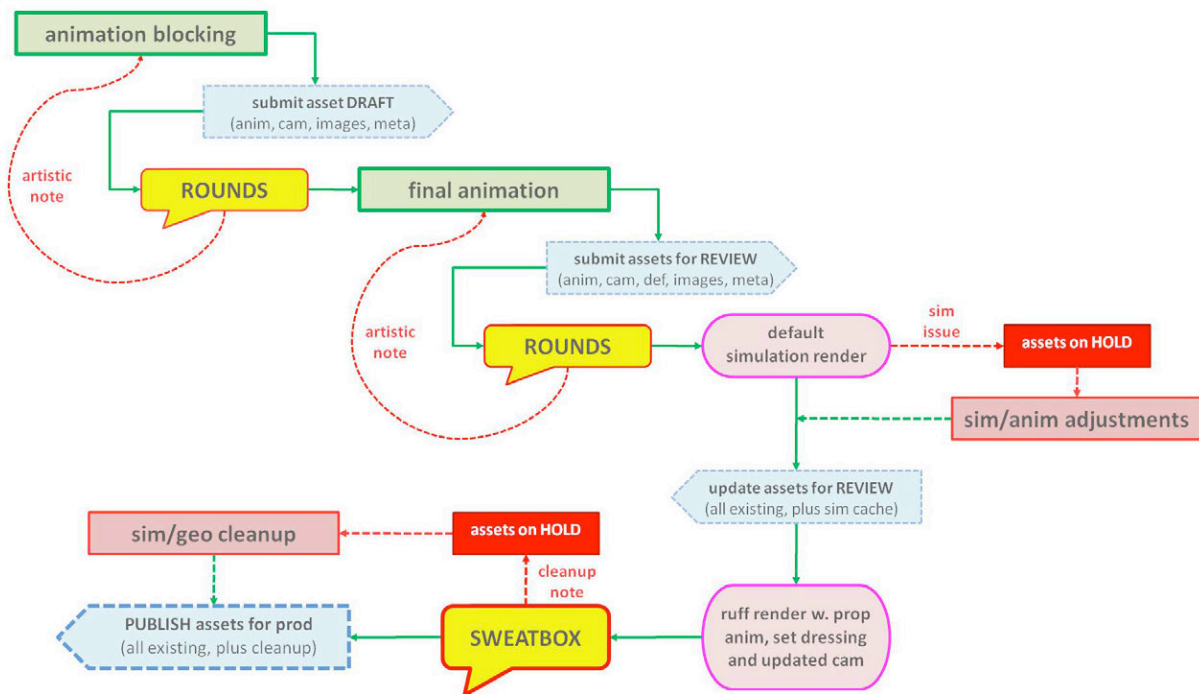
- ❖ **data:** asset files
- ❖ **meta:** configuration files
  
- **editions:** data versions
- **bookmarks:** internal file annotation nodes
  
- ✓ **draft:** work-in-progress
- ✓ **review:** ready for approval
- ✓ **publish:** production-ready data
  
- **read:** data access (import, reference)

Let's talk about organization *within* a few production departments, starting with layout. We have the story/editorial/previz/workbook chain that we saw earlier, but within the layout department itself, we can break things down even further. And this is an example of how you can facilitate a simultaneous workflow on your production.



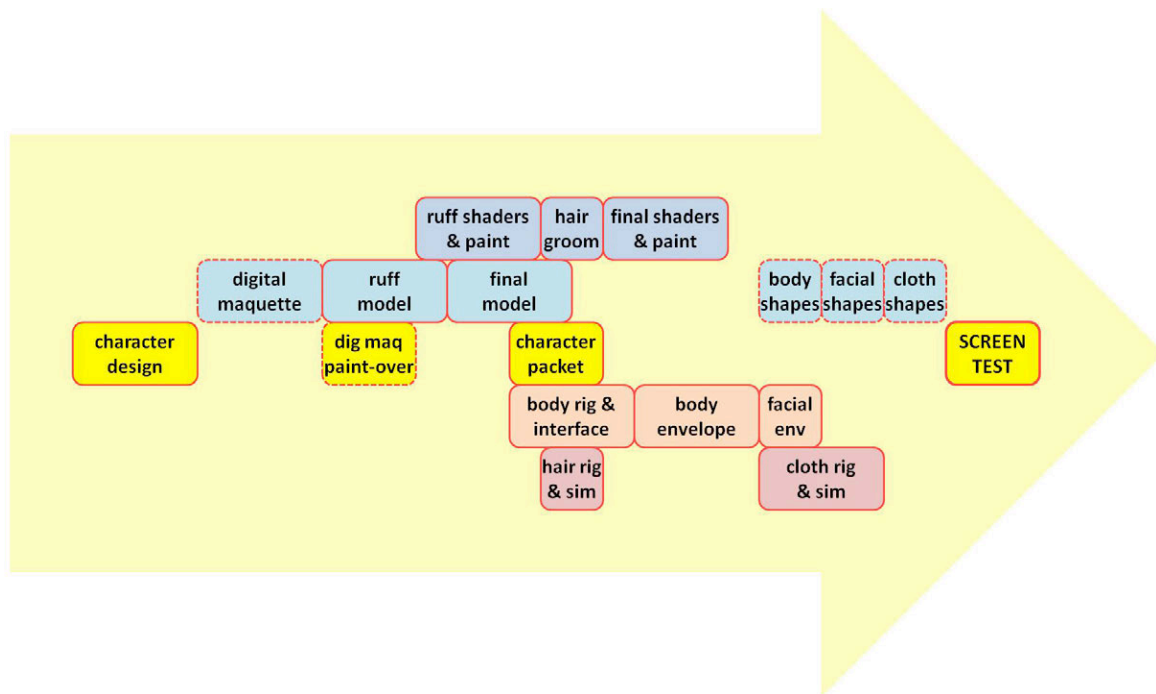
*Rough master set* is the rudimentary shot modeling: the surface I'm standing on, the table top (if I'm going to be touching it), shipped for animation blocking while the final prop models are being constructed. *Final master set* is the full deal: the actual bevel of the table edge, all of the level of detail that is necessary. If I'm gripping the table, I need a finished model of the surface so I can really register my character's hand to the element - not for animation blocking, of course, but for final animation in particular. After that, we're on to *set dressing*: including the lamp on the table that is never touched, the picture hanging on the wall, and so forth.

Now let's take a quick look at animation workflow. Starting with animation blocking, the animator submits a draft version of their shot, and then we go to rounds. The director stops by, and let's say he has notes. So there's some backwash - an artistic note - and the shot goes back to animation blocking. But let's say the director is happy with it. In that case, the blocking is approved to commence final animation. (There could be additional approval steps here, but I'm simplifying for the sake of example). Final animation is then submitted to the asset repository for review.



There's another set of rounds for approval of final animation. If the director has notes, the shot goes back for more work; otherwise it proceeds to a default simulation render. (This is a render in which we throw the default hair/cloth simulations onto our character and see what we get.) If something blows up, we place that asset on "hold" – not the entire shot, just the troublesome sim assets. These are put on hold, some sim and animation adjustments are made, and then we're ready for another review. When the cloth and hair sims are working fine, we'll do a ruff render with prop animation, set dressing and the updated layout camera – perhaps there's been a camera change, or a slight adjustment. (At the studio where I last worked, we had a main scene camera, but also provided the animators with an exact copy that they could modify if they wanted. That went back to layout finaling, where the director and the head of layout decided whether the animator's changes were "keepers". Perhaps they liked what the animator was getting at, but the camera move itself was a bit rough. In that case, the layout supervisor would refine the animator's camera work.) Then we go to sweatbox. This is where the director (ideally) gets his or her final bite at the performance apple. If there are any cleanup notes (surface crimping, interpenetrations or other artifacts) these are addressed, and then the result is shipped for lighting & compositing to complete their work already in progress.

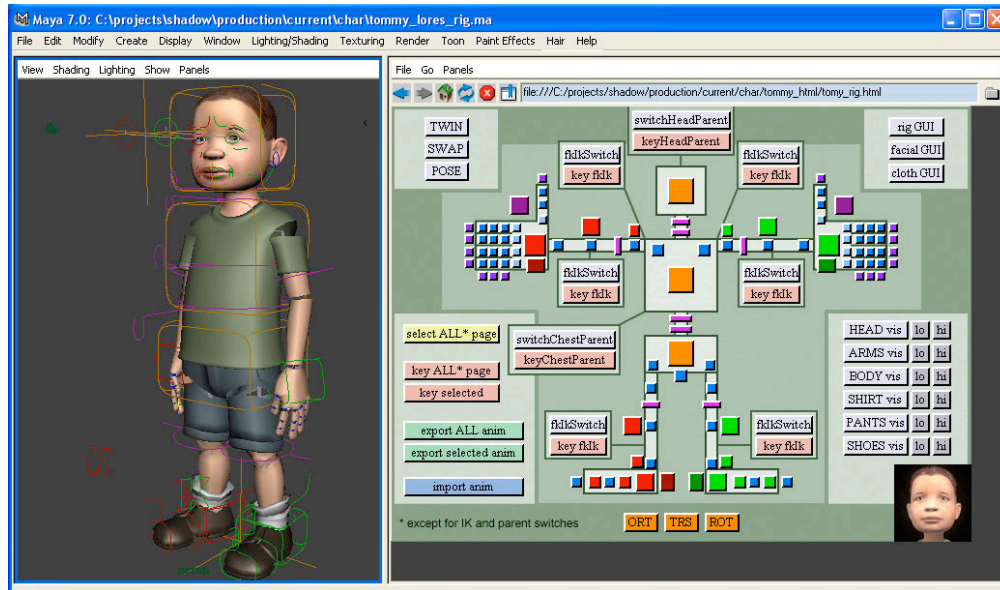
We can (and should) apply this logical progression to an asset itself – let's say in character development, starting with 2D character design and going through to the 3D character screen test.



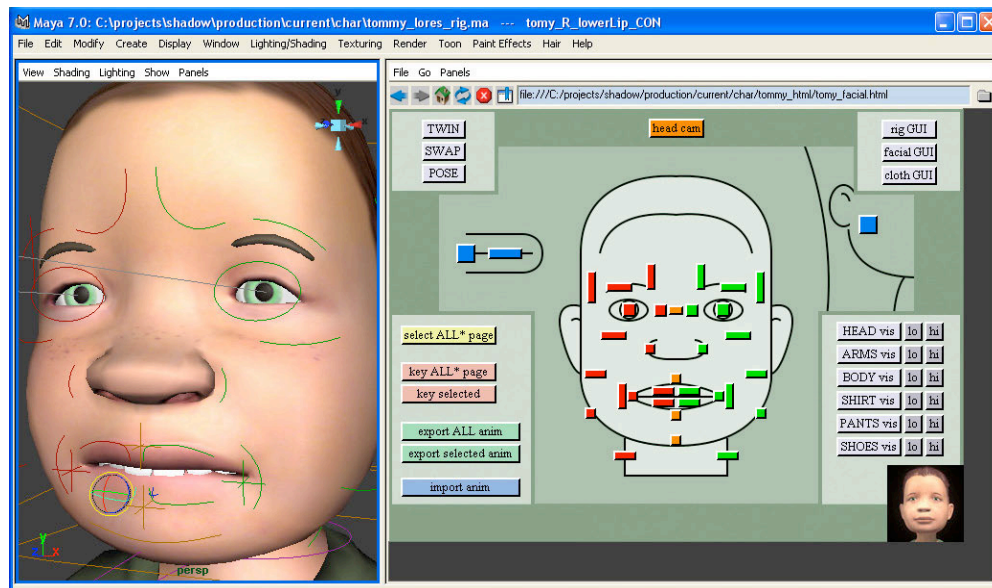
Note how these task modules stack and abut from one end to the other. I intentionally did not indicate a time frame because the duration of the arrow could be weeks or months, depending on your schedule. “Beginning with the end in mind,” I need to dice my tasks within the available window, so these are proportional relationships. The tasks contained in dotted lines are those things that could be considered optional: you may or may not require them. I’d personally recommend *all* of them, but if you’re tight on time, you may not build a *digital maquette*, for instance (a posed, “dirty” model of the character for artistic approval only). On the digital maquette paint-over, an artist paints over a snapshot of the rough model or maquette to quickly provide a sense of what that element should look like when properly surfaced. Rough shaders and paint... final modeling... you see the way these strata are organized. The central yellow core are all of the artistic inputs: the character design, the digital maquette paint-over, the character packet. The light blue are all of the modeling tasks: the ruff model, the final model, blendshapes or PSDs. All of the surfacing tasks (shaders & textures) are up at the top, and the rigging & skinning tasks are towards the bottom. So, you have these lateral layers for each department, but you also see how they correspond *vertically* in terms of what has to happen relative to another task, and what cannot proceed in full until something else is complete. Even with a non-linear pipeline, there are certain tasks that must take place in a certain order, and we need to be conscious of this. Again, some of these steps may be omitted completely, but this is character development in a nutshell.



Returning to my point about the part reflecting the whole, it's my opinion born of experience that the organization within any asset itself should be a reflection of the pipeline as a whole. In the same way that you want a pipeline to be clear, well-ordered and intuitive, each given element should represent this philosophy. There should be a clear visual read on the controls of the character. It should be intuitive and easy to use, and it should be "transparent" as well.



Looking at the control panel on the right, even if I haven't explained it yet, the schematic should make sense. You can tell where the head, hand and knee controls are, etc. Major controls are large and colorful, while secondary controls are less so. The same goes for the facial setup.





## **CONCLUSION**

The part is truly a reflection of the whole, and when everything is working in concert, your crew can create some beautiful music together! When you can make your director feel like this, unaccompanied by the stench of burning cash, you've truly done your job as a CG production professional.



## **BIBLIOGRAPHY**

*“Art & Fear” by David Bayles & Ted Orland*

*“Breaking the Rules” by Kurt Wright*

*“Energy Leadership” by Bruce Schneider*

*“On Film-making” by Alexander MacKendrick*

*“Orbiting the Giant Hairball” by Gordon MacKenzie*

*“Producing Animation” by Catherine Winder & Zahra Dowlatabadi*

*“Talent Is Never Enough” by John C. Maxwell*

*“The Tipping Point” by Malcolm Gladwell*

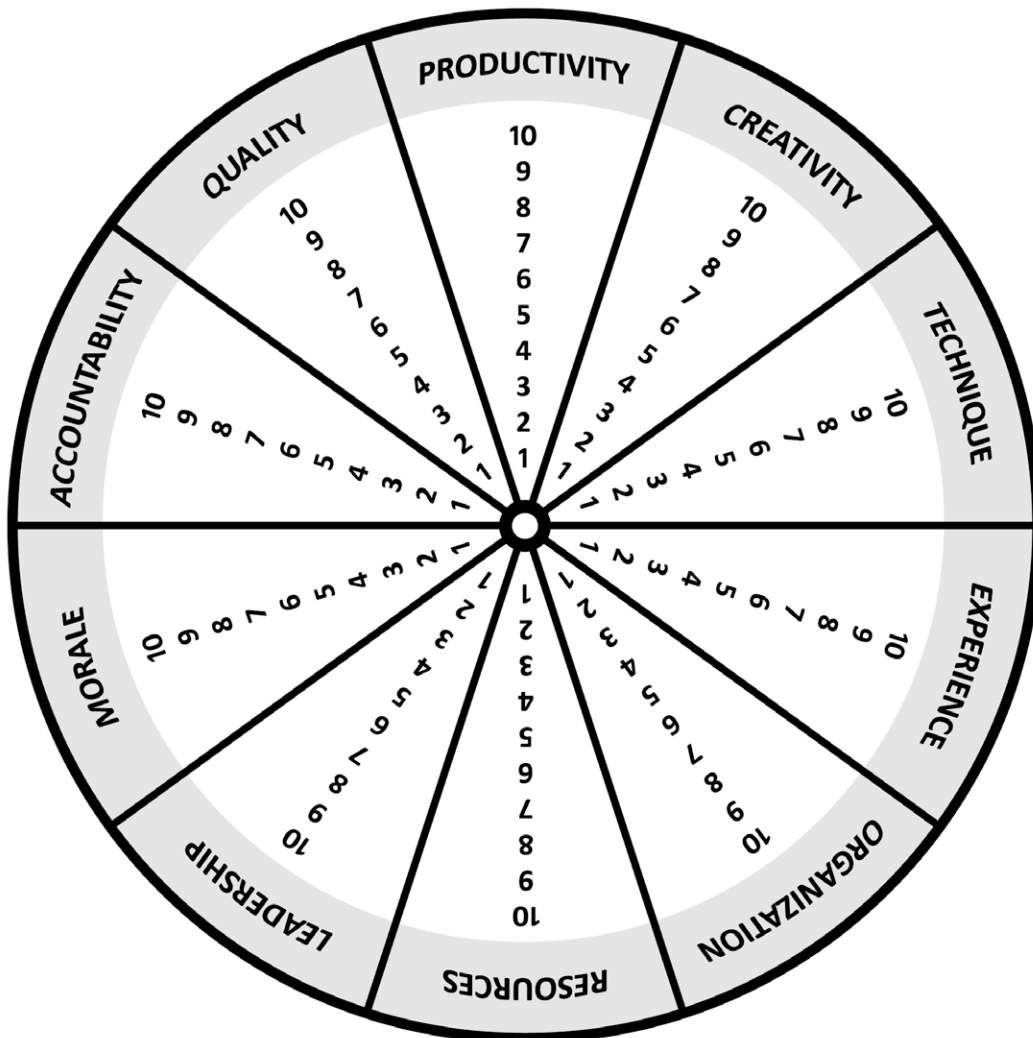
*“Throwing the Elephant” by Stanley Bing*

*“Unstuck” by Keith Yamashita & Sandra Spataro*

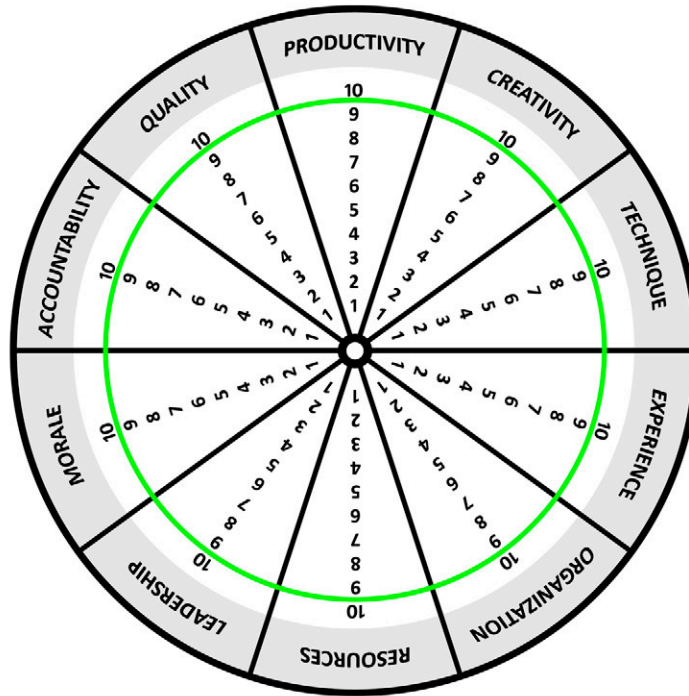
# Animation options LLC

asks...

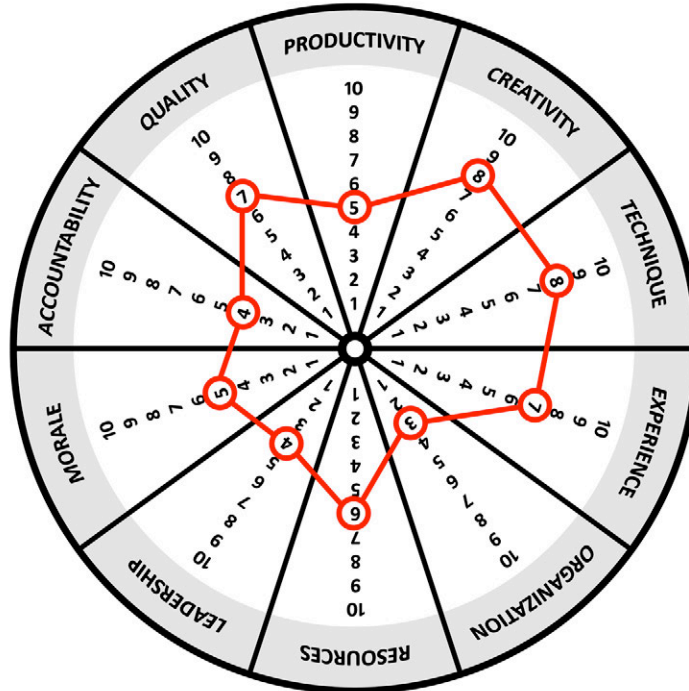
***“Are your wheels balanced?”***



**Is your team functioning optimally?**



**Or is there room for improvement?**



Take a moment to rate your production environment according to the following diagnostic “health wheels”. By circling the appropriate value in each category and then drawing a continuous line through the rankings, you will have an informative graphic mapping of your organizational balance.

Take a look at the *symmetry* and *size* of each shape. You may see great strength in some areas, with room for improvement in others. Or perhaps the overall balance is good, but the magnitude is low.

For a well-rounded view on your situation, distribute copies for completion by your team members (this may be done anonymously for the most candid feedback). Compare and combine the results. Do assessments vary? Are disparities occupationally categorical? Are ratings similar in shape, but dissimilar in size (indicating a common understanding of strengths and weaknesses, but a differing assessment of significance)? How close are your ratings to the average?

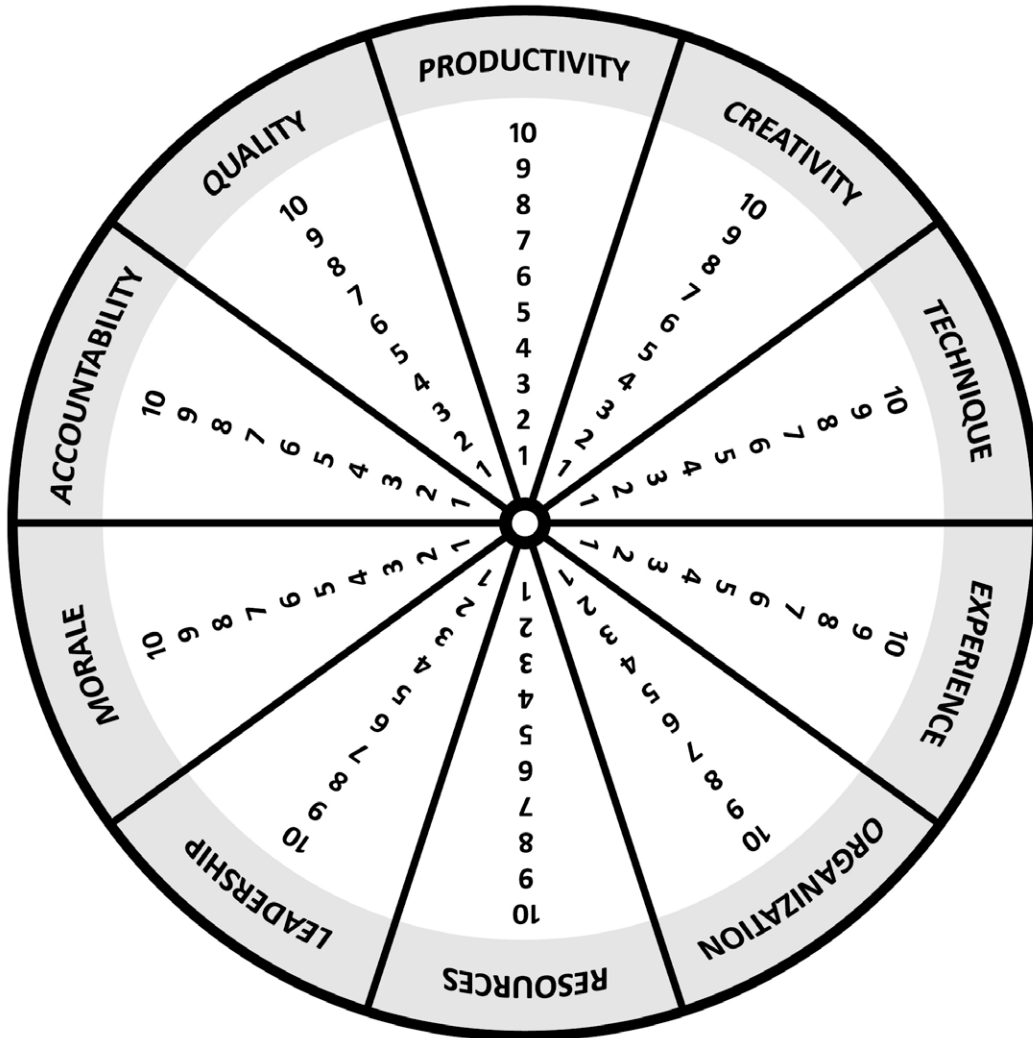
Animation Options LLC helps organizations of all shapes and sizes to function at the most optimal levels possible.

A handwritten signature in black ink that reads "Kevin Deiger". The signature is written in a cursive, flowing style with a large initial 'K'.

President & CEO  
Animation Options LLC  
[kevingeiger@animationoptions.com](mailto:kevingeiger@animationoptions.com)

## Team Balance

How do you assess your production team in these ten areas?  
How do members of your team view themselves?

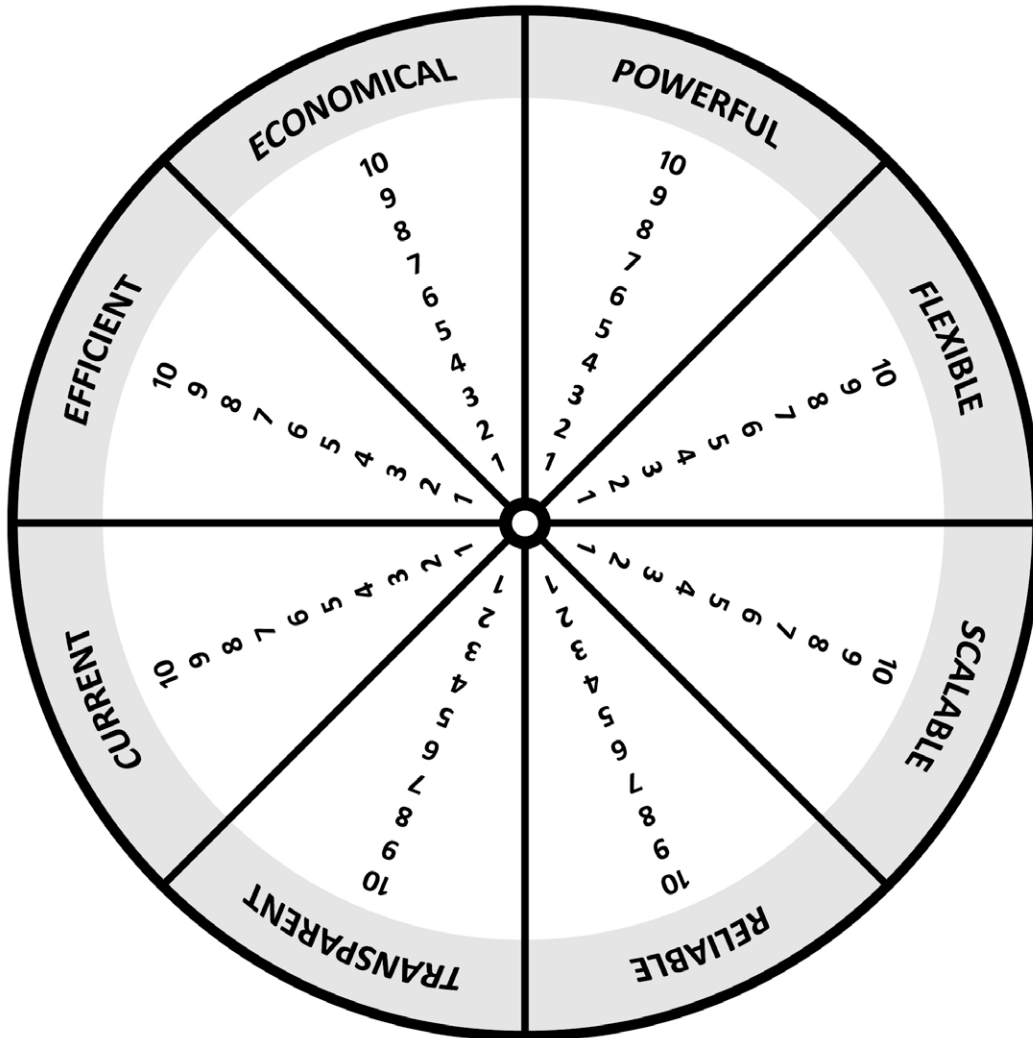


- CREATIVITY**
- TECHNIQUE**
- EXPERIENCE**
- ORGANIZATION**
- RESOURCES**
- LEADERSHIP**
- MORALE**
- ACCOUNTABILITY**
- QUALITY**
- PRODUCTIVITY**

- How conceptually & artistically creative is your team?
- How technically proficient is your team?
- How much production savvy does your team possess?
- How well organized is your team?
- Does your team have the resources they require?
- How is leadership displayed throughout your team?
- How positive, pervasive & inclusive is the team spirit?
- How accountable is your team for their deliverables?
- What is the quality of your team's output?
- What is the quantity of your team's output?

## Pipeline Balance

How satisfactory is your production pipeline in these eight areas?  
How do your team members regard the pipeline?



**POWERFUL**

Can your pipeline handle a heavy workload?

**FLEXIBLE**

Can your pipeline accommodate a variety of work?

**SCALABLE**

Can your pipeline scale up or down as projects require?

**RELIABLE**

Does your pipeline perform without fail?

**TRANSPARENT**

Can you get a clear view on your data at all times?

**CURRENT**

Is your pipeline state-of-the-art?

**EFFICIENT**

Does work flow in an easy, forward direction?

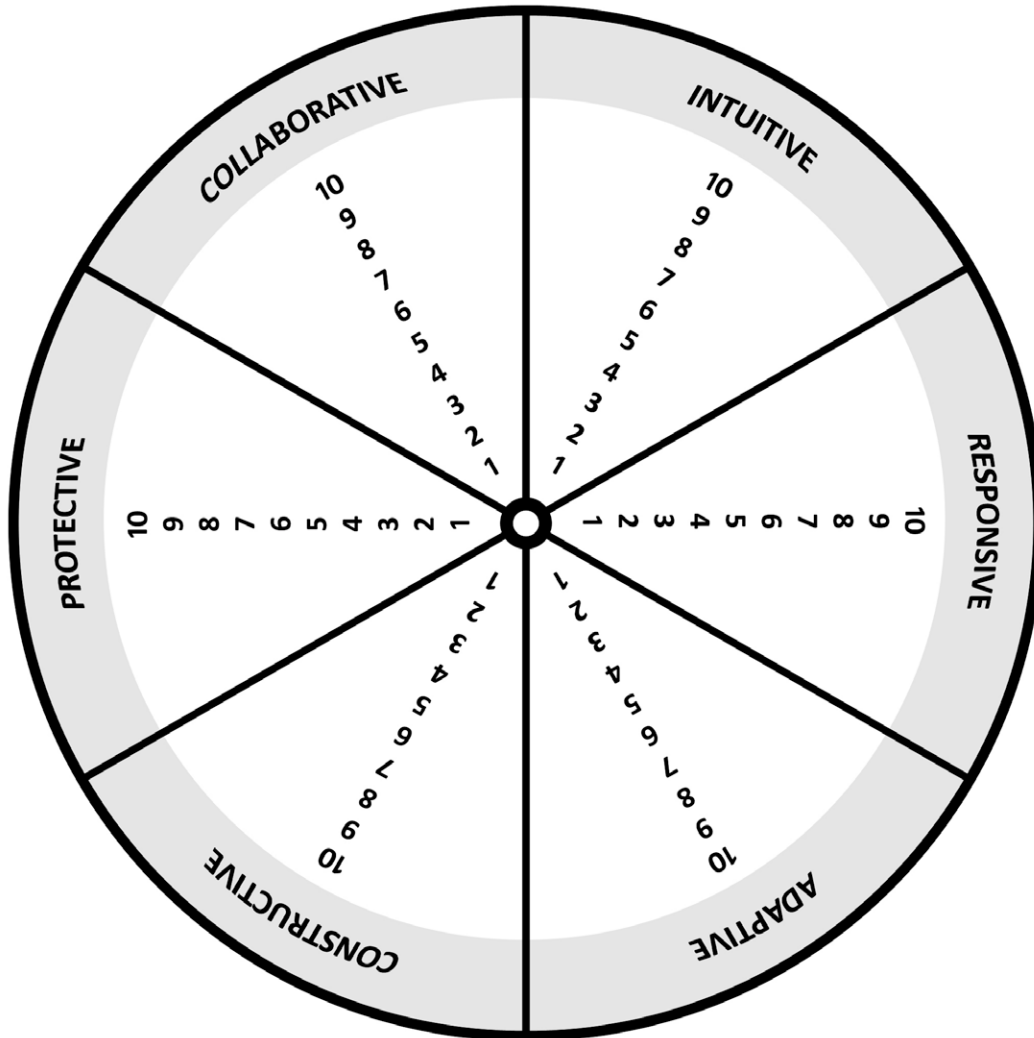
**ECONOMICAL**

Is your pipeline streamlined & optimized?



## Workflow Balance

How do you evaluate your production workflow in these six areas?  
What is your team's experience with the workflow?



- INTUITIVE**
- RESPONSIVE**
- ADAPTIVE**
- CONSTRUCTIVE**
- PROTECTIVE**
- COLLABORATIVE**

- How ergonomically instinctive is your workflow to the team?
- Does your workflow provide quick, quality feedback?
- Does your workflow accommodate a variety of approaches?
- Does your workflow leverage effectively upon existing assets?
- Does your workflow keep assets safe, organized & accessible?
- Does your workflow facilitate team collaboration?

## Questions...

What portion of your day is spent addressing the *vision* of the company? What portion is consumed with *mundane business*? What portion is spent “*putting out fires*”?

Are your “*brain surgeons digging ditches*” (are your valuable artists wasting their time, your schedule and your money with low-level technical tasks)?

Does your team approach their work like a *film*, or like a “*science project*”?

Does your workflow “*work*” and “*flow*”?

Is your pipeline *robust, flexible, efficient and transparent*?

Do you regard pipeline problems as “*normal*” and/or “*unavoidable*”?

Is your creative talent able to make *informed decisions about work in rough form*?

How often *are assets and shots sent back* from one department to another for revision?

How often do your artists find themselves on “*treasure hunts*” (searching for files, trying to determine the correct version)?

How often *are assets created without being deployed*?

Are there *contingencies* in place at every phase of your production pipeline?

Does your pipeline efficiently accommodate “*re-do*” and “*same-as*” shots?

Do you have a working strategy for *asset re-use*?

What *economies of scale* are implemented in your pipeline?

Does everyone in the production chain understand how *the same decision can become more expensive* at different stages of the process?

Can your production pipeline economically accommodate *last-minute story changes*?

Are you satisfied with your production environment in terms of *relationships, communication, adaptation and high-quality delivery*?

# Animation Options LLC

## Pipeline & Workflow Consultation

Whether you're undertaking an animated feature film, live-action special effects, an animated short film or interactive project, Animation Options LLC can help you to architect or optimize a flexible, scalable production pipeline that does the heavy lifting with a light footprint.

You know that staying viable and competitive in our industry requires fresh perspectives and visionary approaches. AO's pipeline & workflow consultation brings many years of hands-on experience with state-of-the-art and next-gen production processes right to your door: innovative, anticipatory concepts that transcend platform to revolutionize your production culture – all within the context of your particular goals, legacy infrastructure, schedule & budget.

We vertically align creative & technical efficiencies across the artistic, managerial and executive levels, working collaboratively with your team to identify opportunities for improved quantitative and qualitative results in the near term, while keeping an eye towards future adaptation and growth in the long. Put the power of "20/20 foresight" to work for you! Together we...

- Look, listen and thoroughly appraise the situation
- Establish production objectives and business outcomes
- Define measures of success for the project and value to the company
- Devise production methodologies and options
- Draft a plan and see it through

Our work includes an unconditional guarantee with 6-month and 12-month follow-up days. Contact us for a free initial consultation, and see how a fixed investment can produce exponential value.

**Kevin Geiger**  
**President & CEO**  
**Animation Options LLC**  
**[www.animationoptions.com](http://www.animationoptions.com)**  
**[kevingeiger@animationoptions.com](mailto:kevingeiger@animationoptions.com)**  
**Skype: animationoptions**

## Kevin Geiger

***“Kevin Geiger is the Winston Wolfe of digital animation production: he solves problems.”***

Kevin Geiger brings two decades of technical, artistic and organizational experience to your benefit as President & CEO of Animation Options LLC.

Mr. Geiger’s career in digital animation and effects began under the mentorship of Academy Award winner Richard Edlund, whose supervision of the original “*Star Wars*” film established an industry. At Edlund’s Boss Film Studios, Mr. Geiger was charged with seminal 3D CGI character work for the MGM release “*Species*” – the first feature film to direct a digital actor in real-time.

Shortly thereafter, Kevin Geiger joined Walt Disney Feature Animation to create articulated digital characters for the groundbreaking “*Steadfast Tin Soldier*” segment of “*Fantasia/2000*”. Mr. Geiger’s technical and artistic proficiency quickly led to his appointment as a founding member of WDFAs Digital Visual Development Department, which saw his contributions on several confidential projects including Disney’s cutting-edge digital human initiative. The production leadership and innovation that Kevin Geiger displayed on films such as “*Dinosaur*” and “*Reign of Fire*” culminated in his role as CG Supervisor on “*Chicken Little*” – where his team established a comprehensive CGI pipeline from the ground up while also retraining dozens of traditional artists and setting a new bar for cartoony 3D character animation.

After supervising character R&D and pipeline architecture on Disney’s upcoming animated feature “*Rapunzel*”, Mr. Geiger left Disney to pursue his independent ventures full-time. As an award-winning animation producer with Simplistic Pictures LLC, and the director and co-founder of The Animation Co-op, Kevin Geiger is a pivotal hub of information and support within the animation community. His outreach extends to academia, where Mr. Geiger has been a long-time instructor of computer graphics and digital applications at Cal Arts, and is currently a guest researcher & professor at The Beijing Film Academy. A frequent international lecturer, Kevin Geiger is prized for his energetic and insightful presentations at conferences and institutions around the world.

More details at: [www.linkedin.com/in/kevingeiger](http://www.linkedin.com/in/kevingeiger)



*You have options.*

[www.animationoptions.com](http://www.animationoptions.com)