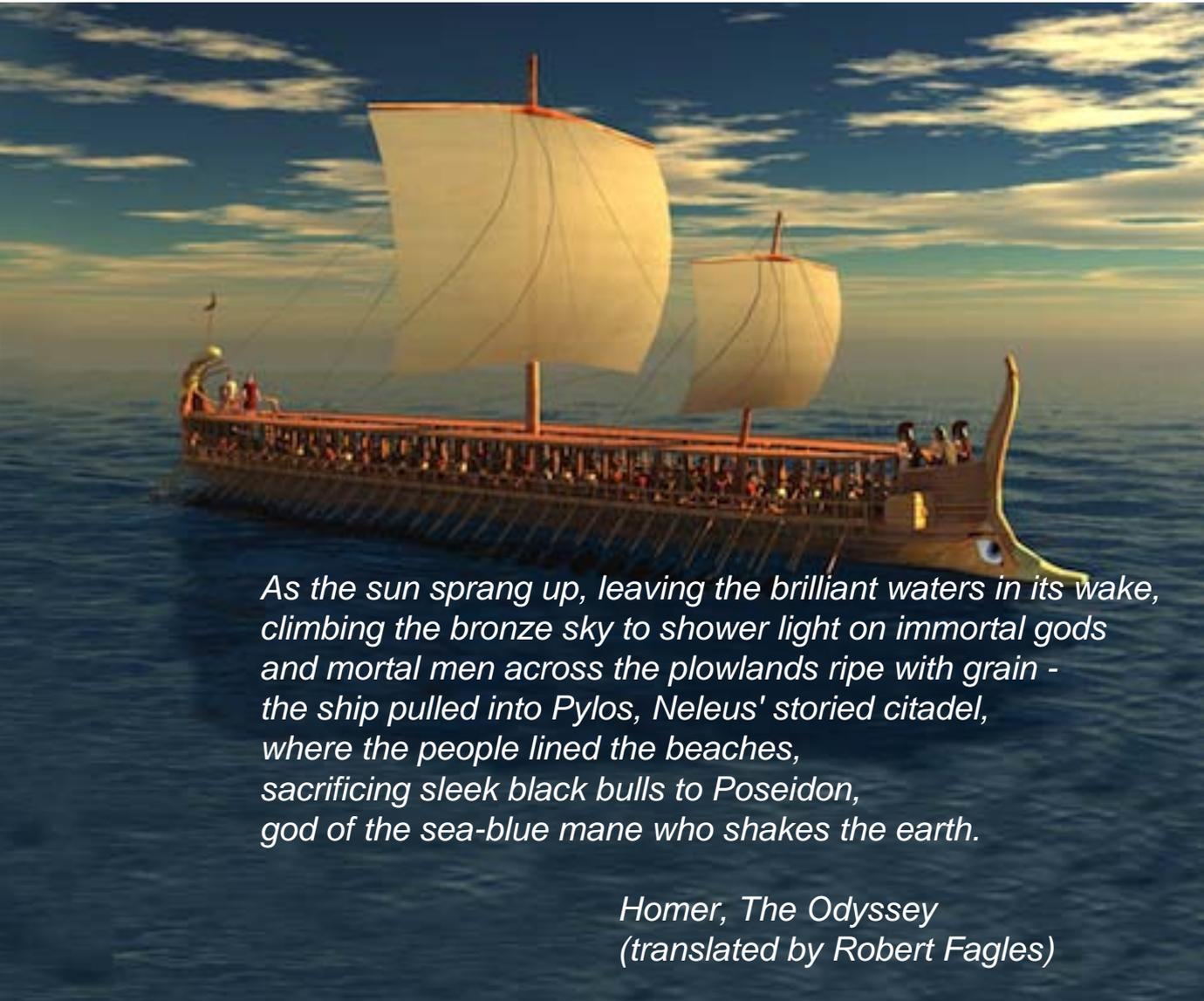# Story in Engineering

What story tells us about human nature
that will make us better engineers

LES CHAMBERS

As the sun sprang up, leaving the brilliant waters in its wake,
climbing the bronze sky to shower light on immortal gods
and mortal men across the plowlands ripe with grain -
the ship pulled into Pylos, Neleus' storied citadel,
where the people lined the beaches,
sacrificing sleek black bulls to Poseidon,
god of the sea-blue mane who shakes the earth.

Homer, The Odyssey
(translated by Robert Fagles)

Good engineers argue the facts

great engineers tell stories

Les Chambers is an electrical engineer specialising in life-critical control systems. He was among the first engineers to directly control chemical reactions with software. In other projects he has designed smoke extraction systems for underground railway networks and worked in validation of strike jet missile systems. Working as a systems engineering trainer, safety authority and quality manager he developed an interest in story theory as a means of persuading developers and managers to follow the strict disciplines required to deliver safe, high-quality systems. Currently, through his work in developing cloud-based applications for engineering specification, his quest is to fuse web app and story technology to move past the concept of "digital assistant" to that of human-empathetic "digital companion".

Contents

Prologue: A *True Story*

Fade in:

<div align="center">

INTERNAL: CONFERENCE ROOM

The road tunnel safety system commissioning team is seated, chatting.
Project manager Jack enters and towers over them. His body
language indicates that he is bent on oratory and not craving their
conversation.
Jack points at the commissioning manager.

</div>

Jack: Here is the opening date. Put it in your schedule and work back from there.

<div align="center">

Jack moves towards the door.

</div>

Les: We're not gonna meet that date Jack. We're not magicians. This is a safety critical system with stringent compliance requirements. We are thirty test cases short of completion. So far I've logged over two hundred major defects. Just the rework and retesting of that lot will take weeks.

<div align="center">

Jack makes a waving motion with his hand as if to fend off a fly.
He addresses the issue of the functional safety program.

</div>

Jack: Les, I thought we weren't going to do this.

<div align="center">

Les stares blankly at Jack.
Jack exits the conference room.

</div>

I was struck dumb, incapable of rational thought - just bloody mad. For with that wave Jack had trivialised the entire discipline of functional safety engineering, he had devalued my profession, my career, my vocation, he had disrespected all the people whose hard work was aimed at keeping the public safe - not only on this project but on all projects that have ever been and will come. I had no words, no vocabulary to counter his pronouncement. I watched silent as he left the room. Later he asked for my defect reports. Working through them he downgraded the defect severity levels thus proving that, "Problems? There are no problems."

My inciting incident. This was my "inciting incident" the point in my engineering career where things were thrown out of balance, the point where I realised that my engineering education was not equal to this situation so violently served up by the real world. In my thirty-fourth year of engineering I realised I'd been living a cloistered life focused on quantifiable mathematical fact uninformed by the wisdom imparted by a classical education. Untrained in the basics of philosophy and psychology I was naked, without the insights and the communication skills required to shield the world from this archetypal hazard: *uninformed-manager-parading-as-expert-crashes-safety-critical-development-schedule*. I needed to be a better persuader.

> *This was my call to adventure and my quest was to right this imbalance in my*
> *engineering education by opening a window into the human condition so*
> *conveniently provided by story theory.*

Recognising archetypes. Taking the story perspective, Jack's behaviour was archetypal, a repeating behavioural pattern encountered in engineering projects. From my point of view, he had become an

antagonist (a shadow), someone or something that stood in the way of my object of desire. I wanted a safe system delivered through proper engineering process. His desire was to deliver a piece of freeway infrastructure on a promised date to a given budget. He was responsible for large chunks of other people's money. He had one focus: return on investment. Characters expressing this archetype get violent with obstructions: anything or anyone trailing the scent of cost blow out or deadline overrun. From his point of view I was an antagonist threatening his object of desire and I had to be destroyed.

Telling the story. Let's freeze the action right here and introduce a Hollywood script writer. Without doubt he would make me the hero and Jack the antagonist. I fitted the mould. Look at me: the archetypal functional safety engineer, with little influence, a bad salesmen, intelligent but full of self doubt (the constant state of the creative), peddling nothing. "Spend this million dollars," I say. "And what do we get for that," they ask. "Trust me," I say. "Nothing bad will befall you." Not a compelling argument! And I was up against an incredibly powerful antagonist who had everything that I lacked: charisma, power, an almost godlike figure at the helm of a half billion dollar project. Jack had the power of (commercial) life and death over all contractors. And this wasn't a conference room, it was the innermost cave, and we were at the story's crisis where the hero confronts the antagonist and is almost killed.

The storyteller's strategy. Now let's flashback to the beginning. What if I were a skilled storyteller? Would I have recognised the Jack archetype and this inevitable crisis? Would story theory have given me more insight into this plot point and informed my strategies for disarming Jack's pathological behaviour? Could I have leveraged the wisdom of human nature captured over thousands of years and encapsulated in myths and legends; wisdom now hidden in plain sight in all our storytelling media.

You had to be there. Engineers aren't salesmen. We know what we are doing but struggle to explain ourselves to the unwashed; the general public. They haven't had the benefit of our education and experience, they don't know and frankly, they don't care. But cut 'em some slack, they've never seen a dead body in a work place, they've never had a desk next to a blast wall with a chemical reactor on the other side with potentially explosive reaction kinetics controlled by software that THEY wrote. They've never woken up at 2am in the morning in a cold sweat over an attack vector they hadn't thought of. They've never had their identities stolen. They've never made a mistake that could have, or did, kill someone.

The supernatural world. My point is that safety critical systems engineering is a supernatural world full of complexities, tests and trials, heroes and villains, conflict and catharsis all bound up in an environment of ramping jeopardy. Engineers inhabit that world and grow stronger from their experiences, but when they return to the normal world they can't explain their ordeals to civilians. You had to be there. Without those experiences no amount of logical argument, promising or threatening will move the civilian to receive, understand, remember, believe and most important of all - act. But what if we took a different tack? What if we studied the technology of human nature, engaged with human emotions and learnt how to give people synthetic experiences that closely approximated our ordeals in the supernatural world? Would we shake loose more dollars for proper safety engineering? Would we design better systems? If I knew of concepts such as aesthetic emotion could I have persuaded Jack to delay the tunnel opening?

Fusing technology and art. There is another imperative. With the ever growing availability of cheap computing power and massive datasets, we are witnessing a rapid fusion of technology with the liberal arts. Augmented reality (www.magicleap.com) and the need for emotional engagement with digital assistants/companions requires engineers to have an in-depth knowledge of the human condition, specifically the dynamics of emotional engagement. Pokémon Go has recently demonstrated what empathy for an automaton can achieve. Suddenly we've got couch potatoes covering kilometres per day in search of cute virtual creatures.

Figure 1. Fusing Technology and the Liberal Arts
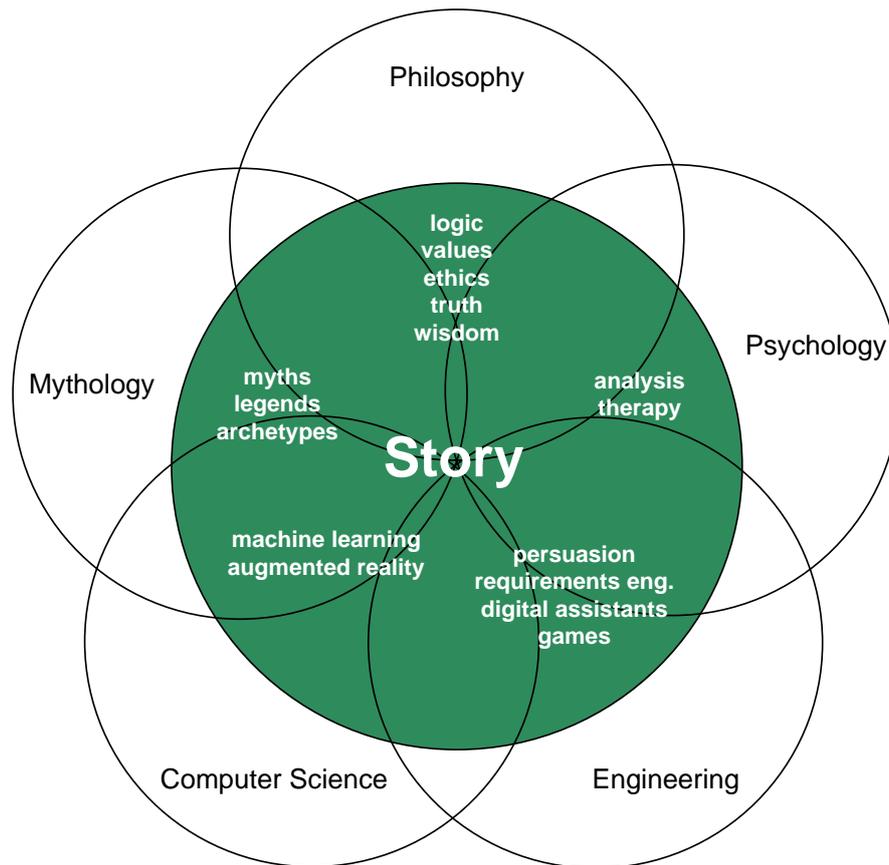
Companies developing these apps characterise themselves as engineering storytellers. They need people who can weave a narrative with software. For example, Magic Leap's banner reads: "...We are storytellers, rocket scientists, wizards, gurus ... were here to make magic real for you ..." Where will they find these people? The engineering education does not do "emotion", engineers don't write stories. Consequently we are missing the core insights required to synthesize 'social' applications such as personal digital assistants. Personality engineering is an unknown concept. Silicon Valley is currently hiring poets and writers to fill the gap. The core skills required are empathy and a knowledge of language. We don't practice them and our teachers and mentors were no better; educated in monasteries isolated from the socialising effect of the company of women, **we were raised by wolves**.

> *Enter story theory, the human user manual evolved over millennia by storytellers.*
> *The ultimate application note on human nature and the role it plays through the*
> *arc of our individual stories.*

By studying story fundamentals engineers can connect with the human emotional need to identify with the feelings of others. So I say to you:

> *The classical engineering education that worships scientific fact and the truth beyond reason that mathematics provides is still necessary but it is no longer sufficient. We need the studies in empathy that story provides.*

Story for engineers. In this tutorial I make the case that understanding the structures, the dynamics and the energy that makes stories effective can make us better engineers. Overlaying story patterns on your day-to-day activities can help you identify where you've been failing in human communication, persuasion, requirements capture and so on.

> *In the best traditions of improving clarity through model based analysis, story theory provides a systematic process for characterising a situation or stating a problem, thus easing the path to a solution.*

Story patterns help engineers:

1. Sell their ideas
2. Increase their powers of persuasion in high-stakes situations
3. Analyse threat situations
4. Recognise and disarm the pathological human behaviours before they become a threat to safety and security
5. Better manage their creative process
6. Discover system and software requirements that would otherwise have been missed
7. Design better human interfaces
8. Participate with confidence in the next wave of computer applications - engineering the personalities personal digital assistants.

All by learning how to tell a rattling good tale.

So, if you're still reading, you are embarked. You have crossed the threshold into the supernatural world of Story. The stakes are high, I'm sorry but there is no turning back!

Les Chambers

How to Read these Notes

Each chapter presents an aspect of story theory. Paragraphs tagged with "Engineering function" identify how this theory can inform and improve some aspect of engineering practice. I attempt to separate the chemistry from the alchemy, the astronomy from the astrology and distil insight from the drama; insights that cannot be gained from an engineering education. I have also included more detail on applying story theory to engineering in section *8. Story Application Notes*.

1. Story Persuades

A story:

> Every day, a blind man sat on the pavement in Central Park. He had his hat in front of him, begging for money. A sign read:
>
> *I am blind*
>
> Passers-by ignored him. One day, an advertising man saw his plight. He altered the wording on his sign and the cash started pouring into the hat. What had he done?
>
> He had changed the sign to read:
>
> ***It is spring and*** *I am blind*.

> — Maurice and Charles Saatchi, *Brutal Simplicity of Thought*.

1.1. How?

The Saatchi story is an example of how powerfully persuasive a message can be if it embeds an essential fact in the flow of a story, wrapping an idea around an emotional charge. The mere fact of being blind is of little interest but when you add a **protagonist** (the blind man) with a **desire** (to see the flowers of spring) and a **quest** (maybe he needs an operation) with **empathy** ("There but for the grace of God go I.") and **conflict** with an antagonist with seemingly insurmountable odds (blindness) - all implicit in the four words added to the original message - you create a story capable of penetrating to our innermost being. That place in all of us that harbours our private fears, desires, dreams, loves, hates, beliefs - our feelings. That place which is the source of all our decisions.

Subtexts inspire our imagination. You could say I've assumed a lot about those four words. Others might see it differently, but that's my point, the advertising guy created a subtext that challenged passers by to imagine; and, despite themselves, they were drawn in. The scope of subtext is the unsaid and the unsayable - our deepest thoughts and feelings that cannot be voiced often because they lie deep below our conscious thought. Philosophers have known for millennia that we are wired to look below the surface in the conversation of others, to imagine what they are really thinking and feeling, to know the truth. As early as 335 BCE Aristotle commented on this phenomenon has his greatest pleasure in theatregoing.

We are wired for Story. Storytellers have known for more than two millennia that human beings are cognitively wired to accept information in the story form. Our brains are naturally driven to make sense of what we see by organising disparate facts into a narrative. A master storyteller can persuade an audience without being "caught at it". But not with just any story. Particular story patterns and devices such as foreshadowing, subtext and metaphor, attract attention, invite engagement, incite belief and even cultivate trust because they tell the truth. They are metaphors for real life.

The genesis of story theory. The first analysis of story structure is attributed to Aristotle's Poetics (circa 335 BCE). In modern literature anthropologist Joseph Campbell's book *The Hero With A Thousand Faces* is the most influential modern text on the subject. Campbell made writers aware of the ageless patterns in compelling stories. Inevitably filmmakers such as George Lucas (*Star Wars*)

recognized the commercial possibilities of Campbell's ideas. Campbell's influence can also be seen in the films of George Lucas (*Star Wars*), Steven Spielberg (*Jaws*, *E.T. the Extra-Terrestrial*, *Jurassic Park*, *Indiana Jones*), Ridley Scott (*Blade Runner*, *Alien*, *Black Hawk Down*), Francis Ford Coppola (*Apocalypse Now*, *The Godfather*) and many others. Christopher Vogler, a script analyst at Disney Studios, made Campbell's ideas more accessible with a seven page memo that ultimately became his book *The Writer's Journey*; now in the bookshelves of all Hollywood scriptwriters. Script writer and story consultant Bob McKee is renowned for his practical insights into successful story design. His books: *Story: Substance, Structure, Style, and the Principles of Screenwriting* and *Dialogue: The Art of Verbal Action for the Page, Stage, and Screen* are also recommended reading. A sampling of McKee's seminar alumni have created *Breaking Bad*, *Game of Thrones*, *Downton Abbey*, *House of Cards*, *Frozen* and *The Wolf of Wall Street*.

Connection to psychology. In his study of personality, Swiss psychologist Carl Jung suggested that humanity is one culture, our stories, fairytales and myths are dreams springing from our collective unconscious. "Myths," he said, "are first and foremost psychic phenomena that reveal the nature of the soul.[1]" According to Jung the collective unconscious holds imprints of our past, archetypes of human experience collected on an evolutionary timescale. Archetypes are triggered by our experiences; they guide and inform our behaviour. Campbell's ideas were therefore distinctly Jungian. He asserted that stories have one structure - the mono myth, and to teach, persuade or create with stories we must apply this pattern. These ideas were practiced to great effect by George Lucas in his *Star Wars* movies. The Jedi Knights had a collective unconscious that they invoked to perform supernatural deeds.

> *... my ally is the Force, and a powerful ally it is. Life creates it, makes it grow. Its energy surrounds us and binds us. Luminous beings are we, not this crude matter. You must feel the Force around you; here, between you, me, the tree, the rock, everywhere, yes.*

> — Master Yoda, *Star Wars: The Empire Strikes Back*

The psychological function of story is therefore to access the "luminous being" in your audience. To communicate at a level of deeper meaning. Anthropologist, Joseph Campbell, a noted scholar of mythology and its indicators of human behaviour, noted, "... It appears that through the wonder tales - which pretend to describe the lives of the legendary heroes, the powers of the divinities of nature, the spirits of the dead, and the totem ancestors of the group - symbolic expression is given to the unconscious desires, fears, and tensions that underlie the conscious patterns of human behaviour."[2]

> *Masters of the art of persuasion have known for millennia that the voice speaks to the conscious mind while stories with their images and subtexts communicate directly with the subconscious where most decisions are made.*

The engineering function of story. This tutorial explores the engineering function of story. I have created it for technical people who, like me, have not had the benefit of a classical education. In it I make the case that:

---

[1] C.G. Jung, *The Archetypes and The Collective Unconscious, Volume 9, Part 1*
[2] Joseph Campbell, *The Hero With A Thousand Faces*

A working knowledge of story patterns and devices can produce better outcomes
from many technical tasks; from selling ideas to defending a position to building
systems such as personal assistants that better integrate with human nature.

1.2. Why Engineers Need Story

To exert influence we need to understand human nature.
To build better systems we need to predict the human emotional response.

Selling your ideas. As part of normal career progression many technical people transition from pure technical work to more people-facing roles. A software developer becomes a system architect, a project engineer becomes a project manager. In story terminology these are inciting incidents in the lives of our heroes, this sudden transition from the solitary pursuit of doing calculations and writing code to presenting ideas that delight and inspire. Most pure technologists have no skills in these areas, no wonder their worlds are thrown out of balance. In accepting these new roles they unknowingly cross thresholds into supernatural worlds ruled by emotion where pure logic has little currency, where what you say is less important than how your audience feels about it.

Don't get me wrong, the facts remain all-important, completeness and correctness in the final product often determines life or death. It's just that, in the supernatural world of human discourse, pure truth must be cloaked so it will penetrate and compel.

Truth presented through story has a long history of gaining consensus.

High-stakes persuasion. At the heart of most disasters lie engineers who saw it coming but did not have the persuasive skills to influence preventive action. Bhopal, the world's worst industrial accident, was the subject of several failed management audits before a methyl isocyanate gas release killed more than 2000 people in one night. In the following years the health of more than 500,000 people was adversely affected. In July 1985 American mechanical engineer Roger Boisjoly advised his management of faults in the design of the space shuttle's solid rocket boosters. Six months later, the space shuttle Challenger blew up on launch, killing seven astronauts.

At the heart of all man-made disasters is a toxic systemic defect: the engineer's inability to
communicate and persuade effectively. And the reason this defect pervades engineering
communities is a lack of education in the mechanisms by which we receive, process and
act on the massive volume of information presented to us from second to second. A study
of story theory provides a highly accessible window into this essential subject.

Conveying technical concepts to non-technical people. More and more we engineers are called upon to persuade non-technical people on the efficacy of technical approaches that usually cost money and sometimes don't provide any obvious short-term benefit. Examples are, quality management, security management and safety management. Failing to persuade can have long-term effects. Children are still being born with birth defects thirty years after the Bhopal incident. The products of the Chernobyl nuclear power plant disaster (strontium-90 and caesium-137) - with half-lives of thirty years - will poison the soil for generations to come.

Stories reach deep into our belief systems and profoundly influence our behaviour.
Be aware that while you are talking your audience is assembling your stated facts
into their own personal story. Make it easy for them and make it compelling.

So, in preparing your next high-stakes presentation where the outcome of a "no" answer could be death or property destruction, what should you consider?

2. A Story Pattern in Brief

Joseph Campbell argued that in all the traditional stories of ancient cultures there could be found one underlying identical pattern. He called it the *monomyth* and it went like this:

> *A hero ventures forth from the world of common day into a region of supernatural wonder: fabulous forces are then encountered and a decisive victory is won: the hero comes back from this mysterious adventure with the power to bestow boons on his fellow man.*

— Joseph Campbell

Disney script analyst Christopher Vogler summarised Campbell's epic study of mythology with a twelve-stage story map that became law in Hollywood.

1	We meet a hero in an ordinary world ...
2	who receives a call to adventure ...
3	that the hero initially refuses, but ...
4	with the encouragement of a mentor and due to some inciting incident the hero develops a desire for some elixir and ...
5	crosses a threshold into a supernatural world where ...
6	the hero encounters various tests and trials meeting allies and enemies. The tension slowly builds until, on the trail of the elixir ...
7	the hero approaches an antagonist holed up in an innermost cave ...
8	where the hero endures a supreme ordeal.
9	Taking possession of the elixir ...
10	the hero sets out on the road back to the ordinary world pursued by the antagonist, enduring a final ordeal and spiritual death ...
11	but is resurrected and transformed by the experience.
12	The hero returns to the normal world with the elixir, a boon that heals a malaise of the normal world.

The following pages explore the relevance of this pattern to engineering.

3. Application: *Persuading with Story*

To persuade an audience you first need to get their attention. What motivates people to read what you've written or listen to what you're saying? From minute to minute we are assaulted by attempts at communication. Most are filtered out.

> *From the moment I picked up your book until I laid it down, I was convulsed with laughter.*
> *Some day I intend reading it.*
>
> – Groucho Marx

When you attempt to communicate you are actually saying, "Please listen to me, please understand, please believe in what I'm saying," and maybe even, "please do this ..." Masters of this art transmit their ideas using patterns that we are programmed to receive - story patterns. At the core of all stories is a hero with a burning desire who goes on a quest and, as the story unfolds, the audience is drawn in at a deep emotional level; through their imagination they inhabit your story. With this act of deep focus begins the process of seeing, believing and attitude transformation.

> *Masters of rhetoric know we become that on which we focus.*
> *We inhabit our focus and it shapes us.*

3.1. Engagement: *Inhabiting the Story*

Empathy for the hero. Audiences engage when they become emotionally involved with your protagonist. The emotional triggers are empathy and authenticity. Your audience must know what your hero wants and want her to have it. Empathy can be particularly strong if what the hero wants mirrors your audience's vicarious desires (finding the gold, falling in love, commanding the space vehicle out where none other has gone before ...). The beginning of empathy is conflict where the hero, pursuing her object of desire, is placed in jeopardy and forced to make difficult decisions. "My God, what would I do in that situation!"

Choosing the hero. Your choice of hero is critical. Ask yourself, "Who or what must be the subject of my audience's empathy." If you're delivering a product sales pitch to an end user the hero must be the customer. They couldn't care less about who developed the product, the key issue is, "What's in it for me". Ergo your story must focus on their tests and trials, their crises and climaxes and their ordeals with antagonists. It must present your product as the elixir that will heal their wounded land.

If you're pitching for venture capital (seeking empathy from a banker??) the hero must be you. "We are this brave and brilliant band of tech warriors, surviving on pizza and Jolt Cola, pulling all-nighters, taming hitherto unknown technologies to save the world, and we've almost got it together, we can see the finish line, the deployment to revenue operations, but we've got this final hurdle, we're running out of money. Will our world beating product ever further the cause of humanity? Help us!"

Empathy case study. I once had a long and emotionally deep conversation with the manager of a railway signalling company. It started out as an off-the-cuff chat. He'd come under unrealistic schedule pressure from his client and was looking for ways of managing the situation. As a sidebar I told him how Wendy Darling once asked Peter Pan the way to Neverland. Peter answered, "Follow the second star on the right and on till dawn." Tell them that, I joked. I'd struck a chord, he sighed and stared out the window, "I wish I could do that," he said. J. M. Barrie's story of *Peter Pan: The Boy Who Wouldn't Grow Up* had opened a door to his deepest feelings. We talked for two hours

working through some strategies. For people to work together effectively they must first engage emotionally and be honest with each other. Doctor Spock of *Star Trek* called this mind melding.

Authentic speakers tell stories that are true to life. Authenticity encourages belief, or at least encourages us to suspend our disbelief. "Yes," your audience thinks, "Life is like that".

Witness Winston Churchill's famous sentence in praise of the fighter pilots of the Battle of Britain:

> *Never in the field of human conflict*
> *has so much been owed*
> *by so many*
> *to so few.*

This sentence is transparently heartfelt. Churchill composed it in transit to London from RAF Uxbridge (August 1940). He was in a highly emotional state having just spent a morning observing RAF fighter aircraft operations against incoming German bombers in an underground operations bunker. His words are made even more powerful by his use of the tricolon -   a rhetorical pattern employing three parallel phrases. We find something complete and satisfying in the group of three. You can get even more emotional impact by carefully choosing the order and adding a twist to the last phrase - the twist is often a surprise. US President Franklin D Roosevelt was another tricolon exponent: "Be sincere, be brief, be seated".

Inauthentic speakers use cliché: *going forward, paradigm shift, low hanging fruit, think outside the box* ... and the like. There is no surprise in a cliché, they are a filler that people ignore - filter them out. They have no dramatic function, no emotional impact, therefore no motivation or communication value because they don't ring true. Consider this technocratic sludge:

> *Achieve a user centric portal framework.*
>
> – Second Australian Annual Conference on Government Portals

Be advised that if you say or write the first thing that comes into your head it's probably a cliché. When Churchill's Rolls-Royce left RAF Uxbridge he instructed his staff not to speak. He reflected for some minutes before uttering that sentence. It may have the longevity of some of Shakespeare's best lines because he has engaged us all at a deep emotional level with his poetic truth.

Inauthentic case study. I once attended a presentation by the managing director of a large defence company. There were more than 200 engineers in the room. The MD's objective was to motivate the troops to improve their project management discipline. The result was the exact opposite. The boss opened his mouth and with his first sentence demotivated everyone in the room. "I came here to enthuse about project management," he said. His voice and body language made it clear that this was a superficial going-through-the-motions kind of talk. There was no hero, no sense of strong desire. What massive imbalance had poor project management created in our normal world? Where was the compelling desire for change? What was the quest? Where were the antagonists; the forces of darkness arrayed against us? And most important of all, what was the elixir that would restore balance to our wounded world. With none of the classic story ingredients his talk lacked authenticity and his attitude transferred to his audience, who switched off immediately.

> *Authenticity and empathy feed off each other when authenticity departs,*
> *empathy dissolves, your audience ceases to feel and you lose them.*

3.2. Conflict: *Story Energy*

A story is energised by conflict, a battle between opposing forces that puts the hero in jeopardy and makes the outcome of the story uncertain. Vile, amoral villains, really bad, bad guys, make the best stories. Antagonists such as Adolf Hitler, the Joker (*Batman*), Darth Vader (*Star Wars*), Hannibal Lector (*The Silence of the Lambs*), Bane (*The Dark Knight Rises*) charge a story with emotional energy.

> Batman: Why didn't you just kill me?
> Bane: Your punishment must be more severe.

Without conflict outcomes are predictable, our curiosity is not aroused and we are not engaged. Conflict stimulates curiosity, adds mystery and builds suspense. Your story must torture your hero almost to death and in the process empty out his character for all to see. Your audience must feel his pain, pick through his character flaws and marvel as he transforms as a human being.

3.3. Suspense: *Empathetic Curiosity*

Our curiosity drives us to solve puzzles and answer questions while our emotional need to identify with others fires our concern about what major plot turns will mean for the well-being of our empathetic hero. Throughout their stories writers create circumstances that ask major dramatic questions, "What will happen next? How will X get out of this one?"

> *Suspense is curiosity charged with empathy.*

> — Bob McKee, *The Art of Dialogue*

Storytellers introduce suspense early by demonstrating a story's premise in some horrendous inciting incident.

> *A story premise is usually of the form: what would happen if this character with these character flaws was transported into this unfamiliar world.*

What would happen if a naive farm boy on the remote planet Tatooine was thrown into an inter-planetary war and, in order to survive, was forced to learn the disciplines of the Jedi Knights and become an intergalactic warrior (*Star Wars*).

Zero Dark Thirty. Maya (Jessica Chastain), a fictional CIA intelligence analyst based in Islamabad, Pakistan is on the team tracking Osama bin Laden. The team believes they've had a breakthrough turning al-Qaeda operative Humam Khalil Abu-Mulal al-Balawi into a CIA double agent. Not so. Half the team is wiped out when al-Balawi blows himself up on their first meeting (this actually happened - the attack at forward operating base Camp Chapman killed seven American CIA officers and contractors). On receiving the news Maya is depicted curled up in the foetal position on the floor behind her desk, then a colleague gives her the news that another al-Qaeda operative she's been trying to locate for months has in fact been dead for eight years. We know Maya, we admire her intelligence and her tenacity, we weep for her in her grief. Our curiosity is aroused, where can she possibly go from here? Our empathy for Maya deepens - suspense builds.

This scene provides Zero Dark Thirty's inciting incident. It's a point of high emotional impact, a major reversal of fortune, made even stronger by a scene progression where grief over the death of her friends is compounded by evidence of her failure as an intelligence agent. She is vanquished by two

antagonists at once, the physical enemy: the Taleban and her internal demon: self-doubt. Does she give up? No, she's the hero, she acts. Armed with the certainty that she was "left on earth" to avenge the death of her friends she transforms from run-of-the-mill intelligence analyst to warrior, avenging angel. Osama bin Laden is going down! Will she succeed? We lean in.

Ramping suspense with shape shifters. Suspense can also be ramped up with shape shifting characters. A shape shifter may be a man in the day and a wolf at night, Doctor Jekyll and Mister Hyde. Their loyalty is always questionable. She loves me - she loves me not?
Flashback to Afghanistan: Humam Khalil Abu-Mulal al-Balawi is a Jordanian doctor. He looks good on paper. At dusk, his vehicle approaches trailing dust over the Afghan plane. Is he an ally or an enemy? Can we trust him or not?

3.4. Foreshadowing: *Hinting at the Future*

Writers use foreshadowing to make turning the page a non-negotiable necessity. Take a moment to enjoy this famous opening paragraph.

> *In the late summer of that year we lived in a house in a village that looked across the river and the plain to the mountains. In the bed of the river there were pebbles and boulders, dry and white in the sun, and the water was clear and swiftly moving and blue in the channels. Troops went by the house and down the road and the dust they raised powdered the leaves of the trees. The trunks of the trees too were dusty and the leaves fell early that year and we saw the troops marching along the road and the dust rising and leaves, stirred by the breeze, falling and the soldiers marching and afterward the road bare and white except for the leaves.*

> — Ernest Hemingway, *A Farewell to Arms*

Subtle images summon audiences forward feeding their curiosity as to what will come, who will fall in love with whom, who will live, who will die and who will be damned for eternity. Hemingway's words, "... and we saw the troops marching along the road and the dust rising and leaves, stirred by the breeze, falling" invoke images of war and destruction and soldiers falling, dead. But in what year? Which river? And who were these troops?

If done skilfully foreshadowing engages audiences and can leave them focusing on story meaning, not for days, but for decades or, in the case of Homer's Iliad - millennia.

The Soul Of A New Machine. Pulitzer prize-winning author Tracy Kidder foreshadows what is to come in the opening pages of his book *The Soul Of A New Machine*. This is the story of the engineering team that designed Data General's first 32-bit computer: the Eclipse MV/8000. The team worked under crippling budget and schedule pressures in a race to compete with Digital Equipment Corporation's VAX computer, which threatened to take over the new 32-bit minicomputer market. On the first page Kidder introduces us to the central character Tom West, not in an office or a lab, but on a yacht in a storm, preparing us for the technological chaos that we as technologists know will come. The scene also foreshadows aspects of Tom's character that the reader will grow to love. This guy never gives up!

Foreshadowing techniques include:

1. **Speculating on characters before they appear** in the story, hinting at mysteries in their past that generate interest before they arrive.

   She left Baton Rouge at a young age and in a great hurry it's not clear why ...

   Subtle references are more likely to go straight to the subconscious where they will become more powerful and more long-lived. I read Tracy Kidder's book more than thirty years ago and still remember the opening scene with Tom West at the helm. Taking the previous example, a less subtle foreshadowing of a woman's character might have been:

   I hear she's a lady of questionable morals ...

   Writers call this, "on-the-nose writing ", telling it exactly as it is, leaving no scope for your imagination. Better not to close the door on the lady's character before you meet her. Better to have your audience looking below the surface, speculating on what may come with imaginations running wild in anticipation.

2. **Referencing a momentous event** that will occur at some point in the future (or has occurred in the past) that shapes the story and all its characters. For example, you're making a case for time and money to optimise a software engineering process. You open with:

   I'm here to talk about lessons learned from project X especially in light of
   what happened. Now Let me begin at the beginning.

3. **Leaving subtle signals.** Signals are hints of what is to come that can only be appreciated with the benefit of hindsight. In his classic novel *The Great Gatsby,* F. Scott Fitzgerald foreshadows the final auto accident where the heroine Daisy accidentally kills her husband Tom's mistress. Earlier in the story Daisy drives so close to a workman by the side of the road that her fender flicks a button from his coat. At the beginning of the book there are more clues:

   I told her how I had stopped off in Chicago ...,
   And how a dozen people had sent their love through me.
   "Do they miss me?" She cried ecstatically.
   "The whole town is desolate. All the cars have the left rear wheel painted
   black as a mourning wreath, and there is a persistent wail all night along
   the North Shore."

   Subtle signals go deep into the subconscious, then at the end your audience looks back and reflects, "Yes I should have seen that clue." Their imagination is engaged even after the fact. Your story leaves an aftertaste that enthrals and sustains memory.

3.5. We Remember In Images

Our minds are flooded with thousands of messages every day. Almost none are remembered. We've all sat through meetings, redolent with tedium, hour upon hour of cliché, managers droning on with lifeless dialogue, nothing to motivate or inspire. Regular surveys reveal that seventy-five percent of meetings are called 'unproductive' by participants - all for lack of a simple insight into a compelling need in all human beings:

We want to imagine. We crave the stimulus to set our minds running with our
own stories.

So when preparing your own special message consider this:

> *Your audience never remembers what you said only what they were visualising while you were talking. So stimulate their imaginations with compelling images.*

Hints:

1. Don't tell - show
2. Don't explain - dramatize,
3. Don't be explicit - suggest

> *Don't tell me the moon is shining; show me the glint of light on broken glass.*
>
> — Anton Chekhov

Example:

In relating the story of my Chinese sidekick on a control systems project in Hong Kong I could have said, "Lewis wanted to learn assembler language programming." But that would be telling. Instead I chose to show:

> *Lewis was a Jiminy Cricket of a man with the classical Chinese disregard for personal space. Whenever I approached a keyboard he appeared like magic examining my every gesture. I'd often feel his soft hands on mine as they moved across the keyboard. I developed a routine of making sudden movements that threw him across the room, "Sorry Lewis I didn't see you there", but it made no difference. Lewis was going to learn assembler even if it killed him.*

Building images in the mind. Help your audience build images in the mind. Make your presentation unique and personal for everyone who hears it through detailed descriptions. How tall were your characters, what was striking about their appearance, how did they walk, what were they wearing. Think about sight, sound, touch, smell and even taste.

For example, you could describe the Bhopal industrial accident by stating bland facts:

> *Three thousand people were killed in one night from a methyl isocyanate gas release.*

Or if you wanted your audience to remember forever the consequences of poor safety management you might say:

> *Methyl isocyanate (MIC) is heavier than air. It was just past midnight. All over town children were asleep in their beds. As the MIC snaked into their bedrooms they felt their eyes burning, then their lungs burning then filling with fluid then with the metallic taste of MIC in their mouths, they drowned.*

Using dialogue. Dialogue builds more powerful images than narration. It also uses fewer words to convey the same idea, at the same time engaging your audience's imagination. The children of the Roman aristocracy were trained as orators from an early age; in preparation for their role as leaders. They were told, "Think as a wise man but speak as a common man." In other words with the simple monosyllabic style of everyday conversation. Be suspicious of any word with more than two syllables. Boil your ideas down to simple sentences and wrap them around emotional charges.

Meeting Top Cat on the road to Damascus. Companies introducing high impact automation into their business operations often underestimate the time and effort required to prepare their people for the brave new world. Budgets need to be allocated for formal training and knowledgeable people made available for handholding post implementation. Some companies find it hard to take critical people out of frontline jobs and give them time to learn and reflect on what is to come. In my experience a senior manager who has never presided over a major automation upgrade needs something more than a logical argument to shake loose the required training time, effort and budget. Something with more impact than a boring monologue on best practice. Dialogue. So when all else fails I tell the story of my road to Damascus moment - the experience that changed my mind forever on the real cost of system deployment.

<div align="center">

INTERNAL: TRAINING ROOM
I present a two-hour introduction to a plant automation system that will completely change the way a chemical processing plant will be operated. I have twenty plant operators in the room. I am concerned. There have been no questions from my audience, a rough and tumble bunch of guys who are usually forthright and rowdy.
I take a break, descend from the podium, and sit amongst them.

</div>

Les: Guys. How do you feel about all this?

An operator, nicknamed Top Cat, speaks up from the back of the room.

Top Cat: Les.
No fucking thing no fucking engineer has ever fucking done in this fucking plant has ever fucking worked!

<div align="center">

The room echoes with murmurs of agreement.

</div>

The beat. Script writers call this exchange a "beat". A single stimulus/response, action/reaction between two characters in a drama. I stimulated the room. I got a reaction. It was terse but redolent with meaning on many levels. This exchange is a direct quote from real life but a script writer creating fiction could not have done a better job. In all our actions we anticipate a reaction, but storytellers know that this must never happen. The reaction must be the opposite of what we expect and in that gap between expected and actual lies the story with all its richness of insight. Ignore such a beat at your own peril.

Analysing the beat. Analysing this exchange through the lens of story we see the operators as heroes, the brave new world of automation as a supernatural world, the training course: a call to adventure to cross the threshold into that world. Top Cat's monologue was the archetypal refusal of the call - just as farm boy Luke Skywalker first refused Obi-Wan Kenobi's invitation to join the Jedi Knights and do battle with Darth Vader. That is of course until Imperial Storm Troopers killed Luke's auntie and uncle and, bent on revenge, he was propelled into the supernatural world of interstellar war.

On the surface Top Cat's monologue was an indictment of useless engineers, but using a storyteller's insight we can look deeper at the subtext of his outburst - the unspoken or possibly the unspeakable truth.

Desire, antagonism, choice, action. All character actions, including speaking, originate from some desire, blocked by an antagonist that prompts the hero to take action. In TC's case his strong desire was to live in an unchanging world. Operators are trained to follow standard operating procedures the same way every time. They don't like change. Now here comes an engineer (antagonist) who is about to upset the balance in his life by completely changing the way he makes chemicals. He considers courses of action and chooses the puff-yourself-up-and-growl-at-the-antagonist-so-he'll-run-away option. It was clear from his response that overcoming that primal desire and converting its energy into wonder at the new technology was going to take time. It actually took six months of talking, explaining and training in simulators. We knew we had succeeded when we started getting comments like, "Star Wars huh!" The massive effort that the company put into operator training gave them the necessary strength of desire to cross the threshold into their new supernatural operational world. The final implementation was a huge success.

When writing dialogue make it terse and redolent with subtext. Plagiarising real life (as I have above) is always best. But if you have to make it up be aware that real-life dialogue is full of non sequiturs, reversals, repetitions and omissions. People rarely say what they mean. When you've written your dialogue DBC Pierre[3] suggests removing every third or fourth word to make it real. His advice is: "Try cutting it until the meaning no longer survives, then add back the one or two words that return the meaning".

Dialogue benefits. An insightful audience will fill in the blanks with their own narrative. You'll need to say no more. If they don't get the subtext at least their curiosity will be aroused. You can then entertain them with an analysis as I have for TC. Overall, dialogue grabs people's attention because it rings true, provides surprise, stimulates curiosity and sets their imagination to work. They'll remember that long after you have gone.

To summarise the storyteller's memory tools, consider:

1. Starting with a bang. Diving straight into a story without a boring introduction
2. Give detailed sensory and visual descriptions of your characters - paint pictures
3. Use dialogue not narration
4. Designing with beats, make sure reactions are unexpected
5. Describing not only what happened but how you/your characters felt about it
6. Not telling them everything, let them fill in their own blanks - the ones they can be reasonably expected to imagine
7. Wrap your ideas around strong emotive metaphors.

---

[3] Refer [Pierre 16], Chapter 30 Dialogue

3.6. Understanding: *Informing with Metaphor*

Strong metaphors aid understanding and enlist enthusiasm. American poet Robert Frost defined a metaphor as:

> *Describing this in terms of that where this is new and that is familiar.*

> — Robert Frost

Frost is responsible for some of English literature's most enduring metaphors, for example:

> *The woods are lovely, dark, and deep,*
> *But I have promises to keep,*
> *And miles to go before I sleep,*
> *And miles to go before I sleep.*

> – Robert Frost, *Stopping by Woods on a Snowy Evening*

Legend has it that Frost had been up all night writing the long poem *New Hampshire* and had finally finished when he realized morning had come. He went out to view the sunrise and suddenly got the idea for *Stopping by Woods on a Snowy Evening*. He wrote the poem in just a few minutes and later reflected, "It was as if I'd had a hallucination." Opinions vary on what it means, of course the poet is always silent, probably because he doesn't know himself (if he could explain, it wouldn't be art). The Jungian analyst will tell you that the woods are a symbol of the mother archetype which manifests in our conscious behaviour as a longing for redemption, devotion or feelings of awe - the feelings that drive people of strong religious faith. The woods are therefore a metaphor for the aspirational self, the good in all of us, the strong desire to engage in everything that feeds the soul. But the horseman has responsibilities in the normal world. It will have to wait for now. This is a repeating theme. Witness the prayers of ancient intellectual Augustine (354-431): "Lord, make me chaste (sexually pure) – but not yet!"

Metaphors can be broadly grouped as open or closed. Open metaphors mean many things to many people, they can be abstract and obscure, they stretch our imagination, extend insight and are thus essential to the creative process. Closed metaphors are used in critical situations where there can be no confusion about meaning.

Using open metaphors to express engineering concepts is counterintuitive. We are trained to deliver well formed specifications in compliance with predefined templates. We have well-established quality criteria: lack of ambiguity, completeness and correctness. So what's the point of a metaphor if it's meaning is not clear? Take this one, relating to the use of free web applications:

> *A pig on a farm gets free food, shelter and health care. If you're not paying, you're the product.*

The pig metaphor is reasonably explicit but it draws its true effectiveness from a subtext that foreshadows some undefined dark event in the future. Who are these app developers? They present as nice guys, but are they planning to, in some metaphorical way, kill us and serve us up for Sunday lunch?

This sentence would be effective in a cyber security briefing. It instils belief by wrapping the idea that downloading free apps can compromise security around the emotional charge of imagined

violent death in an abattoir. And it will be remembered because its symbolism engages with our primal need to cling to life.

Many of Shakespeare's lines have survived for centuries because they speak to our deepest feelings and are never short of practical application in the moment. Take this classic from Macbeth:

> Light thickens, and the crow
> Makes wing to th' rooky wood.
> Good things of day begin to droop and drowse;
> Whiles night's black agents to their preys do rouse.
> Thou marvel'st at my words: but hold thee still.
> **Things bad begun make strong themselves by ill.**
>
> – Macbeth Act 3, Scene 2

Volkswagen would have saved more than ten billion US dollars had it internalised the last line. Projecting this metaphor onto the VW emissions scandal, "Things bad begun" was an eight year project to cheat US vehicle emissions tests with smart engine management software that detected when a vehicle was being tested and automatically detuned the engine for lower emissions. The "ill" in "make strong themselves by ill" was an eighteen month conspiracy to cover up the fraud by obstructing regulators and telling lies to US congressional committees.[4] In plain language the lesson is that evil builds upon itself to the point where it is unsustainable and the evildoer self-destructs. At least that is my interpretation. Yours may be different which is the whole point of the open metaphor - stimulating the imagination and, as a side effect, giving long life to its core idea.

A compelling metaphor is tightly coupled to our subconscious desires and belief systems. It sparks debate at a passionate emotional level. This is essential in creative environments that require divergent thinking where we start with open questions and look for many answers ("what if's"). And we humans are at our most creative when we are passionate.

Engineering function: arguing a case with metaphor. Cases that sorely need to be forcefully argued are often presented in environments redolent with strong desire. The presenting engineer, armed with irrefutable facts, is well aware he is facing strong competition from other interests intent on committing at least one of the seven deadly sins: lust, gluttony greed, sloth, wrath, envy and pride. In VW's case it was greed - a rampant yearning for market share, with Obamacare it was pride - garnering political credibility by delivering on promises made to the American public - even though they were unrealistic from the beginning.

In the tradition of Story when you make a high-stakes argument you are entering the innermost cave and facing down antagonists who have your elixir: truth and rational behaviour. Attacking with facts is often ineffective, engaging with and defeating pathological emotion is a better battle plan. Enter the engineering function of metaphor.

The VW emissions scandal. I doubt that quoting Shakespeare to Richard Dorenkamp (VW's engine development manager) in 2006 would have stopped him introducing "dyno mode" (read: emissions cheat mode) into VW's diesel engine management software. But given the multibillion dollar losses

---

[4] Refer case study, section 8.5. Opposing Deus Ex Machina: *Speaking Truth to Power*

that flowed from this lapse of integrity I have no doubt that the lessons learned are now well entrenched in VW legend and law. And what better way to entrench than to summarise a complex confluence of bad behaviours in one compelling line, "things bad begun make strong themselves by ill." Or something equivalent such as: "Breaking the laws of the lands that buy our vehicles is not only immoral but also unprofitable." Given the egregious nature of the fraud, the negative impact on the environment of all countries that received the 11,000,000 cheating vehicles and the massive losses accruing to VW, I sincerely hope that this scenario will leave an imprint on our profession; to the point where all engineers who are faced with like behaviour will be moved to ask, "Are we doing a VW here?".

The Obamacare debacle. Most of the fifty-five contractors who developed the American Obamacare health care system knew it would fail when put into production, wasting millions of dollars, not to mention the valuable time of fourteen million Americans who attempted to sign up on day one [5]. If a systems integration test fails it's logical to assume the system as a whole will fail when deployed, right? Yet, under senior management and political instruction, they deployed it anyway! This oft repeated pathological behaviour can be classified as: "Lord, make me chaste – but not yet!" where you know an action is wrong but you do it anyway. Would that an insightful developer had stood before a political master and pointed out that, apart from ignoring common sense, the project was about to violate 2000-year-old wisdom. It may have given them pause.

Engineering function: creative design process. Designers of complex software and electronic systems could not function without metaphors. Great advances in software design have been largely due to the concepts of objects (object oriented design) and relations (relational database systems). When we talk about structure we reference trees and layers. The most complex systems I've ever designed were simplified through the metaphor of "collaborative objects" - things that communicate and provide services to each other while hiding the internal details of how they do things. We are at our best when we can liken interactions as though they were human (called anthropomorphism).

A strong metaphor aids reasoning and understanding in both developer and user. In chemical processing a chemical reactor became a live thing that had a defined number of states connected by state transitions (maintenance wait -> load chemicals -> cook -> discharge). Well defined conditions determined when these transitions occurred. The reactor could be in only one state at any point in time. This is a layman's description of finite state automata, a cornerstone of real-time systems design, but as far as the operators were concerned it was just a simple step sequence, easily understood and manipulated.

A comprehensive list of software metaphors is provided in a web resource by Nic Boyd[6]. Nic references an insightful talk by Ward Cunningham[7] on how he arrived at the "technical debt" metaphor which is now commonly used to justify re-factoring of code to reduce maintenance costs.

Ultimately, as engineers, we need to converge on solutions but that is step 2. Step 1: divergent thinking with open metaphors, Step two: convergent thinking with closed metaphors.

---

[5] Refer www.chambers.com.au/public_resources/case_study/obamacare/saving-obamacare-case-study.pdf
[6] Refer www.educery.com/papers/rhetoric/metaphors/
[7] Refer wiki.c2.com/?WardExplainsDebtMetaphor

Closed metaphors are explicit, unambiguous and convey truths that are immediately intuitively obvious. The toilet icon is a good example. Another example: a technologist recently characterised a denial of service attack as someone parking a truck across your driveway.
Closed metaphors can be used to convey a set of complex ideas with a single phrase.

Consider using metaphors to classify:

1. Attitudes of mind (refer section *8.4. The Serial Killer Fallacy: Unsafe Inductive Reasoning*)
2. Situations and behaviours (refer section *8.5. Opposing Deus Ex Machina:*

Strong metaphors. Taking the Jungian view, strong metaphors channel and mould the images/motifs already present in the collective unconscious - redolent with deep emotion - easing the path from the unconscious to the conscious mind where we use them to make sense of our surroundings. For example, in relating the legend of Billy Sing, an Australian Army sniper credited with killing 200 Turkish soldiers in the WW I Gallipoli campaign, Ouyang Yu never states the obvious. A sniper's rifle is not a gun, it's a ...

> *... a concentration of held breath, aligned eye and mental stillness ...*
>
> — Ouyang Yu, *Billy Sing*

And with that simple metaphor our imagination takes control, we are in the trench with Billy, holding our breath, sighting our target, squeezing the trigger. We do it consciously or unconsciously, we can't help it because we are wired that way. In expressing ideas with metaphor successful scriptwriters tell us we are speaking directly to our audience's unconscious, inciting emotions. Take the river metaphor.

The river metaphor. Rivers loom large in many famous stories. Events unfold both emotionally and physically through progress up a river. In *Heart of Darkness* (Joseph Conrad) an introspective sailor journeys up the Congo River to meet Kurtz, and ivory trader who is reputed to be an idealistic man of great abilities. It turns out that Kurtz has established himself as a god with the natives and has gone on brutal raids in the surrounding territory in search of ivory. The river, snaking its way into the unknown depths of the Congo jungle, becomes a metaphor for the evil which consumes Kurtz, and can randomly consume us all given the human propensity to be at the same time both clever and terrible. *Heart of Darkness* was the inspiration for Francis Ford Coppola's movie *Apocalypse Now,* depicting the Vietnam War.

Jungian therapy says, the river, as symbol, embodies the flow of life, the goal-directedness of the psyche, our powerful instinct to move forward and progress our own life's story. In the twenty first century it can be employed to represent the inexorable progress of technology, the insatiable desire for more apps on your mobile phone, the rivers of gold flowing into Google's coffers, the unquenchable desire of a project team to deliver a world beating product and, as a result, the flow of benefits to the cause of humanity. In the movie *Lawrence of Arabia* Auda abu Tayi (Anthony Quinn) expressed a compelling river metaphor in these lines:

> Auda abu Tayi: [to Lawrence] *I carry twenty-three great wounds, all got in battle. Seventy-five men have I killed with my own hands in battle. I scatter, I burn my enemies' tents. I take away their flocks and herds.* **The Turks pay me a golden treasure, yet I am poor! Because I am a river to my people**!

Auda abu Tayi could have been modest, offering the throwaway line, "I am a generous man." But these are not the words of a leader, they would not motivate a tribesman to risk his life in battle. But the idea of generosity wrapped around the emotional charge of the river metaphor certainly would.

Metaphors should surprise and delight your audience, providing sufficient colour to trigger their natural desire to paint pictures in the mind. Just a well chosen word can have an impact even if you have to invent it.

The "explodie" phone. A technology consultant does a cameo on a national radio show. He tells the story:
"I'm strapped into my seat awaiting takeoff. A voice comes over the public address, 'If you have a Samsung Note 7 mobile phone please turn it off. We hear they are EXPLODIE!'. I'm not kidding she actually said that! "

This useful hazard analysis and advice on preventive measures would not have got national prominence had it not been fuelled with the emotional charge of the "EXPLODIE" metaphor - I love it!

3.7.Believing: *Truth in Story*

All belief stems from perceived truth. In order for them to believe, your audience must exit your presentation thinking, "Yeah, life's like that." Your story must be an authentic metaphor for life.

> *Storytelling is the creative demonstration of truth. A story is the*
> *living proof of an idea, the conversion of idea to action.*
> — Bob McKee, *Story*

The key principle is demonstration. Your story should never explicitly **tell** the truth it must **demonstrate** it through the actions of your protagonist. For example, nowhere in *The Godfather* movie trilogy will you find the words, "... unchecked ambition will lead to your destruction". What you see in the climax of the trilogy is demonstration: Michael Corleone falling off a chair into the dust of a barren courtyard in a far-off land, alone, a broken man - dead.

Stories that feature conflict, failure, death, destruction and, every now and then, the triumph of the human spirit are perceived as true. Stories with no conflict, are lies.

So when presenting your story don't:

1. Insist that nothing could possibly go wrong
2. Have characters that are never put in jeopardy
3. Have unrealistic happy endings
4. Preach to your audience (show don't tell).

Instead:

1. Be upfront about what could go wrong and the plans you have to deal with the crisis
2. Relate stories of past conflicts and how you triumphed.

3.8. Expressing truth: *Controlling Idea*

All compelling stories say something. Through their telling they become exemplars of some undeniable truth. Storytellers call this the "controlling idea". Business synonyms include "core message", "takeaway" and "theme".

Example:

> *First they came for the Socialists,*
>
> *and I did not speak out –*
>
> *because I was not a socialist.*
>
> *Then they came for the trade unionists,*
>
> *and I did not speak out –*
>
> *because I was not a trade unionist.*
>
> *Then they came for the Jews,*
>
> *and I did not speak out –*
>
> *because I was not a Jew.*
>
> *Then they came for me –*
>
> *and there was no one left to speak for me.*
>
> — Martin Niemoller, 1892 - 1984[8]

The controlling idea: "Silence equals complicity when it allows evil to continue" or "What you walk past you endorse".

Your story must have a single strong message. Multiple messages tend to confuse audiences, probably because you're asking them to believe in too much at once. The message is strong if it resonates with your audience. Strong messages last, some of them for thousands of years. For example, separated by 500 years, Shakespeare's *Macbeth* and Francis Ford Copola's *The Godfather* convey exactly the same message wrapped around the emotional charge of a story: Ambition unchecked by moral constraints leads to tragedy.

Structuring the controlling idea. Bob McKee has a mathematical definition of controlling idea:

Controlling idea = f(story-value-transition, cause)

Where "story value[9]" is a quality of human experience and "cause" is the force that triggers a positive or negative change in that value. For example, both Michael Corleone and Macbeth transform from good to evil with the cause being unchecked ambition.

Engineering function. The controlling idea behind Air B&B: Your home can be converted from expense item to income earner by using an international booking system. For further discussion refer section *4.6. Controlling Idea*

---

[8] Martin Niemoller was a protestant pastor who's political activism against Hitler gained him internment in concentration camps for the final seven years of Nazi rule.)

[9] Refer definition in section *11. Glossary*

3.9. Truth that Sparks Action: *Aesthetic emotion*

When people leave your presentation nodding wisely, " ... that was so true," it's a great boon to your ego. But it's even better if they put that truth into practice by changing their behaviour or doing something new. J.K. Rowling once mused, "Human beings can learn and understand without having experience. They can think themselves into other people's places." So what would motivate a person, who's never had their house burn down, to install smoke detectors when told the story by a person who has had that experience? The answer is, aesthetic emotion, the stock in trade of the Academy award-winning script writer.

> *Aesthetic emotion is an emotional response to a situation when thought and feeling come together to create meaning. "When an idea wraps itself around an emotional charge, it becomes all the more powerful, all the more profound, all the more memorable. ... It harmonises what you know with what you feel ..."*

> — Bob McKee, *Story*[10]

We experience aesthetic emotion while viewing an artwork, reading a story or a poem, watching a movie or listening to music. We don't have this experience in the dynamic of normal life. The thought and the emotion come to us separately, we have the experience then reflect on it later and through this reflection our attitudes change.

Bogeys and Bandits. Landing a strike jet on the heaving deck of an aircraft carrier at night is scary, especially for a rookie navy pilot. Robert Gandt reports in his book *Bogeys and Bandits: The Making of a Fighter Pilot* the zeitgeist is extreme fear. There is no thought of glory and there is little confidence; no positive self talk: "I can do this, I've been training for this moment for three years." That comes later, on reflection, after many successful landings - the thought follows the emotion, and with that reflection comes the willingness and the confidence to do it again. No aesthetic emotion here. But wait, the U.S. Navy needs carrier pilots so when Paramount Pictures seeks their cooperation to make a movie called *Top Gun* they accept on the spot. They know that when red-blooded American boys are transported through story to carrier deck operations - dancing yellow vested Shooters (Catapult Officers) waving on FA-18s at afterburners ripping flaming trenches in the sky and a macho Maverick (Tom Cruise), inverted, giving the bird to an enemy fighter pilot ... not to mention the flashy women he attracts - they will sign up in droves for the most dangerous job in the world, "... [they'll] feel the need, the need for speed ". This is aesthetic emotion in action.

Sure, the fear is depicted – Maverick loses his nerve after his Radar Intercept Officer, Goose (Anthony Edwards) is killed in a bailout incident – but seated comfortably in a movie theatre the sense of fear does not blot out the glory of it all. Why should it? The audience is - as philosopher Emanual Kant[11] observed - disinterested, not in jeopardy and therefore able to reflect on the experience as it happens and draw conclusions.

> *Aesthetic emotion fuses idea and emotion giving us what amounts to a religious experience, a synthetic experience that can change our attitudes - even cause us to make life choices.*

---

[10] [McKee 98], p 110

[11] Philosopher Immanuel Kant (1724–1804) reflected on the aesthetic emotion concept, first raised by Aristotle.

Aesthetic emotion drives life choice. Real life seldom serves us such moments but it happens all the time in movie theatres. A female friend signed up for Aeronautical Engineering after seeing *Top Gun*. This emotion charged story of Naval aviation when merged with the idea of an engineering career caused a girl with no aviation experience to make a significant life choice. She had "thought her way into another place" through aesthetic emotion.

Montrepreneur. I wrote a poem called *Montrepreneur* and passed it on to my daughters (refer section *10. Montrepreneur*). One of them passed it on to a friend, a young woman who was thinking of starting her own business. Months later this young woman introduced herself at one of my daughter's music gigs and thanked me for helping her make the decision. She had crossed the threshold into the supernatural world of the self-employed. The poem had engaged her at a deep emotional level and informed her decision to act. In story parlance it took on the role of mentor[12]. How could words on the page exert such a strong influence? I can only speculate using story principles:

1. **Truth in passion from experience.** This poem was written by someone who's been there. An entrepreneur who has experienced the fear of failure and the emotional charge of success. It sounds true because it is true. True to real life.

2. **Empathy.** It expresses familiar emotions: "In predawn thoughts, rampant, loose, wandering / crouch the horrors ". Anyone contemplating crossing the threshold into the self-employed hunter-gatherer existence has experienced the horrors of self doubt. Especially on waking when there is nothing to occupy the mind. The words say what she feels. She begins to inhabit the poem - this is empathy.

3. **It offers coping mechanisms.** Fear can be dealt with through mindfulness referenced thus: "but doubt cannot visit / without my consent ".

4. **An idea wrapped around an emotional charge.** It reinforces the emotional charge that drives all creatives to forswear "the fellowship of the water cooler" for the solitary high-risk creative existence, " ... vocation / deep passion in the bones / alone with the wonder "

5. **Aesthetic emotion.** It depicts the fear of failure but simultaneously reaffirms the emotional satisfaction of a successful creative life: "Now I look up to a scary but richer / independent / creative / life". The young woman was in a contemplative mental state capable of appreciating the emotional charge that might flow from this scary decision. And like all good heroes she acted to move her story forward.

Montrepreneur is an incarnation of the mentor whispering in the hero's ear on the threshold of a new adventure, "You can do it. Go!" The mentor, through aesthetic emotion, provides a demonstration of what is possible, giving her the resolve to keep going when things do go wrong (tests and trials). As such, the mentor fills the role so beautifully described by the nature poet Wordsworth:

> *Prophets of Nature, we to them will speak*
> *A lasting inspiration, sanctified*
> *By reason, blest by faith: what we have loved,*
> *Others will love, and we will teach them how;*
>
> — William Wordsworth, *The Prelude*

---

[12] Refer section 7.4. Mentor

So in preparing a presentation, ask yourself:

1. What is my presentation's controlling idea (in one sentence)?
2. What is the point of my story? What is the key takeaway message?
3. Does every element of my presentation contribute to and develop this controlling idea?
4. Do I have one and only one controlling idea?
5. Does the depiction of this controlling idea express aesthetic emotion?

3.10. Story Checklist

Your presentation is coming together. How can story theory make it better? Ask yourself:

1. Who is my hero (the main empathetic character in the story - myself/the audience)
   - what are the hero's character flaws
   - what demons are holding the hero back
   - how must the hero's character transform (evil /good, naïveté /worldliness)
   - does the hero attract empathy (is he in jeopardy, is she suffering?)
   - does my choice of hero match my presentation's objectives (myself/the customer)
2. What is the quest
   - what does my hero want
   - what is the elixir
   - does my hero have a clear desire
   - is that desire strong (related to the strength of the inciting incident)
   - will the desire be shared by my audience
3. What is the premise
   - The "what if"
     (what if we transported this protagonist to that unfamiliar world)
4. What is the source of conflict
   - how bad is the antagonist (really bad?)
   - what barriers does the hero face
   - what forces make the outcome uncertain
   - what is at stake (metaphorical or actual life and death)
5. What is the controlling idea
   - the truth or moral of the story
   - have I expressed it as value transition plus cause
6. Have I made good use of story devices
   - suspense
   - shape shifters
   - foreshadowing
   - metaphor
   - detailed imagery
   - aesthetic emotion
   - no cliché
7. Is the story true?
   - has conflict
   - has ordeals
   - has hero in jeopardy
   - depicts failure
   - shows, does not tell (no preaching)
8. Is the story properly structured
   - inciting incident (shows what the story is about)
   - crisis (the hero recognises his flaws)
   - climax (the hero deals with his flaws)
   - resolution (the elixir heals the wounded land).

4. Story Design

4.1. In the Beginning: Concept

Writing a work of fiction is a job of pure creativity. You start with a blank page often staring at it for hours, days, months ... until your forehead bleeds. Writing non-fiction is a little easier because at least you've got a plot of sorts to work with. Events that actually happened. But even then careful design is necessary. Compelling drama, after all, is real-life without the boring bits.

Engineers and writers are one. The creative technologist has a lot in common with the creative writer. They are the same person sitting alone in the same room with the same self doubt and the same ideas that will not come. Engineers should study the creative writing process because the two professions are one with the same objectives and the same desired result – human beings must love the things we create.

The premise: what if. So where does the initial creative spark, the crazy idea, come from? A glance out the window, a line from a song, pure lust for the opposite sex (the genesis of Facebook). That which, one day, may become complex always has simple beginnings, good stories and useful systems often start with a "what if". What if a woman kills a man who tries to rape her friend (*Thelma and Louise*). What if we could find anything on the web with a simple request (*Google*). What if a mobile phone became both a marketplace and an execution platform where people could buy, sell and run applications (Apple's concept of a smart phone). In the writer's world the "what if" is called the premise (not to be confused with premise in logic - more on this in section *4.5. Premise*).

4.2. Conceptual Design

Creative process. Armed with our crazy idea (premise), where to next? The possibilities are endless and there is no general agreement on best practice, although the writer community broadly categorises approaches as outside-in, or inside-out. And here's the thing, these processes apply to both story and software development.

Outside-in. Exponents of outside-in go straight to implementation, they sit down and start typing - thousands of lines-of-dialogue/lines-of-code, most of which they know they will later ditch. Ernest Hemingway got it right: "The first draft of anything is shit" (Aside: this is the software engineer's tragedy - too many of our systems are delivered first drafts). Successful writers all agree that the mark of brilliance is not what a writer delivers but what a writer is capable of throwing away. Ergo the process, right off the bat, of trying to create what will be seen (the outside view) will initially fail but the insights gained on the essence of the story/system make it worthwhile. In technology, this is the mantra of the prototyper and the aficionado of agile development.

Great outside-in successes. I do not view outside-in behaviour as positive or negative. It is as it is and from time to time it has been highly successful. Donna Tartt took eleven years to write *The Goldfinch*. It won the Pulitzer Prize for fiction in 2014. The script for the movie Blade Runner – adapted from the book *Do Androids Dream of Electric Sheep?* by Philip K. Dick - was in development for more than a decade. Apple designer Jonathan Ive spent "months and months and months" working out the exact shape of the aluminium stand for the desktop iMac computer because "... it's very hard to design something that you almost do not see because it just seems so obvious, natural and inevitable". Many well known software products – example Oracle's database system product –

have been rewritten several times as their authors revisualise how they should "naturally and inevitably" integrate with their users' business functions. Agile software development methodologies have been highly effective in some environments.

Inside-out. The inside-outer prefers to meditate on the story/system's essence (its inner meaning and truth) as a first step, rather than picking through the entrails of an outside-in brain dump for the same ideas. Then slowly the story concept is developed without writing a line of dialogue/code. This approach is common with professional movie scriptwriters who do not have the luxury of eleven years to produce a world beating movie. Fixed price, fixed time software developers find themselves in the same predicament as they burn through large quantities of other people's money on a daily basis. Outrageous as it may seem some customers have an unquenchable desire for predictability, demanding a result on the "first draft" by a certain date!

Using inside-out, script writing professionals have been known to generate a script from initial idea to final draft in six months[13]. They usually start with a step outline.

Step outlines are a structuring device used by scriptwriters to lay out the skeleton of the story. A "Step" is an "Event" in the arc of a story. Each step may ultimately translate to more than one "Scene" (refer: Section *9. Sample Step Outline: Casablanca*). Control Systems engineers use the same concept in the design of state engines. Each step is described with one or two sentences. Step outlines can be used to pitch a story to investors. It should take no more than ten minutes. The step outline is then further evolved into a story treatment by adding more words to each step description.

Prisoners of THE FORM. Both scriptwriters and software developers love working on green-fields stories/software products. Starting with a blank page, we are free! free! our creativity is unconstrained. It's so much fun!

You think?

In reality we are all constrained by some FORM. In story, FORM is the limited set of story patterns that work for various story genres. The ultimate constraint is the limited set of FORMS that engage human beings. In story telling the most common FORM is the Arch Plot or the classical design (refer section *5. The Story Pattern*).

> *CLASSICAL DESIGN means a story built around an active protagonist who struggles against primarily external forces of antagonism to pursue his or her desire through continuous time within a consistent and causally connected fictional reality to a closed ending of absolute irreversible change.*
>
> — Bob McKee, *Story*

Classical design dictates that our step outline must have certain kinds of events at certain points in the story (plot points), we must use story devices such as conflict, empathy, suspense and foreshadowing to keep our audiences engaged. In software development our architectural choices for particular application classes are limited. Control systems use state engines, web applications use client/server architectures and so on. It's interesting that for centuries artists have recognised that

---

[13] Bob McKee, *Story* page 412

these limitations do not destroy creativity but enhance it; the FORM must be embraced to attain mastery.

Step outline in flight control. As with script writing, software architecture design is constrained in all application domains. In fifty years of building computer control systems the profession is converging on certain step outlines that work the best in various applications. For example, the Airbus step outline for flight control is expressed in laws and modes[14] where a law expresses the overall health of the control system and the equipment under control and the mode is the point in the aircraft's journey (ground mode, flight mode, flare mode):

NORMAL LAW:	Normal operating configuration of the system.
ALTERNATE LAW:	If Multiple Failures of Redundant Systems occur.
ABNORMAL ALTERNATE LAW:	Activated if the airplane enters an unusual attitude, allowing recovery from the unusual attitude.
DIRECT LAW:	The lowest level of computer flight control and occurs with certain multiple failures.
MECHANICAL BACKUP:	In case of a complete loss of electrical flight control signals, the aircraft can be temporarily controlled by mechanical mode.

Plot point annotations. Scriptwriters annotate their steps with plot points - major turning points in the story. The mandatory points are inciting event, crisis and climax (refer section *5.2. Story In Five Acts*).

Story treatment. When happy with the step outline, the writer creates a story treatment which is a step outline with more paragraphs added to each event.

Writing the dialogue/software. Inside out scriptwriters delay writing dialogue until they are happy with the story structure often spending sixty percent of the overall script development time in manipulating step outlines and story treatments. They do not rush into writing dialogue until the last moment. Architects of complex software and electronic systems take note. The scriptwriter's dialogue is our procedural code. Project teams that move too early into the code writing phases of a project are doomed to an eternity of making changes, each change introducing more problems. The result is often a delivered system that is old (i.e. prone to falling over) before its time. It is interesting that many scriptwriters have experienced exactly the same problem.

---

[14] Airbus flight control laws are summarised at:
http://www.airbusdriver.net/airbus_fltlaws.htm, available 17 Sep, 2016

4.3. The Elevator Pitch - *Story Throughline*

Technical people often struggle to explain complex concepts to non-technical people. The common mistake is to dive straight into the technical detail of what the thing does without reference to feeling and motivation - why the thing does what it does - followed by how it does it. I call this the *Little Red Riding Hood Behaviour*. We go straight to the "what", "the wolf ate grandma," without the obligatory, "Once upon a time a little girl walked through the woods to deliver food to her sickly grandmother ......".

There is help at hand. You've probably heard of the elevator pitch, where you meet someone important in an elevator on the ground floor and you've got seconds to pitch them your world beating idea before the elevator makes it to the executive floor. This is the role of the throughline.

Figure 2. A compelling pitch starts with why, works through how and ends with what
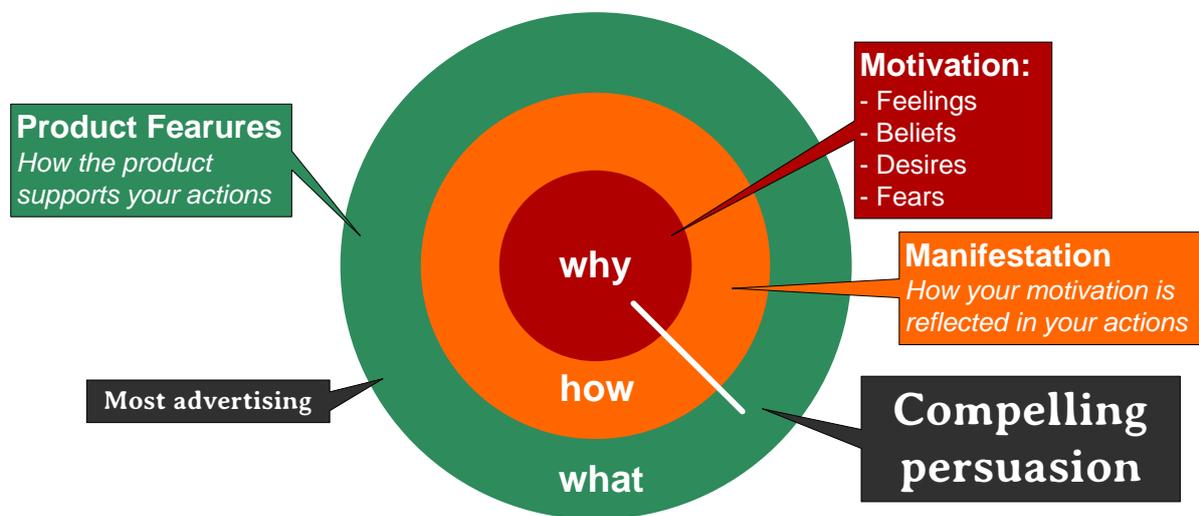
A throughline or logline tells what the story is about in one or two sentences. It's the text you often see on a movie poster. Its purpose is to convey a story's central idea clearly and succinctly to an agent, publisher, producer, movie studio executive, moviegoer or boss.

For example:

- A businessman falls in love with a sex worker he hires to be his date for the weekend (*Pretty Woman*).
- She's the perfect woman - until she has a drink (*Blind Date*).
- A young man and woman from different social classes fall in love aboard an ill-fated voyage (*Titanic*).
- A man who is bitten by a genetically-altered spider, discovers that he has the strength and agility of a spider (*Spiderman*).
- The Solid project aims to radically change the way Web applications work today, resulting in true data ownership as well as improved privacy (Andrei Sambra, Solid team member)[15].

Design function. The throughline describes the unifying idea or super-objective that holds the story together . It typically describes the desire-driven quest of the hero - the 'why'. Bob McKee calls it the "spine of the story". Each scene must express some aspect of this spine. A story may briefly wander

---

[15] Source: http://hi-project.org/2015/12/solid-introduction-mit-csails-andrei-sambra/

off the spine but must ultimately return to maintain the interest of the audience. In the movie *Butch Cassidy and the Sundance Kid*, Katherine Ross rides a bicycle with Paul Newman, while B. J. Thomas sings "Raindrops Keep Falling On my Head". But the lovable outlaw duo soon return to the serious business of robbing trains.

Systems engineering function. All systems should be described with a throughline that succinctly describes the desire-driven quest of its owner. This focuses the development team on the true mission of a system. If candidate functions do not support that mission they should be omitted; in particular those "cool features" that the customer didn't ask for and won't use.

If you view your customer's basic motivation in story terms, the 'why' can always be found in the hero's quest. Quests can involve:

1. **Situations.** Dealing with an unacceptable state of affairs.
   The Godfather: Michael Corleone's beloved father is under existential threat. The drug dealer Sollozzo working with the Tattaglia crime family attempt to assassinate Don Corleone. Michael knows that they will not give up. Something must be done.
   Control systems : Our company's very existence is threatened when we operate at low yields and deliver poor quality product to our customers. The control system shall reduce off-spec production to 0.01% by using advanced control with improved process sensors.

2. **Activities.** Satisfying a desire to take possession of some elixir.
   Raiders of the lost Ark: The Nazis will become invincible if they possess the Arc of the Covenant. To save the day, Indiana Jones goes on a quest to possess the Ark, a gold-covered wooden chest described in the Book of Exodus as containing the two stone tablets of the Ten Commandments.
   Crowdsourcing: Good ideas often come to nothing for lack of money. The web app shall help ordinary citizens finance innovative ideas, that would otherwise not be funded, through donations from the general public.

3. **States of mind.** Making positive changes in individual or communal perceptions or belief systems.
   The Sopranos: Mob boss Tony Soprano wants to escape his inner torment. He is a murderer and a serial adulterer but he wants to throw off his criminal past and become a normal moral human being
   Visibility and inclusiveness: Customers get frustrated and angry when they don't know what is happening to their shipment. The system shall present us as open and friendly by allowing customers to look at our inventory levels and track their shipments all the way to their door.

4. **Manners of thinking.** Improving thought processes.
   Star Wars: The Empire Strikes Back. Master Yoda trains Luke Skywalker in the supernatural powers of the Jedi Knights. To become a Jedi Luke must commit himself to the discipline completely, win or lose. Yoda to Luke skywalker, " Do. Or do not. There is no try. "
   Collaborative design: Creative teams are more productive if their work environment facilitates random interactions where they can bounce ideas off each other. The system will improve design collaboration through immediate access to each other's creative output and live chat between team members.

4.4. Writing a Throughline

As an exercise let's do a quality check on my last throughline example:

> *The Solid project aims to radically change the way Web applications work today, resulting in true data ownership as well as improved privacy*

This throughline was written by a technologist, the others came from professional scriptwriters. How does this prose stack up against the other examples in terms of its ability to engage readers to the point where they want to hear/see/do more? .

1. Q: Who is the hero.
   A: It's not explicitly stated but it's probably you.
2. Q: Do we know what the hero wants?
   A: There is mention of privacy.
3. Q: What is the elixir?
   A: Privacy.
4. Q: Who is the antagonist.
   A: Not identified.
5. Q: Do we have an expectation of conflict - the ordeal death and rebirth.
   A: No.
6. Q: How does the author use devices such as metaphor or subtext to stimulate our imagination.
   A: None.
7. Q: How will the elixir restore balance to the hero's life.
   A: Not covered.

Conclusion: This is the classical advertising pitch that describes what the project does not why or how. Let us write a more compelling pitch including all the missing elements.

Notes:

Desire / belief: no one has a right to access my personal data without my consent.
The elixir: Privacy.
Antagonist: Google, Facebook and the state run security agencies know far too much about me.
Conflict: I will regain control of my personal data from these forces of darkness.
Metaphor: I will defeat Big Brother style surveillance.
Restoring balance: The system will give me an encrypted wallet of all my personal information. I will grant or deny access to designated web services.

First rewrite

> *The Solid project supports your fundamental right to have total control over your personal data. You will break free from the Big Brother style surveillance of Google, Facebook and the state run security agencies. Your data will remain in the cloud but will be totally under your control. You will be allocated an encrypted wallet to store personal information and use a web service to grant or deny access to designated web service providers.*

Second rewrite

The first rewrite has too many words, remember we're in an elevator ascending to the executive suite at 2000 feet per minute. So extract the fundamental ideas and the emotional charges surrounding unwonted surveillance, the antagonist, the conflict and the restoration of balance to your normal world - and we get.

> *Sick of being watched by Big Brother? Google, Facebook and state security?*
> *Wrestle back control over your personal information. The Solid project gives you*
> *an encrypted wallet in the cloud so YOU decide who gets to look.*

4.5. Premise

A story's premise expresses the creative spark, the exciting idea that inspired a writer to tell a story. It's an idea to be explored, often expressed as an open question: "What if ..."

Common components of a premise are:
Situation > Character > Goal > Opponent > Disaster/Opportunity

Examples:

- What if we could clone dinosaurs (*Jurassic Park*)
- What if we lived in a future totalitarian government (George Orwell, *Nineteen Eighty-Four*)
- What if an honest man was forced by circumstance to assume leadership of a Mafia family. (*The Godfather*)
- What if a tech entrepreneur could convince all the music companies in the world to sell their music, through his Internet music store so anyone could download it to a mobile device song by song? (Steve Jobs, iTunes)

Functions of a premise are:

1. Stimulate the storyteller's imagination
2. Focus the storyteller on the basic point of the story
3. Focus a creative team on what is to be addressed
4. Summarise a proposition in few words
5. Stimulate the imagination and hook an audience.

Everyone on a project should understand the premise and be able to recite it in a single sentence.

Contrasting premise in story and logic. Note that the story premise differs from the concept of premise used in classical logic. In story, the premise asks an open question, "what if". In logic a premise is a statement of self evident truth upon which logical arguments and their resultant theories are based[16]. For example:
Premise: *Qantas has never crashed a jet aircraft*
Theory: *Qantas will never crash a jet aircraft in the future*

---

[16] Refer www.personal.kent.edu/~rmuhamma/Algorithms/MyAlgorithms/DeductInduct.htm for an excellent explanation of the use of premise in deductive and inductive reasoning.

In contrast an air crash genre story premise might be:
What if a pilot loses both engines after take-off? (premise of the movie: Sully) [17]

The story premise is designed to spike the audience's curiosity, to set their imaginations running. The logical premise is a closed statement of fact, it smacks of centrally controlled orthodoxy, it's boring. It may appeal to the logicians amongst us but does not incite the emotions which is the core dramatic function of story.

Engineering function: Applying story premise to hazard analysis. The story premise is useful in hazard analysis as we attempt to predict the future we cannot depend on many unassailable facts. We must therefore pose as many what-ifs as possible and pursue the ramifications very much like a storyteller designs the arc of the story. The premise poses the question and the story's climax provides the answer and that answer is a demonstration of the story's controlling idea.

For example take the adventures of Captain Sully Sullenberger. This was a 208 second real-life drama depicting the ditching of an Airbus A320 in New York's Hudson River after all engine power was lost in a collision with a flock of Canada geese.

Premise:	What if an airline pilot loses both engines immediately after take-off?
Inciting incident:	"Birds!" US Airways Flight 1549 strikes a flock of Canada geese during its initial climb out of LaGuardia Airport.
Crisis:	Captain Sullenberger makes the decision to perform a "water landing" in the Hudson River.
Climax:	The landing is successful. All passengers and crew are rescued.
Resolution:	After an initial debate over whether Sullenberger's decision was correct he is declared a hero. Dual engine loss immediately after takeoff is added to pilot simulator training.

"What if" is a foundation concept in functional failure analysis, it is not new in safety engineering, so where does story theory add value?

Taking Sullenberger's story as a metaphor we see that the National Transportation Safety Board's (NTSB) initial questioning of Sullenberger's decision was based on simulations that seemed to prove that, on detecting a bird strike, he had sufficient height and energy to turn back to LaGuardia airport and land normally. It was only when he pointed out that at least 35 seconds should be allocated for decision-making in the simulation before the return was attempted, that he was exonerated of all wrongdoing. It turns out that this was a highly unusual event that no pilot trains for. It is therefore reasonable to expect a decision-making delay - pilots are not robots.

This is the human dimension that story can contribute. Few hazard analyses go into great detail over the feelings of the human beings involved when put under stress in imagined hazardous events. In Sullenberger's case the engineers and check pilots driving the simulation were true to type. They did not consider human factors, they had no empathy. To them it was reasonable to expect a pilot to

---

[17] Refer to Section *8.4. The Serial Killer Fallacy*: *Unsafe Inductive Reasoning* for further discussion of defensible propositions relating to safety.

initiate a turn back to LaGuardia immediately on bird strike. In contrast a storyteller would be working through the hero's emotions - emptying out his character, "My God I have no engines and 154-passengers and crew are depending on me!" What demons was he fighting in the crisis: fear, self-doubt ... and how would that impact his decision-making and his response time? And most importantly what experiences could we give him in the arc of his story (his life) that would improve his response in the future (more realistic simulator training).

In my time with the Dow Chemical Company there was a legend: A board member walks into the control room of an ethylene plant. Pointing to a pipe flange 30 feet up in a pipe rack he addresses an operator. "What would you do if that flange cracked and ethylene poured all over the deck?" Quick as a flash the operator answered, "Unless there was a shut-off valve in the car park. Nothing!" Hazard analysis needs story. I rest my case.

4.6. Controlling Idea

The controlling idea describes a story's fundamental meaning. It expresses the principle that guides story design. For example, in the *Dirty Harry* movies justice is restored because the cop is more violent than the criminals. Deconstructing this statement we have a transition between two states of fortune – justice/injustice and a reason for the transition.

Engineering function: Controlling idea in system goals. Projecting this idea onto system development we can express a system's fundamental reason for being as follows:

The *<target customer community>* will transition from *<the current state of deprivation>* to *<the new state of fulfilment>* because the system will *<description of service>*.

The iPod's controlling idea. Can we describe in one sentence the vision that created this billion-dollar industry?

The iPod, and its successor the iPhone, grew out of a primal human desire to have music everywhere at all times. Initially developed by the Sony Walkman, public taste for mobile music was left unsated by the music industry's lack of technical literacy. Here the story values were access to mobile music and lack thereof. Steve Jobs' multi billion dollar controlling idea was:

> *The world will gain access to all music everywhere because I will integrate the flow of music from music companies to an Internet store (iTunes) that allows downloads to a simple (and aesthetically pleasing) listening device via the Internet.*

Jobs pursued his controlling idea relentlessly, befriending musicians such as Bob Dylan, negotiating with music companies and driving his design team to produce a simple and aesthetically pleasing iPod. Sony could have had that business but it lacked the desire and the controlling idea.

Engineering function: The desire is at the root of all requirements. Desire is a primal human emotion that we often banish from our projects in favour of cold logic – to the detriment of insight. A project's descent into disaster often starts on the first day of requirements capture when the analyst doesn't ask or isn't told what is really important. The premise and controlling idea of the business story are lost in the noise of complex features and technological gadgetry (more at section *8.3. Desire: Writing Requirements*).

As a remedy we can preserve important project objectives through strong controlling ideas wrapped around the emotional charge of the customer's primal desire for an elixir.

4.7. The Elixir

The elixir is the object of desire. It has the power to restore balance in the normal world. It can be money, fame, power, love, peace, happiness, health, freedom, wisdom. It is interesting to note that in myth and legend the most satisfying elixirs are those that bring wisdom and greater awareness. Physical possessions fare badly. In the movie *Titanic*, Rose (Kate Winslet), as an older woman, throws the priceless blue diamond: Heart of the Ocean into the sea at the site of the Titanic's sinking. It turned out that her elixir was not wealth, it was survival and the blessing of a long and eventful life that was of her choosing. Her ordeal had transformed her from spoilt, superficial young woman to focused human being.

Possessing the elixir must be a matter of life and death. In *The Godfather*, Michael Corleone must kill his father's enemy or his father will die. A weak elixir is a nice-to-have. The blue diamond was Rose's weak elixir. Her compelling desire was for the elixir of agency. She wanted to control her own life and not become an appendage to a wealthy man.

Engineering function: evaluating project goals. In evaluating the necessity of any course of action (example, project objectives) ask the question, "Is this a matter of life and death? Will we cease to exist if we fail to achieve this goal?" If the answer is "yes" the project team must fully understand the consequences of failure. This discipline is well understood by fixed price, fixed time software houses who make a point of keeping team members up to date on their project's profit and loss position.

All stories must have an elixir, why else would a hero leave a comfortable existence in the normal world to risk his life in an unfamiliar, supernatural environment. Mythic theory also tells us that unless the hero takes possession of the elixir and returns to the normal world, sharing it with its inhabitants, there will be no healing. Nothing is learnt, there is no character transformation in the hero and the adventure must be repeated.

Engineering function: justifying post project reviews. Does this ring a bell? Organisations that do not learn from their mistakes possibly? Companies that do not hold post project reviews that formally recognise what has been learnt and what needs to be improved? Was this the origin of the saying, "Those who do not learn from their mistakes are bound to repeat them?"

Engineering function: project objectives describe the elixir. Non-performing projects often have no clear definition of their special elixir. Team members can't state in one sentence why they're there. I recently contributed to an online forum that asked for the top five reasons for having a quality management system. There were comments such as "[to have a] Managed process helping to ensure consistency". I don't think I'd risk my life for that elixir. How about: "Reduce costs by fifteen percent and double sales." Now that's more like it; a cause worthy of (metaphorical) mortal combat in the innermost cave - in the belly of the beast.

Engineering teams that have no shared concept of their project's elixir often have low morale and poor productivity. The reasons can be found in the story metaphor. As you may recall, all stories revolve around a hero with a quest. For a story to engage an audience they must know what the hero wants and want him to have it. For a team to spend late nights fighting the forces of evil in the belly of a beast they must share desire for the elixir. And that desire must be specific and strong. No elixir, or a weak elixir translates to poor motivation.

5. The Story Pattern in Detail

There are only two or three human stories, and they go on repeating themselves as fiercely as if they had never happened before; like the larks in this country, that have been singing the same five notes over for thousands of years.
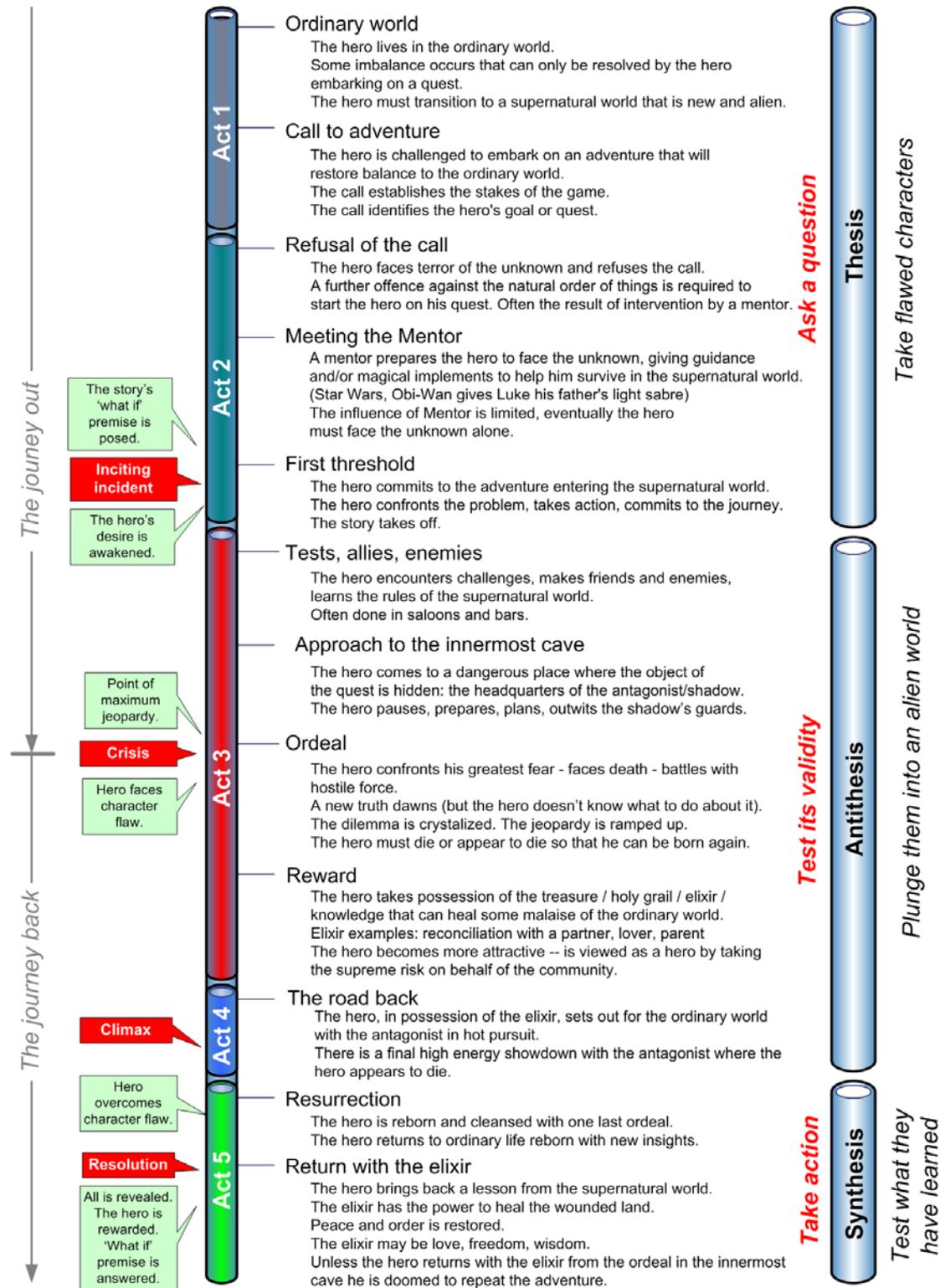
— Willa Cather, O Pioneers

5.1. The Essence of Story

There is this person ... then something happens

The Story Pattern	The Godfather	The Tunnel Project
The normal world as we know it is thrown out of balance; threatened in some way.	Michael Corleone is a war hero intent on living a normal life with his fiancee Kay. There is an attempt on the life of his father Don Corleone who is a New York Mafia Don.	Technology becomes available that allows remote monitoring and control of road tunnels. The technology improves safety and security in the tunnel but if it fails it can harm life and property.
Inciting incident. A protagonist, suffering some kind of personality flaw determines that something must be done to restore balance in the normal world.	Michael wants no part of the family business but loves his father. He returns to the family to look after him. After a second attempt on his father's life he determines that something must be done.	The consultant is hired to oversee the functional safety management program to make sure that the new technology will not trigger any safety incidents. The consultant is concerned that he has little agency for influencing the actions of senior management.
The supernatural world. The protagonist launches forth on a journey into a supernatural world to find the elixir that will restore balance to the normal world.	The Corleone family plans to murder Sollozzo, the drug dealer who they know is behind the attempts on Don Corleone's life.	The consultant prepares safety plans and conducts safety audits. He ultimately develops system tests. Test execution reveals many defects. The system is unstable.
Crisis. In the context of a crisis the protagonist takes possession of the elixir.	Michael kills Sollozzo and his henchmen, corrupt policeman McCluskey at a meeting in an Italian restaurant. His elixir is the safety of his family.	In a progress review meeting the project manager refutes the importance of the safety management program and downgrades the severity of test results. The consultant realises that he is a dangerous man, ignorant of proper systems engineering process and the safety risks of not doing things properly. The consultant has no strategy to deal with this.
The road home. On the way back home the protagonist is forced to deal with the consequences of securing the elixir.	Michael flees to Sicily where he marries a local girl. The New York Mafia families pursue him. His new wife is killed in a bungled assassination attempt.	As the tunnel opening deadline approaches, testing continues. Relations sour with management as the consultant becomes more aggressive in support of the safety management program.
The final ordeal, death and rebirth. Within sight of home the protagonist confronts a final ordeal to secure the elixir. It nearly kills him.	Michael's father Don Corleone sues for peace and secures his safe return to New York. Don Corleone warns Michael that upon his death their enemies will attempt to kill him. When Don Corleone dies, Michael pre-empts his enemies' plans by killing all the New York Mafia dons and miscellaneous traitors within the Corleone family.	The deadline arrives and the tunnel is opened with testing incomplete and an extensive list of unresolved defects. The consultant decides not to escalate his concerns to the manager's political masters as a potential for harm is not high. The system fails and shuts down the freeway twice, exposing motorists to back-of-queue collisions. Testing continues at night when the tunnel is shut down.
The normal world. The protagonist doesn't die but is reborn and uses the elixir to restore balance to the normal world.	The Corleone family relocates to Nevada taking over Las Vegas casinos.	The consultant vows to never again tolerate corruption of proper system engineering process. Next time he will blow the whistle.

5.2. Story In Five Acts

We impose order on the massive volume of information that assaults us every day by arranging it in narrative format. We observe, we make a candidate assertion or ask a question (thesis), we test its validity (antithesis) and we take action (synthesis). This is a key driver of the story structure. Here is Christopher Vogler's story pattern in a five act framework.

Figure 3. The Five Act Story Pattern

Ordinary world
The hero lives in the ordinary world.
Some imbalance occurs that can only be resolved by the hero embarking on a quest.
The hero must transition to a supernatural world that is new and alien.

Call to adventure
The hero is challenged to embark on an adventure that will restore balance to the ordinary world.
The call establishes the stakes of the game.
The call identifies the hero's goal or quest.

Refusal of the call
The hero faces terror of the unknown and refuses the call.
A further offence against the natural order of things is required to start the hero on his quest. Often the result of intervention by a mentor.

Meeting the Mentor
A mentor prepares the hero to face the unknown, giving guidance and/or magical implements to help him survive in the supernatural world.
(Star Wars, Obi-Wan gives Luke his father's light sabre)
The influence of Mentor is limited, eventually the hero must face the unknown alone.

First threshold
The hero commits to the adventure entering the supernatural world.
The hero confronts the problem, takes action, commits to the journey.
The story takes off.

Tests, allies, enemies
The hero encounters challenges, makes friends and enemies, learns the rules of the supernatural world.
Often done in saloons and bars.

Approach to the innermost cave
The hero comes to a dangerous place where the object of the quest is hidden: the headquarters of the antagonist/shadow.
The hero pauses, prepares, plans, outwits the shadow's guards.

Ordeal
The hero confronts his greatest fear - faces death - battles with hostile force.
A new truth dawns (but the hero doesn't know what to do about it).
The dilemma is crystalized. The jeopardy is ramped up.
The hero must die or appear to die so that he can be born again.

Reward
The hero takes possession of the treasure / holy grail / elixir / knowledge that can heal some malaise of the ordinary world.
Elixir examples: reconciliation with a partner, lover, parent
The hero becomes more attractive -- is viewed as a hero by taking the supreme risk on behalf of the community.

The road back
The hero, in possession of the elixir, sets out for the ordinary world with the antagonist in hot pursuit.
There is a final high energy showdown with the antagonist where the hero appears to die.

Resurrection
The hero is reborn and cleansed with one last ordeal.
The hero returns to ordinary life reborn with new insights.

Return with the elixir
The hero brings back a lesson from the supernatural world.
The elixir has the power to heal the wounded land.
Peace and order is restored.
The elixir may be love, freedom, wisdom.
Unless the hero returns with the elixir from the ordeal in the innermost cave he is doomed to repeat the adventure.

Act 1 | Act 2 | Act 3 | Act 4 | Act 5

The journey out — The journey back

The story's 'what if' premise is posed.
Inciting incident
The hero's desire is awakened.
Point of maximum jeopardy.
Crisis
Hero faces character flaw.
Climax
Hero overcomes character flaw.
Resolution
All is revealed. The hero is rewarded. 'What if' premise is answered.

Ask a question — **Thesis** — *Take flawed characters*

Test its validity — **Antithesis** — *Plunge them into an alien world*

Take action — **Synthesis** — *Test what they have learned*

[Vogler C, *The Writer's Journey*]

5.3. Plot Points

All stories feature at least three scenes where major events occur: the inciting incident, the crisis and the climax. These are referred to as plot points. The dramatic function of a plot point is to move the story ahead. This is obligatory, we are wired to keep moving, always curious to see what's over the next hill, so we naturally recognise movement as a quality factor in our myths, legends, story books and movies. A plot point also signals a change in our hero: his desires, character flaws, attitudes of mind. The plot point is always a major reversal of fortune, always involving conflict and jeopardy: the Titanic sinks, Darth Vader kills Obi-Wan Kenobi, Michael Corleone kills Sollozzo, Thelma and Louise drive off a cliff, the Australian Bureau of Statistics deploys a census website, it suffers a denial of service attack and is shut down ... and so on.

Stories may have many plot points but the natural laws of storytelling require at least an inciting incident, a crisis and a climax. We can look at the impact of key plot points from the perspectives of story arc and character arc.

Plot Point	Story Arc *The overall structure of the story:- beginning, middle, end*	Character Arc *The transformation of the hero's character through the arc of the story*
The inciting incident	What would happen if these events occurred?	What would happen if we put this protagonist in this alien world?
The crisis	It would trigger this inevitable conflict ...	It would force the protagonist to face this character flaw ...
The climax	leading to this final confrontation	which would result in this character transformation

5.4. The Inciting Incident

> *One day Gregor Samsa awoke to discover he had been changed into a large cockroach.*
>
> — Franz Kafka, *Metamorphosis*

Dramatic function. In the movie *The Godfather* the inciting incident was the attempt on Don Corleone's life by thugs serving the drug dealer Sollozzo. This scene provided the following dramatic functions:

1. **Introducing chaos.** The protagonist's life is thrown into disarray - put out of balance.
   Michael Corleone, previously visualising a quiet life in legitimate business, is drawn back into his family's criminal affairs.

2. **Kick-starting the story.** The hero reacts by embarking on a quest for some object of desire that will right the imbalance.
   Michael plots with his brothers to stop further attempts on his father's life. His immediate desire is his father's security and the overall safety of the family.

3. **Demonstrating the story premise.** Your audience is faced with the story's premise, the 'what-if'.
   What would happen if an honest man is forced to commit a crime out of love for his father (What else can he do? Call the cops?).

4. **Hooking the audience.** A well designed inciting incident puts a deep hook into an audience, feeding their natural curiosity with the dramatic question: "How will this turn out".
   By this point we've met Michael and his lovely (but naive) fiancé Kay. We care about him. We know he's an honest man, loved by and loving Kay and a loyal son. My god! What will he do?

5. **Foreshadowing the crisis.** There is a set up that must inevitably result in a confrontation in the story's crisis (known as the obligatory scene).
   If mob assassins attempt to kill your father, there must be consequences - revenge. We visualise how Michael will confront his father's enemies. Sollozzo must die!

6. **Awakening desire.** Conscious and unconscious desires are aroused in the hero.
   Michael is filled with a strong desire to protect his father. But we are also given a hint of an unconscious desire. After Michael thwarts the second attempt on his father's life at the hospital he lights a cigarette and notices that his hand is not shaking. He is finding the cut and thrust of the criminal world exhilarating and knows he is good at it! We are given a brief glimpse of his unconscious desire to dominate the underworld.

7. **Awareness and commitment to change.** The hero is forced to confront the reality that something must be done and commits to that change even though he may not know how it will be achieved.
   Michael realises that his brother Sonny does not have the strategic and tactical skills to eliminate the forces of darkness seeking to destroy his family. It must fall to him with his military training and superior intelligence. He commits to personally killing Sollozzo with the full knowledge that it will change his life for ever.

8. **No turning back.** The hero crosses the threshold into an alien, supernatural world from which there is no turning back - at least until he possesses the object of his desire (the elixir).
   Michael knows that he will be stepping from the legitimate world into the criminal world. He deludes himself by thinking he can make the Corleone family legitimate within five years and makes a promise to Kay.

Quality factors. Effective inciting incidents have the following qualities:

1. **Horrendous, chaos inducing, not unremarkable or vague.** Consider the worst possible thing that could happen to your protagonist. It must radically upset the balance of forces in the protagonist's life.
   The Godfather. *Assassins attempt to kill Michael's father.*
   Star Wars. *Luke Skywalker's auntie and uncle are killed by Imperial storm troopers.*
   Jaws. *The shark-mauled body of a female swimmer washes up on a beach.*
   Real life. *Australian Bureau of Statistics puts up a census website. On the day of the census, ten million citizens login, it is attacked by hackers and is shut down. The reputation of the developer (IBM) is in jeopardy.*

2. **The hero must react** to the inciting incident. The story must take off.
   The Godfather. *After the assassination attempt the Corleone family goes onto a war footing, Michael separates himself from Kay and rejoins the family to plot revenge. We expect no less, any other response would not be authentic.*

3. **It occurs early.** It must appear in the first twenty-five percent of the story's telling. Don't make your audience wait too long to understand what the story is about and what the hero wants. Audiences get bored with too much exposition.
   Casablanca. *Thirty-two minutes into the movie Ilsa appears in Rick's Cafe American. "Of all the gin joints in all the towns in all the world, she walks into mine."*

4. **Not too early.** There must be sufficient exposition to enable the audience to understand its import. The audience must be given time to develop empathy for the protagonist; to take on their feelings and project their own hopes and fears into the lives of the characters - the

lacrimae rerum, "the tears of existence"[18]

The Godfather. *We are given at least 30 minutes to develop empathy for Michael Corleone before he faces the inciting incident. Sure, his family is one of the major crime gangs of New York but he's not a bad guy ("That's my family Kay, that's not me"). He wants to live an honest life and marry a good woman. As a result our empathy is ramped up when we watch him make the awful decision to become a murderer.*

5. **Arousal of strong desire.** The inciting incident must arouse strong desire.
   The Godfather. *At story commencement Michael has no desire to be a Mafia Don. His family's suggestion that he should get involved would not be an inciting incident, it is too weak. In contrast the proposition that his father will be killed if he does nothing is a strong motivator.*

6. **Unconscious desire.** Particularly compelling stories have inciting incidents that arouse unconscious desires. They stimulate the audience's capacity for visualisation. We develop our own alternative narratives and in so doing begin to inhabit the hero's supernatural world.
   The Godfather. *Michael's coolness in the face of the second assassination attempt leads us to speculate. "This guy is enjoying the drama. He wants more. He is not going back to his old life. This is going to end badly."*

5.5. The Crisis

EXTERNAL: EDGE OF THE GRAND CANYON
Thelma and Louise are stationary in their convertible surrounded by police intent on arresting them for robbery and murder.
Thelma: Let's keep goin.
 Louise: What do you mean?
Thelma: Go.
 Louise: You sure?
Thelma: Yeah.
They kiss, Louise steps on the accelerator, and together they ride the convertible over the cliff.
— Movie, *Thelma and Louise*

In this scene from Ridley Scott's classic move, Thelma and Louise face a crisis of the worst kind. They have a choice, surrender and spend the rest of their lives in jail or "keep goin" and find freedom and transcendence, renouncing a corrupt society where a man can rape a woman and get away with it. With their final act they move on to something better, something higher - death (or so we are led to believe).

A story's crisis is the point of maximum jeopardy for protagonists. Referred to by Joseph Campbell as the entry to the innermost cave.

> *... where you find yourself face-to-face with ... a menacing shadow composed of all your doubts and fears and well armed to defend the treasure. Here, in this moment, is the chance to win all or die. ... Whatever the outcome of the battle, you are about to taste death and it will change you.*
>
> — Joseph Campbell, *The Hero With a Thousand Faces*

---

[18] From the Aeneid (circa 29–19 BCE) by Roman poet Virgil (70–19 BCE).

When Michael Corleone kills Sollozzo and McCluskey in *The Godfather,* director Francis Ford Coppola provides us with all the elements of the archetypal crisis:

1. **Extreme jeopardy.** If the hero cannot solve the dilemma he faces metaphorical or actual death.
   Once Michael Corleone produces a gun he must kill McCluskey and Sollozzo or they will certainly kill him.

2. **Major dilemma.** The hero faces a dilemma. All his previous actions in his quest for the elixir have failed and now there's only one thing left to do. Tension builds and the hero makes a choice between two or more reasonable courses of action. The dilemma is that these choices violently conflict.
   Michael knows that these men will not stop until his father is dead and the only way to save him is to kill them. But murder is against his nature, he is an honest man.

3. **Moments of truth.** In a moment of supreme insight a new and shocking truth is crystallised and the protagonist's certainty in this truth causes him to act.
   The sad truth is inescapable, unless he kills these men his father will be killed. He cannot call the police and he cannot sit by and do nothing. In pulling the trigger Michael demonstrates his certainty in this truth - it's the Devil's offer he cannot refuse.

4. **The obligatory scene.** The series of events set off by the inciting incident arrives at its inevitable consequence with a death or glory confrontation between the protagonist and the antagonist.
   The first assassination attempt on Don Corleone made this scene unavoidable. The Corleone family does not back down!

5. **Seizing the elixir.** The crisis is triggered because the antagonist possesses the elixir. The protagonist seizes the elixir and sets out on the road home.
   Michael must confront his enemy and seize the elixir (the security of Don Corleone).

6. **Windows into the soul**. The choices made by the protagonist under the extreme pressure of a crisis are a window into his deep character, his essential nature, the ultimate expression of who he is.
   For Michael, in a life-and-death crisis, filial love trumps all else, even his strongly held belief that "thou shalt not kill". But that's not all, the compelling Godfather narrative is expressed here in a subtext. In killing Sollozzo and McCluskey he fulfils his, as yet, unacknowledged desire for power. HE is unaware but WE can see this tragic flaw, and our visualisation draws us further into the story. As Michael pursues this desire his goodness will corrode away in compliance with the timeless archetypal pattern of the tragedy (refer: Breaking Bad, Moby Dick, Wolf Hall, Lolita, Line of Duty, Macbeth ...)

7. **Character transformation.** The hero experiences internal conflict between the flawed person that he was and the person that he must become to achieve his goal. His action in the crisis signals the beginning of that transition.
   In pulling the trigger Michael enters the criminal trade forever. Although he deludes himself that he can make the Corleone family business legitimate, the reality is he cannot survive in the criminal underworld without the willingness to kill his enemies. The Mafia businessman cannot afford compassion and forgiveness. They are character flaws that will make him a victim not a Don.

8. **Assertive action.** All stories are driven forward by the actions of the hero. Whatever the nature of the crisis the hero always acts to solve the problem. The hero is never passive.

> *Having secured his father's future, Michael is propelled forth on the road home which will end with the family's move to Nevada. Later in the Godfather movie trilogy the metaphorical road home will end in his own degradation and destruction.*

9. **Irreversibility.** The hero's actions cannot be reversed. There is no going back.
   On pulling the trigger Michael becomes a murderer. This cannot be undone.

But the crisis isn't the end of it. Sure, the hero has the elixir but the antagonist has not been defeated. There are many outstanding issues not the least of which is the hero's internal struggle with his character flaw which is recognised but as yet not resolved. So the story is propelled forward with the hero in possession of the elixir on the road home and the antagonist in hot pursuit toward the story's climax.

5.6. The Climax

EXTRATERRESTRIAL: ATTACK ON THE DEATH STAR
Piloting his X-Wing fighter Luke Skywalker is attacking Darth Vader's Death Star at its most vulnerable point, a particle exhaust vent leading directly to the synthetic planet's reactor core. He fails to hit the target using his fighter's automated target acquisition system. He hears the voice of his mentor.

Obi-Wan Kenobi: Use the force, Luke. Let go. Luke.

Luke switches off his fighter's computer and successfully guides his missile onto the target using the enhanced human instinct bestowed upon him by the collective energy of the Jedi Knights (the Force).

— Movie, *Star Wars*

In this climactic scene Luke Skywalker forswears dependence on machines in favour of the infinitely more powerful human intuition of the Force. As such he positions himself as the ultra creative leader who will always triumph over the machine men exemplified by the Death Star. His transformation from farm boy to intergalactic warrior is complete.

> *The climax answers the question posed by the inciting incident, the hero finally understands the supernatural world, knows what he must do and executes. The story's controlling idea or truth is expressed through his actions.*

The ordeal death and rebirth. Over thousands of years the organic evolution of the story pattern has dictated that the hero must face at least two ordeals: at the crisis and the climax. In both cases, in conflict with the antagonist, the hero's life is placed in extreme jeopardy. While the crisis makes the hero aware of his character flaws, the climax is the point where he deals with them and changes forever. The climax represents a symbolic cleansing of the hero to prepare him for re-entry to the normal world. The purification is achieved with a figurative or actual ordeal, death and rebirth. This metaphor is projected onto all our stories and acted out in our rituals and traditions. For example, a christening features immersion in water as the ordeal of death by drowning and the bringing up from the depths to the new world as the symbol of rebirth and resurrection.

Finding truth in myth and legend. Joseph Campbell's extensive studies of the myths and legends of widely separated civilisations down through the ages have revealed this common thread.

> *We shuffle back towards the village. Look! The smoke of the Home Tribe fires! Pick up the pace, we're almost back – huzzah! But wait – the priest appears to stop us from charging back in. You have been to the land of Death, he says, and you look like Death itself, covered in blood, carrying the torn flesh and hide of your game from the hunt. If you march back into the village without purifying and cleansing yourselves, you may bring death back with you. You must undergo one final sacrifice before rejoining the tribe. Your warrior self – the adventuring hero in you – must "die" so you can be reborn as an innocent into the group. The trick is to keep the wisdom of the Ordeal, while getting rid of its bad effects. After all we've been through on the quest, we must face a final trial – maybe the hardest.*

The dramatic function of the climax is therefore to retain the lessons of the climax but without the debilitating emotional baggage of the near death experience. The widespread adoption of this pattern across culture, across time indicates that it may convey deep truths that we should examine further.

Assimilating with the normal world. Millennia ago so-called primitive tribes enacted rituals to cleanse returning warriors of the horrors they experienced in war to ease their integration with peaceful society. These rituals often involved reliving their worst experiences. The Vietnam war was an example of warriors being denied these rituals - the symbolic reliving of the ordeal-death-and-rebirth. They were often denigrated as murderers on returning home. The result: endemic post-traumatic stress disorder (PTSD). A significant percentage of police officers face the same problem. Only now are we beginning to realise that denial of the reintegration ritual can be highly damaging to a warrior's mental state.

Touching the Void. Mountaineer Joe Simpson broke his leg at 22,000 feet on the West Face of Siula Grande in the Peruvian Andes - typically a death sentence. As his climbing partner attempted to rope him down the mountain Joe fell into a crevasse, but with several acts of supreme determination he managed to survive. Joe wrote a book (*Touching the Void*) and went on many speaking tours. In the process he retold his story thousands of times. Joe reports that this act of retelling cleansed him of his demons (read PTSD). You could say he relived his climax over and over again and as a result was cleansed and made whole to return to the normal world.

The Godfather: At the climax Michael Corleone ordered the assassination of the other New York Mafia Dons thus facilitating the family's relocation to Nevada. At this plot point his character completed the transition from positive to negative values; honest man to ruthless killer. Sad but necessary for success in the criminal underworld. Note that, as the Corleone assassins went about their work, Michael attended the baptism of his sister Connie's child. The baptism metaphor reinforcing the symbolic ordeal, death and rebirth that the audience needs in a climax.

> *All climaxes feature the destruction of physical enemies and/or the defeat of the hero's internal demons as a prerequisite for possessing some object of desire.*

Sacrifice. Authentic resurrection calls for sacrifice by the hero. The very definition of a hero is the willingness to give up something one values for the benefit of another. The **"something"** surrendered can be valued possessions or an intangible such as an attitude of mind – even life itself. In Charles Dickens' *A Tale of Two Cities*, Sydney Carton sacrifices himself on the guillotine to save the

life of French nobleman Charles Darnay. In the movie *Alien Three*, Ripley (Sigourney Weaver), knowing she has a monster growing inside her, gives herself up to destruction for the good of humanity.

Learning in crisis. The Koran says, "Do you think that you shall enter the garden of bliss without such trials as come to those who passed before you?" Translated:

> *You can only find truth in the context of trials.*
> *True learning is never easy religion cheaply achieved.*

The lessons of story teach us that true attitude transformation can only take place in the context of crisis, climax, ordeal, death and rebirth. This was demonstrated yet again in the Harvard Business Review's July-August 2016 article entitled *Designing A Bias-Free Organisation*. The authors report that many American corporations are "wasting their money on diversity training". It turns out that two days in a training room does not eliminate racial and gender bias when you're hiring a new employee. In the article Iris Bohnet, Director of the Woman and Public Policy Program at the Harvard Kennedy School, suggests behavioural design as a solution. She cites the success of blind auditions for orchestra musicians that increased the fraction of women in orchestras to almost 40 percent today. Bohnet admits that there is no easy path to attitude change but, on the positive side, cites men with daughters as her greatest allies. Story gives us insight into why. Compare admiring a pretty girl at a party to being present at the birth of your third daughter (as I have). Married life and children has all the qualities of the epic story, the quintessential ordeal, not one but many pairings of crisis and climax, much learning, much attitude change.

Catharsis. The climax should provide a feeling of catharsis. It is the Greek word for "purging" (or "vomiting up") but has come to mean a purifying emotional release or breakthrough. In psychoanalysis catharsis relieves anxiety or depression by bringing unconscious feelings to the surface. Catharsis brings about a sudden expansion of awareness, a peak experience of higher consciousness. It is also restores balance in emotional state. A moving story with a well crafted climax brings about this healthy cleansing with extreme changes of emotion, joy, laughter, tears. For example at the climax of Star Wars, Luke Skywalker is in extreme jeopardy, finally placing his trust in "the force" he blows up the Death Star and balance is restored to the universe. There is still some apprehension - Darth Vader has escaped - but also much happiness, we can relax ... for the moment.

Integration. The climax signals the completion of the character transformation from cowardice to courage, from hate to love from bigotry to tolerance. The hero shows he has absorbed every lesson from every character. He has absorbed the mentor, shape shifter, shadow, guardians and allies. These changes must be visible in the appearance or actions of the hero. We must be able to see it in his dress, behaviour, attitude, actions and the choices the hero makes in the climax.

Telling the truth. The climax must tell the truth, it must be full of meaning. Deep meaning stirs emotion. The climax should express truth by acting out the story's controlling idea. The classics of literature and film deliver this truth unambiguously through indelible images that are sometimes remembered for centuries. At the climax of *The Godfather* trilogy Michael Corleone kneels on the steps of an opera house by the body of his beloved daughter killed in the crossfire of yet another Mafia assassination attempt. His mouth is open in a silent scream. This is the end of the road, the inescapable proof that unchecked ambition destroys, wrapped around the emotional charge of unbearable grief. We leave the theatre in a daze, oblivious of the anonymous faces waiting for the

next session. We've left the supernatural world of the movie theatre and are back in the normal world of a rain swept street. But the truth stays with us, sometimes in our dreams, "unchecked ambition destroys ... this is so true".

Anti-pattern: Stories that don't ring true. Stories that do not demonstrate truth are rejected by their audiences. A life lived without expressions of truth end in tears. A famous story anti-pattern that demonstrates these ideas is discussed in section *8.5. Opposing Deus Ex Machina: .*

Surprise. We love being surprised, it makes our world a little more knowable but from a different perspective. Neuroscientists report that what most surprises will be most strongly learnt and acted upon. Story can deliver surprise on the turn of phrase, in an exchange between two characters or in the major turning points of the plot.

> *Those are my principles. If you don't like them…*
> *I have others.*
> — Groucho Marx

Here we are expecting integrity but we get hypocrisy. But we are drawn to it because it rings true, it gives insight into character, normally left unsaid. We all know someone like this.

Highly rated movies pack surprise in at every turn. In an exchange between two characters (called a beat by scriptwriters) he says, "I love you." She slaps his face. And in the gap between the expected in the actual lies the story.

At their climax, good stories deliver surprise on a major turning point in the plot. The question posed by the inciting incident sets up a need in the audience for the climactic scene but leaves us to imagine how it might unfold. William Goldman[19] argues that,

> *The key to all story endings is to give the audience what it wants,*
> *but not the way it expects.*

What the audience wants in the climax is emotional satisfaction – but if that satisfaction is delivered in a way they didn't expect - even better. Aristotle pointed out, "The ending must be both inevitable and unexpected. Inevitable in the sense that the inciting incident makes everything and anything seem possible but at climax as the audience looks back through the telling it should seem that the path the telling took was the only path."

Oedipus the King (circa 441 BCE). In Sophocles' classic Greek tragedy Oedipus discovers that the villain he killed at the climax was his father and the woman he married was his mother. An unpleasant surprise.

Star Wars - The Empire Strikes Back: Right from the beginning we expect a final showdown between Luke Skywalker and Darth Vader but ... locked in mortal combat with Vader, Luke loses his hand to Darth's light sword, but Vader does not administer the coup de grace. Instead he tries to persuade Skywalker to join him on the dark side. "I am your father," says Darth. Luke refuses and escapes but this surprise turn of events changes the dynamic of the Star Wars narrative. Is this the beginning of

---

[19] William Goldman is a celebrated Hollywood scriptwriter with credits: Butch Cassidy and the Sundance Kid, The Princess Bride, Heat.

empathy for the antagonist? Can Darth Vader be such a bad guy? after all he's Luke's father. Surprise surprise!

5.7. The Resolution

It could be best to write conflict before sex, when the future is tangy, and
write resolutions and reflections in the salty calm aftermath.

— DBC Pierre, *Release the Bats: Writing Your Way Out Of It*

Returning with the elixir. The dramatic function of the resolution is to demonstrate how the elixir has healed the troubles of the ordinary world. The story must show how lives of the general population have been changed by the actions of the hero. The Rebel Alliance has won, the Death Star has been destroyed, the elixir of freedom is restored to the galaxy. The heroes are rewarded, Luke Skywalker didn't get the girl (Princess Leia) instead he got fame and a medal (this was a family show). Villains are punished. Darth Vader spins off into space in a flimsy fighter, surely he will not survive.

Elixir metaphors. The elixir can be tangible or intangible. A cervical cancer vaccine, wealth, fame, love, peace, happiness, profound insight. The elixir is at the heart of the truth conveyed by the story. For example:

- Crime doesn't pay because the cops a more violent than the criminals (*Dirty Harry*)
- I am my brother's keeper (*Tale of Two Cities*)
- There's no place like home (Wizard of Oz)
- Love conquers all (*When Harry met Sally*)
- Unchecked ambition destroys (*The Godfather, Macbeth*)
- The wages of greed are ruin and destruction (*Treasure of the Sierra Madre*)
- Self-determination trumps wealth (*Titanic*)

Winding up loose ends. The resolution resolves loose ends. There is closure for all storylines and themes. Han Solo has transformed from a selfish intergalactic smuggler to a selfless hero joining the battle with the Death Star at the final moment.

Restoring balance. The metaphor of marriage or forming new friendships is often used to illustrate the restoration of balance to the ordinary world. In the final scene of Casablanca Humphrey Bogart doesn't get the girl but forms a new friendship with police inspector Claude Rains, "Louis, I think this is the beginning of a beautiful friendship."

Anti-pattern: returning without an elixir. If the hero returns without an elixir he is universally doomed to repeat his ordeal until he does learn. This truth is repeatedly conveyed through many ancient myths and legends. For example, a sack full of gold coins won from the fairies when opened in the ordinary world is found to contain nothing but wet leaves. This is a metaphor for truth being spiritual and very hard to explain to others. "Others" must go to the supernatural world themselves. This plays out in real life when returned soldiers only socialise with each other, they cannot share their experiences with someone who hasn't experienced combat. This inability to seek professional help and relive the ordeal, death and rebirth often results in mental illness.

Proof of passage. Tangible and intangible elixirs brought back from the supernatural world are proof that the hero has made the journey. He has learnt the lessons of the crisis and climax and can demonstrate this learning. This often results in people with experience having a "presence" that commands respect. But beware, elixirs secured through life transforming experiences may evaporate if we do not internalise them as part of our daily lives. The real elixir from the quest is not from the souvenirs but the lasting inner change and learning.

6. Character

TRUE CHARACTER is revealed in the choices a human being makes under pressure—the greater the pressure, the deeper the revelation, the truer the choice to the character's essential nature.

— Bob McKee, *Story*

6.1. Character Arc

Character is plot. Stories are driven forward by the actions of their heroes and through these actions the heroes are transformed. There is a natural cycle:

Desire (hero) -> Action (hero) -> Reaction (antagonists) -> Reflection (hero) -> ...

All stories are therefore character driven. Their experiences change their attitudes, modes of thinking and habits of mind. In the movie Casablanca, Rick (Humphrey Bogart) starts out as a selfish and cynical lone wolf of a man ("I stick my neck out for no man"). At the climax he performs an unselfish act at great risk to his own safety, helping his ex-girlfriend Ilsa escape to America with another man.

A Few Good Men. In Aaron Sorkin's[20] movie a US Navy defence lawyer, Lt Kaffee (Tom Cruise), sets out to prove that the (fictional) commanding officer of the Guantanamo Bay detention camp, Colonel Jessop (Jack Nicholson) ordered the hazing of a marine private (called "code red") resulting in his death. When we first meet Kaffee he is a smug, superficial, spoilt brat who prefers to plea bargain and has not seen the inside of a courtroom. As the story unfolds it becomes clear that unless he grows up, behaves professionally and faces down Jessop in a courtroom, he will not achieve his object of his desire - justice for the dead marine. In the climactic courtroom scene under extreme pressure - accusing a senior officer of lying can be career destroying in the Marine Corps - he goads Jessop into confessing his crime with an exchange that has gone into the language:

> Jessop: You want answers?
> Kaffee: I think I'm entitled to them!
> Jessop: You want answers?
> Kaffee: I want the truth!
> Jessop: You can't handle the truth!
> Jessop: Son, we live in a world that has walls, and those walls have to be guarded by men with guns ... And my existence, while grotesque and incomprehensible to you, saves lives. ... you want me on that wall, you need me on that wall. ... I have neither the time nor the inclination to explain myself to a man who rises and sleeps under the blanket of the very freedom that I provide, and then questions the manner in which I provide it.
> ...
> Either way, I don't give a damn what you think you are entitled to.
> Kaffee: Did you order the Code Red?
> Jessop: I did the job I...
> Kaffee: Did you order the Code Red?
> Jessop: **You're Goddamn right I did!**

---

[20] Aaron Sorkin's script writing credits include: The West Wing, A Few Good Men, The American President, Charlie Wilson's War, The Social Network, Moneyball and Steve Jobs.

Sorkin skilfully builds this compelling story on Kaffee's character transformation, engaging his audience with character transitions from boy to man, immature to mature, indifference to courage, backroom litigator to courtroom warrior.

Engineering function: personal development. In the technology industries it is common for people to actively seek out new experiences that will trigger personal growth. We are a restless bunch of pilgrims. Managers should visualise all their people as heroes on a character arc, a continuous transformation from birth to death.

Character arc is mandatory. The dramatic function of story is to not only reveal the hero's true character but also to chronicle changes in that character for better or for worse in the arc of the story. Heroes that don't change are boring because they are not true-to-life. We all change in response to life experiences. I did not enjoy the last Jason Bourne movie. Matt Damon's character at the climax was identical to the Jason Bourne of the inciting incident.

Engineering function: give them experiences. Technologists who are not experiencing change are likely to become bored and depressed and seek alternative employment. All managers should ask themselves, "What 'ordeals' am I providing for my people that will help them grow?"

Distinguishing character from characterisation. Character and characterisation are different concepts. Characterisation is all that can be observed about a person by static examination: age, IQ, sex, speaking style, dress, stated values and attitudes. Characterisation is what can be seen on the surface. Character is what lies beneath. Characterisation is expressed when nothing is at risk. Character is revealed when in jeopardy, under pressure. For example a project manager might extol the virtues of thorough system testing but when a deadline approaches and the prospect of financial loss becomes real, testing might be curtailed.

Engineering function: validate character by crisis. When interviewing job candidates what you observe in the jeopardy-free day-to-day is seldom what you will get in a crisis. So how can we get visibility of true character when no risk is involved and the candidate is willing to say anything we want to hear? Character can be revealed by probing a candidate's past for high pressure situations where their actions revealed their true nature. The interview room can also be transformed into a high stress environment by of proposing a case study and asking your candidate for solutions. Refer application note *8.2. Character Arc: Picking the Dream Team*.

Engineering function: capture requirements by observation not conversation. Requirements engineers should accept what people say at face value but also seek to validate all stated "truths" by observing behaviour, especially under stress. The most useful automation is always created when analysts work in a company's operations, meet the people at the coalface and experience first hand the tests and trials that they face. Systems built from pronouncements by subject matter experts in back offices are always at risk of failure.

Mapping character transformation. Character transformation can be mapped using a set of transitions between mental or physical states of human experience (called story values). These transitions can have connotations of negative to positive or positive to negative. In the arc of Kaffee's story there was an overall positive transition from indifferent plea-bargaining lawyer to courageous courtroom lawyer. But along the way there were many negative transitions, from ultra

confidence to a feeling of inadequacy. This exchange between Jessop and Kaffee on a visit to Guantanamo Bay expressed the story's inciting incident. Kaffee makes a routine request for some records and Jessop responds by humiliating Kaffee in front of his fellow officers.

> Jessop: The Corporal will take you by Personnel on your way back to the flight line and you can have all the transfer orders you want.
>
> Kaffee: [to his colleagues] Let's go.
>
> Jessop: But you have to ask me nicely.
>
> Kaffee: I beg your pardon?
>
> Jessop: You have to ask me nicely. You see, Danny, I can deal with the bullets and the bombs and the blood. I don't want money and I don't want medals. What I do want is for you to stand there in that faggoty white uniform and with your Harvard mouth extend me some fucking courtesy! You gotta ask me nicely.
>   [a beat, as Kaffee swallows his disbelief]

This incident was the genesis of Kaffee's desire for revenge against this arrogant man. A desire that propelled him into the unfamiliar supernatural world of the courtroom. Note that this negative transition of story value does not trigger character change in Kaffee but it does signal that something must be done, motivating Kaffee to embark on a quest that will change him for ever.

Story structure forces character change. Stories must be structured to provide pressurised dilemmas that reveal the hero's character flaws and force change (refer Table 1). When Kaffee cross-examines Jessop his initial strategy, to prove Jessop's guilt through logic and circumstantial evidence, is clearly failing. Yet Kaffee knows that Jessop wants to confess. Even though it is technically illegal, Jessop is proud of the US Marine Corps' highly effective methods for motivating underperforming soldiers. Kaffee also knows that Jessop will confess if he enrages him. But to achieve this he must insult a senior officer and risk being kicked out of the Marine Corps. He is faced with a clear choice do the "smart", indifferent thing and let it go or do the high risk courageous thing and go for it. At the climax his strong desire to bring this arrogant man to justice forces his character transition from indifferent to ethical/incorruptible/courageous.

Character inflection points. Audiences find dramas with protagonists that do not change untruthful because life is not like that. We instinctively know that everyone changes over time, albeit slowly. But there are inflection points, major reversals of fortune, that hurry character transformation along. These points are on display in the case study of section *5.1. The Essence of Story*. These points, traceable to real life situations, are the inciting incident, the crisis and the climax.

Table 1. Tracing character inflection points

The Story Pattern	The Godfather	The Tunnel Project
Inciting incident. A protagonist, suffering some kind of personality flaw determines that **something must be done** to restore balance in the normal world.	Michael wants no part of the family business but loves his father. He returns to the family to look after him. After a second attempt on his father's life he determines that **something must be done.**	The consultant is hired to oversee the functional safety management program to make sure that the new technology will not trigger any safety incidents. The consultant is concerned that he has little agency for influencing the actions of senior management. **Something must be done.**
Crisis. In the context of a crisis the protagonist takes possession of the elixir. **The protagonist is forced to face his character flaw even though he may not understand how to deal with it.**	Michael kills McCluskey and Sollozzo at a meeting in an Italian restaurant. His elixir is the safety of his family. **Michael concludes that remaining an honest man will not solve this problem. He becomes a murderer but does not fully understand the ramifications of his action.**	In a progress review meeting the project manager refutes the importance of the safety management program and downgrades the severity of test results. The consultant realises that the PM is a dangerous man, ignorant of proper systems engineering process and the safety risks involved in not doing things properly. The consultant has no strategy to deal with this. **He realises he has no ability to disarm pathological management behaviour and sets out to find a way.**
Climax: The final ordeal, death and rebirth. Within sight of home the protagonist confronts a final ordeal to secure the elixir. It nearly kills him. **As an outcome of his ordeal the protagonist finds a way to deal with his character flaws and is resurrected as a different person.**	Michael's father Don Corleone sues for peace and secures his safe return home. Don Corleone warns Michael that upon his death their enemies will attempt to kill him. When Don Corleone dies, Michael pre-empts his enemies' plans by killing all the New York Mafia Dons and miscellaneous traitors within the Corleone family. **Michael's transition from honest man to Mafia crime boss is complete.**	The deadline arrives and the tunnel is opened with testing incomplete and an extensive list of unresolved defects. The system fails and shuts down the freeway twice, exposing motorists to back-of-queue collisions. The consultant vows to never again tolerate corruption of proper systems engineering process. Next time he will blow the whistle. **The consultant's transition from man-capable-of-compromise to uncompromising-functional-safety-evangelist is complete.**

6.2. Character Arc in Personal Development

A study of character arc in story development provides us with tips for developing the skills of the people in your organisation.

Character is plot. **Character arc is mandatory.**	Human beings need to move, to grow and to evolve. If your people aren't growing their morale will suffer and you may lose them.
Distinguishing character from characterisation.	Believe nothing you hear. Find truth by observing human beings in motion under stress.
Story structure forces character change. **Character inflection points.**	People only truly develop when they are put in situations that they feel are beyond their capabilities (exposed to unfamiliar supernatural worlds). Your job as manager is to create these narratives, to orchestrate the ordeal death and rebirth.
Mapping character transformation.	When designing the 'ordeals' that will help your people grow, be clear on the required change in character value and the force that will cause it to happen. Growth = f(character-value-transition, cause)

Engineering function: responsibility accelerates personal growth. Five years out of University I was given total responsibility for automating a reactor system on an island in the Hong Kong archipelago. Working alone in a foreign culture and deploying unfamiliar technology this was the most accelerated learning process I have ever experienced. Looking back I can only admire the company that had the courage and foresight to give me that experience.

7. The Cast of Characters

A story's characters provide the dramatic energy that keeps us enthralled. Why? Because characters are not real people, just metaphors for human nature and as Nobel laureate William Faulkner said, "Human nature is the only subject that doesn't date." We find the tragedy of King Leonidas and the 300 Spartans at the battle of Thermopylae (480 BCE) just as fascinating as the adventures of Rick Deckard, the man who "retires" replicants (high-quality robotic replications of human beings) in the movie *Blade Runner* (1982).

Character archetypes. Story theory classifies characters by archetype, a concept developed by psychologist Carl Jung. Jung believed that the unconscious mind has a structure that is shared by all humanity - the collective unconscious - something we were all born with just as surely as we all have arms and legs. Within this unconscious lie instincts and archetypes: universal symbols such as the great mother, the wise old man, the shadow, the tower, water, the tree of life and so on. These are imprints of our past, motifs of human experience collected on an evolutionary timescale. A motif is a recurring pattern of any kind, a frequently occurring situation, a behaviour, a symbol, visual and auditory images of all kinds.

Fusion with psychology. This is where story fuses with the psychotherapeutic practice of analytical psychology which examines the influences these primordial images have on a patient's behaviour. According to Jung the collective unconscious exerts overwhelming influence on the minds of individuals involving virtually every emotion and situation. They can terrify but also heal.

Fusion with neuroscience. Jungian ideas have followers among neuroscientists. They suggest that mental commonalities in humans originate from the subcortical area of the brain: specifically, the thalamus and limbic system. The emotional brain. These structures link the brain to the rest of the nervous system and are said to control vital processes including emotions and long-term memory.

Manifesting archetypes. Archetypes live in our unconscious so they cannot be identified in our outward presentation, but they manifest in our behaviours, images, art, myths, religions and dreams. Personal experiences activate archetypes in the mind giving them conscious meaning, they also covertly organise human experience and memory. This could explain why the same character types keep reappearing in myths and legends, and in modern times, books, movies, television and all other forms of dramatic art. Jung opined that they keep reappearing because they are an accurate model of real life that can be used to analyse and predict human behaviour.

> *Story archetypes inhabit real-life. They are expressed by the people who surround you every day, they interact with you in harmony or conflict and through this conflict you are changed. A study of archetypes will help you relate to others and navigate the arc of your career.*

Jung identified twelve archetypes some of which have informed storytellers for thousands of years - not because they had Jung's insights but through a natural and unconscious process of catharsis where anxieties are relieved by bringing unconscious feelings to the surface. Story telling has long been recognised as excellent therapy post trauma. Warriors returning from battle must be encouraged to tell their stories, it has a purging, cleansing effect.

7.1. Classical Story Archetypes

An understanding of archetypes allows you to recognise behaviour patterns and deal more effectively with people. An individual character may express characteristics of more than one archetype. Archetypes are invariant throughout time and culture. The archetypes that inhabit story theory are:

1. **Hero.** The main protagonist of the story - moves the story forward by his actions - undergoes transformation in the course of the story.
2. **Mentor.** Teaches and protects the hero - inspired by divine wisdom - often pushes the hero across the threshold into the supernatural world. The mentor often gives the hero an instrument to assist him with his quest.
3. **Trickster.** A source of mischief - desire for change - debunks the status quo - is always the sceptic - survives using trickery and deceit as a defence - has great intellect - has secret knowledge - entertains as jester or clown.
4. **Threshold Guardian.** Prevents the unworthy from entering - a minor thug in the pay of the arch villain - holds information of value.
5. **Herald.** Announces the coming of significant change - not to be ignored.
6. **Shape Shifter.** Changes constantly from the hero's point of view - loyalty or sincerity is always in question.
7. **Shadow.** The antagonist/villain expressing the energy of a dark side - bent on destroying the hero - does not undergo transformation in the course of the story - has qualities the hero lacks - must be vanquished to liberate the elixir.

Archetypes can be facets of a person's behaviour. For example the hero may have her own internal shadows. The voice that tells her "You can't do this. You're not good enough."

Engineering function: behaviour analysis. Archetypes are the language of character. They help you classify and understand who a person is and what role they should be playing in your project. Analytical psychologists who follow Carl Jung's models of the human mind use archetypes to explain a person's unconscious thoughts that in turn affect their outward behaviour.

7.2. Hero

Heroes are willing to sacrifice something they value for the benefit of someone else.

> *Train yourself to let go of everything you fear to lose.*
>
> — Master Yoda,
> *Star Wars: The Empire Strikes Back*

In heroic service to their country, air crews of the British Royal Air Force's Bomber Command suffered a 44% death rate in World War II.

In psychological terms the hero is the authentic self that initially separates from the mother and the community as ego, where ego is an identity of our own construction. Over time all heroes struggle and grow emotionally, ultimately integrating all the qualities of other archetypes into a fully integrated self - a process called transcendence.

In short, when you leave home you think you know who you are but then you face ordeals - marriage, career, near death experiences. You learn more and in the process you grow into a more integrated human being.

Dramatic function. The hero is an audience's window into a story. By her actions the hero drives the story forward. To engage with the story we must have empathy for the hero, know what she wants and want her to have it. We covert some of her capabilities and recognise her flaws within ourselves.

Engineering function: heroes act. In engineering projects heroes are the key personalities who move things forward. They are also human. They can be determined but uncertain, charming but forgetful, both inpatient and accommodating. They are recognisable by their self sacrificing nature and are the ones who usually grow the most in the course of a project. They take the most risks and assume the most responsibility.

Engineering function: organisation as hero. When deploying a major system of any kind management should view the entire organisation as a hero who will undergo a substantial transformation. Any technological disruption to the way a company operates should be viewed as a supernatural world. Organisations that do not actively set out to plan for and manage the tests and trials that will inevitably occur are heading for a fall.

Personal growth through ordeal-death-and-rebirth. Organisations should identify their heroes (the people who do things) and seek to give them ordeal-death-and-rebirth experiences to accelerate their development – even tolerating failure on the hero's developmental character arc. The following legend of Thomas J Watson Snr.[21], which IBMers swear by, illustrates:

> *A top IBM salesman lost $5 million on a project he'd been working on. Called to see the boss, the salesman prepared to be fired. However, on meeting Watson, he was surprised to find that Watson wanted to discuss the next big project they were planning. Confused, the salesman asked Watson if he was going to fire him for the loss.*
> *"Fire you?" responded Watson. "Why would we want to fire you when we've just spent $5 million training you up?"*

Applying the story pattern to this scenario we see the salesman has suffered a crisis. He has done battle with an antagonist in the belly of some beast and nearly (metaphorically) died. But Watson wants him to escape because he has the elixir in his possession – lessons learned from failure ($5 million dollars worth of lessons). Watson perceives him as the hero on the road back, elixir in hand, with high potential to heal IBM's wounded land - a large hole in the annual sales projection. An insightful man was Thomas Watson.
Epilogue: this was the salesman's crisis. His climax will be the next project where he will put his learning into practice. It would be unwise to make the same mistakes twice.

---

[21] Thomas J Watson Snr. was one of IBM's most influential leaders. Watson became president of IBM in 1915 and, according to the company's annals, was an inspirational leader.

7.3. Shape Shifter

The shape shifter deals in deceit and unpredictable change. In the day time he's a man, on a full moon he's a wolf.

Shakespeare's Macbeth wrestles with his conscience. Should he go ahead with his evil plan to murder King Duncan while he is his houseguest?

> *... He's here in double trust:*
> *First, as I am his kinsman and his subject,*
> *Strong both against the deed; then, as his host,*
> *Who should against his murderer shut the door,*
> *Not bear the knife myself.*
>
> > — William Shakespeare, *Macbeth, Act 1 Scene 7*

Outwardly Macbeth presents as a welcoming host, inwardly he is planning murder. Archetypal shape shifting behaviour.

Dramatic function. The shape shifter builds doubt and suspense in a story. Movies such as *The Big Sleep*, *The Maltese Falcon*, and *Chinatown* depict detectives dealing with shape shifting women. The detective hero navigates a web of lies revealing the truth in the climax.

Engineering function: evaluating the subject matter expert. In systems engineering, shape shifters change their mind about critical system requirements from day to day, they therefore need to be recognised and encapsulated in management processes that limit their damage to a project. The configuration management discipline was established to deal with shape shifters.
Shape shifters make commitments but don't feel compelled to deliver and when confronted are full of excuses. "I know I said I'd finish that software module last week, but the cat ate my mouse." Shape shifters keep you on edge because you never know if you can trust them.

Engineering function: shape shifter anti-pattern. People whose behaviour is the opposite of the shape shifter are the most valuable people on a project. They only commit to things they know they can deliver and they always deliver on their commitments. Most engineers learn this career advancing principle at some point in their lives. Wouldn't it be wonderful if they were explicitly trained in this concept from an early age? Much like the fictional Jedi Knights of the Star Wars movies.

> *Do or do not. There is no try.*
>
> > — Master Yoda, *Star Wars: The Empire Strikes Back*

The fortunate ones gain this knowledge from a mentor.

7.4. Mentor

Mentors express our higher self, all the good within us. That wiser and nobler self that seeks to connect with all the knowledge of the universe, as did Master Yoda of Star Wars (though it took him 800 years). Mentors help heroes through major turning points in their lives.

Dramatic function: mentor as exemplar. Mentors function as exemplars showing the rooky what is possible.

EXTERNAL: SWAMP ON PLANET DAGOBAH
Under the tutelage of Master Yoda a dejected Luke Skywalker fails to levitate his X-Wing fighter out of the swamp using just his mind. He questions whether he will ever master the ways of the Jedi. Thus far he has levitated rocks using mind power but questions whether the Force is sufficiently powerful to lift an X-Wing fighter.

Luke: I don't believe it.
Yoda: That is why you fail.

Yoda meditates then gestures and raises the fighter from the swamp. Luke's faith in the power of the Force increases immeasurably.

— Movie, *Star Wars: The Empire Strikes Back*

Engineering function: surviving promotion. When engineers take on significant new career responsibilities it is analogous to crossing the threshold into a story's supernatural world. The programmer who becomes a team leader, the detailed designer who becomes a system architect, the project manager who becomes a program manager. Story heroes seldom cross the initial threshold without some advice from a mentor.

> *There is an ancient rule that you can't do it alone.*

The mentor often gives the hero a gift, a tool that will sustain him through his tests and trials in the supernatural world. Obi-Wan Kenobi gave Luke Skywalker his father's light sword. Later on, Jedi Master Yoda trains Luke in the disciplines of the Jedi Knight and the power of the Force.

Engineering function: giving certainty. In technology projects the role of the mentor is to provide the light sword of knowledge that will help the hero survive in the supernatural world of complex systems. As did Yoda, mentors should not tell but show what is possible, giving their mentees valuable certainty about their own potential and the power of proper engineering processes – the Force translated to engineering. Imparting such faith early in a hero's life can accelerate a career.

> *People who grew up in difficult circumstances and yet are successful have one thing in common; at a crucial juncture in their adolescence, they had a positive relationship with a caring adult.*

> – Bill Clinton, President of the United States

Faith in proper process is a particularly important concept. In many university graduates this faith is either weak or non-existent. They are at the beginning of their character arc and their academic mentors have often not experienced the tragedies that can flow from poor quality work and lip service paid to safe engineering practices in life critical systems. Entering the workforce graduates transition to a supernatural world and one of their ordeals will inevitably be a conflict in some

innermost cave with an accountant telling them to cut costs and take shortcuts with safety. Exposure to a mentor can increase the certainty that these shadows/antagonists/villains must be vigourously opposed.

Pairing with a mentor seems like common sense but few organisations have active mentoring programs for heroes about to cross their own special threshold. The result is defenceless practitioners wreaking havoc while they work it out for themselves.

> *You can't do it alone. If you haven't been allocated a mentor go out and find one.*

Find more on mentoring at www.chambers.com.au/services/mentoring/mentoring.php.

7.5. Threshold Guardian

Threshold Guardian's personify the obstacles we face in pursuit of our desires: prejudice, bureaucratic rules, rude waiters, rain on a beach day ... and on a psychological level: repressed fears, vices, self-doubt.

Dramatic function: testing the hero. Threshold Guardians are often responsible for low-level tests and trials on the way to the life-and-death confrontation with the antagonist. They are low-level thugs with a symbiotic relationship with the antagonist, tasked with excluding the unworthy. Case study: Your project manager has authorised business class travel. The low-level functionary in the front office responsible for booking your flights says it's against company policy.

Engineering function: barriers to knowledge. In engineering projects threshold guardians are people or circumstances that keep you from accessing the information you need to get the job done. One example is the middle manager who will not give you access to the people who fully appreciate the essential requirements of a system. Their time is deemed too valuable to be spent in the back office talking to systems analysts. These heroes need to be at the coalface executing for the good of the company.

Disarming the threshold guardian. Threshold guardians must be defeated by trickery. In fairytales the hero dresses up as an enemy sentry and marches with them through the castle gates. In engineering projects you become one of them working in operations at the coalface. This is not as fanciful as it sounds. The most successful control systems I have ever implemented had the engineers who ran the chemical processing plants actually writing the software with support from a central band of technologists (mentors). We all wore the same rotting jeans.

7.6. Herald

The herald is a harbinger of significant change. We have all experienced situations that have given us certainty that something must change. We have a conversation, see a movie, are beaten up by our partner. Often we don't know what the change will be but, looking back, we can remember that initial tremor that became the earthquake that precipitated the change in job, the divorce application, the falling hopelessly in love.

Dramatic function: the hero's first alert. The herald is usually responsible for the hero's first call to adventure, the one that is often refused.

Star Wars. Farm boy Luke Skywalker discovers the hermit he knows as Ben Kenobi is actually Obi-Wan Kenobi, a Jedi Knight who knew his father. As they talk, the droid R2D2 expresses a distress call from Princess Leia of the Rebel Alliance. "Help me Obi-Wan you at my only hope." Obi-Wan sets out to join the battle against the dark side and invites Luke to follow in his father's footsteps. "You must learn the ways of the force," he says. Luke refuses (the first refusal of the call to adventure). "I've got work to do here." When his auntie and uncle are killed Luke finally accepts his fate and joins the battle - the ordeal foreshadowed by Obi-Wan acting as herald.

Engineering function: lead indicator. In business the herald is a metaphor for lead indicator. The harbinger of change that should not be ignored. In story terms, the warning is a setup that will have a pay-off at some point in the future - no question, high certainty. An arrogant entrepreneur or accountant becomes CEO of an engineering intensive business such as an airline, a rail company, an automaker, a chemical company. Soon cost-cutting destroys the long-term viability of the business. Maintenance is cut, equipment is run down, experienced people leave, the young ones are not hired and developed. The result: harm to people and the environment. Heralds appear before all major accidents. Books were written about the inadequate height of the tsunami barrier walls in front of the Fukushima Daiichi nuclear reactor. Many newspaper articles were written about the degradation of safety equipment and practices at Union Carbide's Bhopal chemical processing plant. There were demonstrations in the streets. Then more than 2000 people died in one night. In forensic analysis, the root cause of this incident, in common with many other disasters, can be traced back to managers who should have known better. They ignored a herald.

True heroes take counsel from heralds and act to move the story forward into broad sunlit uplands as opposed to supernatural underworlds of death and degradation that are the wages of inaction.

7.7. Trickster

Tricksters provide comic relief, keeping us down to earth with humour and satire. They are the jesters who get away with deflating big egos with their sharp wit. Layered in their mischief is a strong desire for change, they are the enemy of the status quo.

Dramatic function: relieve tension. The dramatists job is to slowly build attention to an excruciating crisis followed by a climax. The trickster gives us momentary respite with wild emotional swings from apprehension to laughter.

First appearances can be deceiving. One should always reserve judgement. The person you may first perceive as annoying, mischievous and superficial might run deeper than you think.

> *Searching for his mentor, Luke Skywalker crash lands his X-Wing fighter in a swamp on the planet Dagobah. He meets an annoying, senile, humpbacked midget with long ears who he summarily dismisses. This trivial looking swamp creature turns out to be Grand Jedi Master Yoda, the oldest and most powerful Jedi in the Star Wars universe.*
>
> *— Star Wars: The Empire Strikes Back*

Yoda is actually a mixture of archetypes. He is mischievous. On first meeting Skywalker he rifles through his supplies looking for something shiny. But he is also a threshold guardian keeping the secrets of the Jedi from Luke until he proves himself worthy of this knowledge. He is also an oracle

and mentor who can see future possibilities. When he does deliver great wisdom it's often couched in comedic language.

> *Size matters not. Look at me. Judge me by my size, do you? Hmm? Hmm. And well*
> *you should not. For my ally is the Force, and a powerful ally it is. Life creates it,*
> *makes it grow. Its energy surrounds us and binds us. Luminous beings are we, not*
> *this crude matter. You must feel the Force around you; here, between you, me, the*
> *tree, the rock, everywhere, yes. Even between the land and the ship.*
>
> — Yoda, *Star Wars: The Empire Strikes Back*

Engineering function: trickster as creative. If you have a Yoda archetype on your project, dig deeper. Beneath the mischief you may find a creative intellect. Great intelligence is required to inhabit the character of another. Most actors are highly intelligent. Tricksters perform best when given work requiring quick wits and high levels of creativity. Visualising new product features, evaluating new software tools. Don't give them mundane jobs and beware of their penchant for the dark side. All hackers are tricksters.

Engineering function: don't profile on appearances. When working in foreign countries I am always paired with a sidekick to help me navigate local issues. So far they've all been tricksters. On one assignment in Taiwan my sidekick constantly questioned the level of engineering process we forced him to follow (this was a safety critical system). "Why do we have to generate all this paper," he'd complain, over and over again. Then one day a colleague lost his temper, "Mate, it's almost like we've got to reload your brain every morning with this stuff!" The trickster smirked, "Yes, but every night I reset!"

As with all my sidekicks this man became an invaluable asset. We still correspond. Behind the jokes I always find a sharp mind. On my first foreign assignment I made the mistake of inappropriately profiling my trickster is an idiot, when in reality he was just untrained. When I trained him I realised that he was a smarter, better programmer than I. Appearances are always deceiving, better to train them up, give them work and then judge them by what they achieve.

7.8. The Antagonist or Shadow

The shadow represents the forces of antagonism, a projection of the dark side of human nature, anything that blocks the hero's way in his quest for his object of desire.

Dramatic function. The shadow creates conflict that brings out the best in a hero. As Aaron Sorkin put it, "somebody's got to want something, somebody's got to be standing in their way of getting it." The shadow puts the hero's life in jeopardy providing the catalyst for character transformation.

Empathy for the shadow. Most shadows do not view themselves as bad people. They might have a wife and children and a mother who loves them. They do evil things because they sincerely believe it's for the best. Stories that engender some empathy for the villain can be incredibly powerful because we find contradictions in a person's character compelling, especially if we can recognise some of their feelings/aspirations/character flaws/behaviours in ourselves.

Table 2. Shadows in fiction and real life

Category	Instance	Example in Fiction	Example in Real Life
Environment/ situation	sinking ship hurricane disease time/distance	**Titanic** A ship hits an iceberg in the north Atlantic and is slowly sinking. There are only enough lifeboats for half the passengers.	**Online Advertising** Online advertising mediums such as Google have taken control of the rivers of gold that once funded print newspapers. They struggle to remain viable.
Institutions	Government corporation political party employer	**Pirates of the Caribbean** The East India Trading Company employs Jack Sparrow as a privateer to eradicate pirates from Caribbean waters so they can dominate Caribbean commerce.	**Government** 55 contractors collaborate to build the Obamacare[22] health care system. There is no effective systems integration. Government officials instruct them to go live even though they know it will fail.
Inner conflict	fear doubt guilt prejudice repression conscience	**Sophie's Choice** On entering a Nazi concentration camp, Sophie is forced to choose which of her children will live, and which will be sent to the gas chamber.	**Conscience** A software engineer is instructed to write software to detect that a vehicle is on an emissions test bed and de-tune the vehicle to produce fraudulent emissions metrics. He struggles with his conscience.
Personal conflict	Arch-villain family manager lover	**Terminator** A cyborg assassin is sent back in time from 2029 to 1984 to kill Sarah Connor (Linda Hamilton), whose son will one day save the world from rogue machines in a post-apocalyptic future.	**Hacker** A website developed by the Australian Bureau of Statistics to conduct the 2016 census was shut down by a denial of service attack. The hackers responsible are as yet unknown.

Macbeth. If all Macbeth did was kill people we would not find him interesting, but Shakespeare gave him a conscience. He suffers anguish before and after each murder. Lady Macbeth is also plagued by guilt imagining she sees blood splatter on her hands.

> *Out, damned spot! out, I say! - One: two: why, then, 'tis time to do't. - Hell is murky!*
> *- Fie, my lord, fie! a soldier, and afeard? What need we fear who knows it, when*
> *none can call our power to account? - Yet who would have thought the old man to*
> *have had so much blood in him?*

> — William Shakespeare, *Macbeth, Act 5 Scene 1*

Blade Runner. Roy Batty (Rutger Hauer) is the bleached-blond killer replicant of Ridley Scott's classic sci-fi thriller *Blade Runner*. He is relentless in his quest to have his use-by date extended by his manufacturer Eldon Tyrell (Joe Turkel). When Tyrell refuses he gouges out his eyes before dislocating his skull with his bare hands, he head butts walls and, at the climax, almost destroys replicant terminator Rick Deckard (Harrison Ford). But as his time runs out his parting monologue is pure poetry – it breaks your heart:

---

[22] For details of the Obamacare Project refer:
www.chambers.com.au/public_resources/case_study/obamacare/saving-obamacare-case-study.pdf

I've seen things you people wouldn't believe.
Attack ships on fire off the shoulder of Orion.
I watched C-beams glitter in the dark near the Tannhäuser Gate.
All those moments will be lost in time, like tears...in...rain.
Time to die.
— Roy Batty (Rutger Hauer), Movie: *Blade Runner*

This passage has gone into the language as the "C-beam Monologue" after its most compelling metaphor. More evidence supporting the utility of strong metaphors and sympathy for the bad guy in creating long-term memories.

Engineering function: problem definition. To get to a solution you must first have a clear definition of the problem (the antagonist). In complex systems projects we struggle with problem definition. Sometimes we are well aware of them but do not take corrective action (the hero doesn't act - the story is not propelled forward).

> *Story defines a problem as something that stands in the way of our desire. If our desire is righteous we are, ergo, the hero and the opposing force is the shadow who must be overcome.*

Problem definition at Intel Corp. In his book, *Only the Paranoid Survive,* Andy Grove, former CEO of Intel Corporation, tells the story of the turmoil surrounding Intel's transition from memory chip to processor chip manufacture. Japanese manufacturers were killing Intel in the marketplace with low-cost high-quality memory chips, but the company's top decision-makers found it hard to admit they weren't competitive. Vacating a traditional marketplace is never easy. Grove solved the problem with a narrative. "What if they fired us all tomorrow," he said. "What would our successors do?" The answer was clear, they'd get out of memory chips.

Engineering function: decisive action. Once a hero has identified an antagonist he reviews his action options, selects one and executes. In story, as in real life, this must happen to progress the plot. Plots that do not progress through the actions of the hero get bad ratings. Real-life projects fail.

Engineering function: recognising pathological inaction. The shadow can be a destructive force if not acknowledged and confronted. Inaction against recognised antagonists has been the root cause of many disasters. At Bhopal the shadows were managers who tolerated unsafe operating procedures; at Fukushima the shadow was expressed through inadequate design for a predictable tsunami event; the shadows responsible for 162 deaths when air Asia Flt 8501 (2014) crashed into the Java Sea were managers who tolerated lax maintenance of avionics hardware and did not allocate sufficient budget for pilot training (the pilots failed to recover from a high altitude stall with a disabled autopilot).

Engineering function: getting along. You don't pick your team members and you will never be best friends with all of them. You may actively dislike some of them (antagonists). But as a professional you must maintain good working relationships with all of them. This gets hard if they are rude, unresponsive, dismissive, uncooperative, arrogant, bullying, chronically grumpy ... Diplomats face the worst case. They routinely have to work effectively with people they despise: murdering dictators, corrupt politicians, soulless ideologues representing authoritarian regimes. At some point

everyone has a Lady Macbeth or a Roy Batty on their project (hopefully without the extreme violence). Dealing effectively with a perceived antagonist is a test of empathy. So if you are paired with someone who you can't stand try applying some of these story perspectives:

- **The elixir** in this case is a productive working relationship. Story tells us that elixir is a life and death matter. If you do not possess it your normal world will never be healed. Technologists who can't work effectively with other people have limited career prospects. Further, if you have management aspirations you must possess this elixir. It is therefore a metaphorical life or death issue requiring supernatural effort.
- **Tests and trials.** Fate is testing you. Your predicament is just another ordeal in the supernatural world. Bear in mind that you cannot grow as a human being without tests and trials. You must therefore engage with this problem not ignore it. Heroes act to move the story forward. In this case we are talking about your life's progression, your life's story. It must not remain stagnant.
- **Empathy for the antagonist.** Remember what I said earlier:

    Most shadows do not view themselves as bad people. ...

    They do evil things because they sincerely believe it's for the best.

    The first step in developing empathy is to view the shadow as a human being trying to do the right thing. Your shadow may be blissfully unaware that its behaviour is causing you pain. Find a way to address this issue starting your sentence with, "I know you have the best interests of this project at heart but what if we ..."
- **Strength of desire.** Empathy is shared feelings so find a feeling in them that matches your own. Start with their strong desires. They needn't be work-related. For example we all love our children. And when you've found a desire in common make sure they know you are with them.

A small dose of empathy tames a team killer. I achieved this by accident once. An arrogant woman with many years experience with a particular application delighted in humiliating everyone around her, paying out on their contrasting ignorance. She was the classic team killer, a shadow and a threshold guardian. Management was reluctant to fire her because she knew too much. Then she had a baby. When she returned to work, out of politeness, I enquired after her health, "Are you all back together," I said. It's a natural thing a father who has witnessed three births might say. "Yes I'm well, thank you," she replied. Our relationship improved from that day on. The subtext: a shared (highly emotional) experience expresses empathy.

A small dose of empathy might not be the beginning of a deep friendship but it can improve a working relationship. And further, we live in hope that shadows can be redeemed. Did not Arnold Schwarzenegger morph from a killing machine in the movie *Terminator* to a protective mentor in *Terminator Two: Judgement Day*?

Beware "the right man". There is a particularly dangerous class of villain. One who combines charisma with a strong conviction that his pathological behaviour is right. He will stop at nothing believing that the end justifies the means. His charismatic presentation carries whole communities, even countries, on a path to destruction. The classic example is Adolf Hitler who reduced Germany to rubble in twelve years. This is a villain masquerading as a hero.

Engineering function: profiling "the right man" archetype - normalisation of deviance. In systems engineering the promise of career, money, fame or a thrill in the moment drives seemingly rational people to cut corners, delivering too early, under-spending on testing or ignoring plausible risks. We seldom take big risks out of the blue. Risk taking feeds on itself. On Monday, laziness, greed, hubris or pride might cause us to make a small compromise, which eases our path to a larger one on Tuesday. We suffer no penalty and are thus encouraged to repeat the process. And over time we harden our commitment to lower standards. Left unchecked this process often leads to disaster as organisations wither into poor judgement. Anomalies are tolerated, machines are driven outside their design limits, safe operating procedures are watered down. As ever-riskier behaviours are tolerated the high-risk status quo takes on a kind of beauty - action heroes are admired. Corrupted standards go unquestioned and a kind of blindness sets in. The players become so comfortable with deviant behaviour that they consider it more normal than deviant. It is the accepted way we do things around here – "the right way". Most do not see these shadows so bad behaviour is not opposed. Insightful whistleblowers are punished, dissenters are demonised as "non-team players". Then space shuttle Challenger blows up on launch, the Chernobyl nuclear reactor melts down.

In her study of the risks associated with complex technical systems, sociologist Diane Vaughan calls this reality by consensus, "normalization of deviance" and classifies it as a pathological behaviour particularly prevalent in engineering organizations.

In story parlance this is the pattern of the "Right Man Shadow".

8. Story Application Notes

When we no longer know what to do we have come to our real work, and when we no longer know which way to go we have begun our real journey. The mind that is not baffled is not employed. The impeded stream is the one that sings.

— Wendell Berry

8.1. Engineering Function

There have been times in my engineering career when, faced with a difficult situation, I have had absolutely no idea what to do. Without exception all these scenarios involved human conflict. With the benefit of hindsight I strongly believe that, armed with a working knowledge of story theory, I would have been much better prepared to face the dilemmas of the human condition.

The following story application notes overlay story patterns on real-life situations in engineering. They classify human behaviour and suggest solutions. They may help you:

1. Recognise and classify pathological attitudes of mind and external behaviour
2. Devise courses of action to disarm them
3. Invoke productive attitudes of mind when approaching difficult situations
4. Develop insights into why people behave the way they do
5. Recognise what's important and what is trivial and decide when you need to act and when you can safely let a situation slide by.

8.2. Character Arc: *Picking the Dream Team*

Back story. You are about to build a web application that writes complex specifications using a simple specification language. The application draws from massive datasets of existing knowledge online and generates in seconds what used to take a competent engineer weeks. Such a system just might be possible with the advent of new technologies such as machine learning and low-cost massively parallel computing. But there are many barriers to success. It's never been done before and there is a chorus of people telling you it's impossible. You're going to need a highly motivated team who will keep going in the face of repeated failures. It looks like a fun project so there are seven hundred candidates. You only need ten so how do you pick the dream team?

Technical competence is a hygiene factor. You establish that all your shortlisted candidates have a background in the languages and facilities that you plan to deploy. The thing you are looking for is personal attributes that have nothing to do with technology - you are looking for character.

Tech project as story. Let's characterise your project as a story and each team member as a hero. On some inciting incident (you secure venture capital) the team crosses the threshold into the supernatural world that is green-fields system development. There will be tests and trials. Antagonists must be overcome (immature technologies, accountants, disgruntled investors). There will be many crises (lack of funds). Towards the end of the development there will be a climax (deployment to revenue operations) and if all goes well your team will return to the ordinary world with the elixir: a fully functioning high productivity specification system that makes the team millionaires.

Mining a candidate's authentic self. So before you start the interviews let's look at what story theory can tell us about the character traits you'll need in a team member and the questions you can ask to establish the existence of those traits in a candidate's authentic self.

Character is plot. Just as all stories are driven forward through the actions of the hero so are technology projects advanced by the project team's cast of characters. And the direction that a story takes is a function of the character transformations of the hero. Modern complex systems are pure polymerised intellectual property, configured directly from the minds of human beings. Now more than ever we need to apply better science to the way we match people with projects. Any experienced project manager will tell you that methodologies and tools will not save you if you have the wrong people. In fact even with the wrong methodologies, the wrong tools and the wrong languages the right people will save you every time. Passionate desire trumps everything.

Character and characterisation. Story tells us that what we see when a candidate enters the interview room is characterisation not character – age, IQ, sex, speaking style, dress, occupation, stated values and attitudes of mind. Jung called it persona (from the Latin "mask"). According to Jung the persona is the set of social masks we wear for various audiences and situations. It acts to shield our ego from negative images. Persona is the superficial presentation; what we need is what lies beneath - the subtext. Story tells us that true character is only revealed through actions under pressure. So how can we get character visibility in a conversation with little risk involved and a candidate willing to say anything we want to hear?

Strength of desire. I have said that a story is driven forward by the actions of a hero. Those actions are motivated by strength of desire. That desire is acquired in the story's inciting incident. This is not a trivial event, it is a major turning point in a person's life (a plot point). The more horrendous the circumstance the stronger the desire. A life-and-death matter is good, though in your interview the motivating life experience might be less dramatic.

> Question: Tell me about what has occurred in your past that would motivate you to sign on to a crazy project like this.

Look for serious life transforming events. The failures are more instructive than the successes. Comments like, "We tried to achieve this back in '97 but failed because the technology just wasn't there. We pulled 80 hour weeks for a year but ran out of money. I've always felt that succeeding would further the cause of humanity. This time I think we can do it," are golden!

Rationale: Forty years in safety critical projects have taught me that your most valuable assets are people who never give up. I prefer this character attribute over gun programmers and designers. I care less about in-depth knowledge of a language or system product and more about people who will focus on a goal, find out what they need to know to achieve it and go for it despite everything! A strong belief in the social value of the project's end product is also a compelling motivator. "We're not writing software, we're saving the planet!"

Self-awareness in the crisis. The inciting incident develops desire in the hero, launching him into the supernatural world. But he has a personality flaw that must be overcome if he is to grasp the elixir. He becomes aware of this flaw in the crisis when, in the belly of the beast, he faces the antagonist in mortal combat.

> Question: Tell me about a crisis you faced in one of your projects. What problems were you facing (the antagonist)? How did you overcome them? What did this experience teach you about yourself (awareness)? Did you uncover something missing in your skill set and how did you go about rectifying it?

Rationale: No one is perfect. We all have character flaws and we all make mistakes. The people you need on high-risk projects are the ones who are prepared to reflect on their shortcomings and take corrective action. These are the learners. The people who develop fast to overcome their demons. What you don't want are episodal thinkers, people who believe that all life's episodes are separate and distinct and unrelated and as a result never learn from experience.

Conquering all in the climax. At the climax the hero has a final confrontation with the antagonist. There is an ordeal, death and rebirth (abstract or real). And in this context the hero deals with his character flaw and overcomes it.

> Question: What is the most challenging test of your skills you have ever experienced; the one that nearly killed you? What was the outcome? How did this experience change you forever?

Rationale: Lessons learned in the context of life-and-death struggle stay with us forever. They give us certainty of what to do should we face this climax again. This certainly ensures that a person will not take a backward step when they know a course of action is right. Just as Michael Corleone knew he had to pull the trigger when Sollozzo threatened his father's life, so will a test manager refuse to sign off a system that has not completed testing, so will a safety authority refuse to certify an

avionics system if proper safety engineering processes have not been followed, so will a system architect fight for appropriate design time before 100 programmers descend on the system build. A candidate bearing the scars of many near-death experiences becomes an asset to a project. The person with no scars may have weak motivation and crumble at the first test of character.

Proof of quest. The hero returns from the supernatural world bearing the elixir that heals the wounded land. Apart from its healing qualities the elixir is proof that the hero has travelled in the supernatural world. An authentic hero should therefore turn up to an interview with something they have done. Some elixir that proves they survived a journey in some past unfamiliar world. This is particularly important in technology projects as many talented and creative technologists are poor verbal communicators - they struggle to sell themselves. For example, users of Apple's OS X operating system will be familiar with the icon display that expands when your mouse pointer hovers over particular elements. The inventor of that user interface was interviewing at Apple and not doing very well until he stopped Steve Jobs in reception and showed him his work. Steve hired him on the spot.

Picking the hero. I have characterised all team members as heroes but story theory tells us a story can have but one, the protagonist, the story's central character, the person by whose actions the story progresses. Bob McKee calls this the archplot of classical design which is more than 4000 years old.

> *CLASSICAL DESIGN means a story built around an active protagonist who struggles against primarily external forces of antagonism to pursue his or her desire through continuous time within a consistent and causally connected fictional reality to a closed ending of absolute irreversible change.*
>
> — Bob McKee, *Story*

A story with multiple heroes confuses the audience because it travels in too many directions at once, so by nominating everyone as a hero, have I pushed the story metaphor too far?

Not so! But this raises an interesting point. All heroes are not created equal. In staffing a project there are particularly important characters, people who, if correctly cast, will drive your project to success and if miscast will almost guarantee a failure.

Subplots. As we have seen stories have archetypal characters of which the hero is one: mentors, shape shifters, threshold guardians, heralds, tricksters ... A story may also have many subplots each with their own protagonists. Classical story design dictates only one central plot, the one that carries the fundamental truth as expressed in the story's controlling idea. And the hero of that archplot is a very important person, extreme care must be taken in filling this role.

Steve Jobs as hero. In a green-fields technology project the central plot is the development stream that produces the deliverable system. Its story arcs from concept to deployment. Its hero is the product visionary. Steve Jobs was an excellent archetype. He was not a project manager or a system architect or a programmer, he just had an innate knowledge of what people wanted and an uncompromising feel for good design (Apple never ran focus groups on his watch). His lack of people skills and poor sales of the new Macintosh computer sidelined him in his own company (1985). In 1997 he returned to save the company with his unfaltering vision.

Technology project subplots. Examples of subplots in technology projects are the project service disciplines such as configuration management, verification and validation, safety management, quality management and so on. All important functions but not the core plot of the story. Each of these functions plays out its own story and its characters may even become antagonists at various points in the arc of the main plot. Which brings me to another important point.

Character integration. In story the hero's character flaws are often highlighted when they are played off against the strengths of the antagonist. The villain is strong where the hero is weak. In the movie *A Few Good Men* defence counsel Tom Cruise was up against a competent prosecutor with many courtroom hours under his belt. Cruise had none, which is manifested through his feelings of inadequacy and his initial poor performance in court. But as the drama progresses he absorbs the skills of his antagonist and triumphs in the climax.

Absorbing the strengths of mine enemies. As in story so in real life the hero of your project must absorb all the strengths of his antagonists - the people whose role is to check him and balance him, the quality auditors, the safety design reviewers the configuration management Nazis (and ... ugh ... the accountants). This means having a good working knowledge and empathy for these support services that will ensure your product does not fall over or kill someone when it is deployed (or never see the light of day because you run out of funds before you can deploy).

Where are you in your character arc? Our character develops in an arc from birth to death. We are all therefore incomplete individuals.

> *At 15 I set my heart upon learning.*
> *At 30 I establish myself (in accordance with ritual).*
> *At 40 I no longer had perplexities.*
> *At 50 I knew the mandate of Heaven.*
> *At 60 I was at ease with what ever I heard.*
> *At 70 I could follow my heart's desire without transgressing the boundaries of right.*

> — Confucius[23]

Technology projects employ a diverse community of people each of whom is at a particular point in their character arc. Nature abhors step changes, we all develop slowly over time but not at an even pace. Inciting incidents, crises and climaxes spur our development at various points. The character arc metaphor is useful in determining who fits which role. You can afford to have junior programmers at the beginning of their arc. Your project will give them life and death experiences that will make them strong and their inevitable failures will not be damaging. In contrast your designated hero must be further along the curve - a fully formed hero. He must be a close match to the ideal hero archetype for your story genre (read project type).

---

[23] Source: Dr Geoff Victoroff, *Saving Your Brain*

8.3. Desire: *Writing Requirements*

Strength of desire. To engage an audience a hero's desire must be strong. The hero's quest must be nontrivial. Why else would you embark on an adventure into a supernatural world when you could stay at home and live a comfortable life?

Companies do not embark on system developments without very strong motivation. Large sums of money are involved and in the case of safety critical systems human life can be in jeopardy. To discover the essential requirements of a system the analyst must therefore fully understand the fundamental desires that are driving the customer. A pithy statement of system objectives seldom tells the whole story.

Measuring desire. The strength of desire can be measured by the risks the hero is willing to take in pursuit of the elixir. The authentic hero is willing to die for it. Anything less and the story gets boring. What represents metaphorical death for a corporation? What are they risking for their elixir? In the software industry it's usually money and credibility. On one of my projects the cash burn was $70,000 per day. The insightful engineer measures that desire early as it represents the unifying force that holds an entire project together. Bob McKee calls it "the spine of the story". Requirements calibrated at high desire represent the core benefit of a system. And further, If you're working on a project that is losing its desire, find a way to stoke the fires or bail out.

Analysis of desire yields hidden requirements. As with a human being, a company's decision to act is always motivated by primal emotion. Survival instinct, for example, a desire to colonise, dominate and monetise a marketplace. Analysts can apply story patterns to explore the murky world of these emotions inviting repressed feelings to boil to the surface. We're not asking the customer what she wants we're asking her how she feels. Questions emanating from the story metaphor uncover strong emotions, for amongst these shadows live repressed, unspoken requirements. So immerse yourself in the customer's story, think and feel as your customer thinks and feels, forget about requirements for the moment and think about desire.

Spoken, unspoken and unspeakable. If you ask a user what they want they'll tell you something, which may or may not be accurate. *This is the spoken*. Using modelling techniques and triangulation (getting multiple perspectives on the same issue) you may discover missing requirements, details they forgot to tell you. Then there are the things they purposely don't tell you, sometimes for political reasons. *This is the unspoken*. But most obscure of all are the things they can't tell you because they are not consciously aware of them. As with story, heroes know what they want, usually at the inciting incident, but only discover what they really need at the climax. *This is the unspeakable.* The climax of a complex systems project is the point of deployment / commissioning / revenue operations. At this plot point epiphanies on the real objectives of a system create rework and are expensive. The quest of the requirements engineer is to avoid climactic discovery at all costs. But how?

Discovery through catharsis. The story literate analyst works step by step through all the conflict, tests and trials the user has experienced in the application domain, especially the high jeopardy

incidents of metaphorical ordeal-death-and-rebirth. The user is encouraged to talk freely about their emotions during the ordeal, giving unconscious feelings and perspectives the opportunity to bubble to the surface. This can bring about expansion of awareness and new insight.

Case Study - Medication Tracking System:

A traditional analyst approaches a Medication Tracking System. She does an interview and documents an objective:

> *The Medication Tracking System shall ensure that all patients receive their correct prescribed drugs.*

The story literate analyst digs deeper, "Tell me some stories about life in the hospital ward. Have there been any incidents, near misses with dispensing medication?" You might get a response like this:

> *Mary Rose was blond, beautiful and three years old. On a Monday she was admitted to our hospital as a precautionary measure with a mild case of flu. On Tuesday she was dead. The autopsy revealed she had been administered an overdose of insulin. She had received the medication intended for the patient in the next bed. The objective of the Medication Tracking System is to make sure this can never happen again.*

Here is an idea wrapped around an emotional charge (aesthetic emotion) – a heartfelt outpouring of desire. It's a story device that engages people and makes them care.

> *Caring is the beginning of empathy and empathy is the beginning of understanding; the first step on the road to accurate requirements.*

In the case of Mary Rose it is logical that patients should get their medication but the image of a dead child will guarantee that the development team will crawl over broken glass to make it happen. The storyteller's requirement statement also tells us much more about our target system:

1. This application is safety-related. Failure can cause harm.
2. The system premise is: what would happen if we use technology to make sure that a patient cannot be administered the wrong medication – ever
3. The controlling idea is: this system will prevent patient death or injury through incorrect medication by *<drug validation strategy>*. The change in story value is: unsafe (patient in jeopardy) to safe
4. The most important attribute of the system is safety integrity. This system must improve patient safety not degrade it.
5. The system must be available 24/7.

A developer reviewing the traditional statement of system objective could easily miss these five derived requirements. This is the power of story.

Recording story as rationale. But that's not the end of it. By adding these five requirements the requirements engineer has taken an emotional outpouring and converted it to clinical, technical requirements. The emotional subtext that brought them into being should not be lost however. This is why these requirements should be tagged with this emotional rationale. This will provide a bullet-proof defence should a cost-cutting antagonist ever attack their reason for being.

8.4. The Serial Killer Fallacy: *Unsafe Inductive Reasoning*

Inductive reasoning takes observations of the real world and develops generalizations and theories. This is also called a "bottom-up" approach. For example:

Past performance equals future performance. In budgeting for safety and security engineering, organisations that have not experienced losses in the past tend to either undervalue these disciplines or completely ignore them. Either consciously or unconsciously they use a dangerous variant of inductive reasoning. There is a human bias towards the perception that problems we don't understand can be solved because they resemble things we do understand. Hence the conclusion that, as we have not had a safety or security incident in the past we will not have an incident in the future.

The criminal profiler's premise. FBI serial killer profilers swear by the premise that, "The best indicator of future performance is past performance. Ergo, if not caught, a serial killer will continue to kill." This works well for them because it has been repeatedly proved true way back to Jack the Ripper.

Qantas never crashes. Unfortunately this class of inductive reasoning is hazardous when used in systems engineering. The theory that nothing will go wrong in the future because nothing has gone wrong in the past is a fallacy. For example, the proposition that Qantas will never crash because Qantas has not crashed in the past is a dangerous assumption. This argument progresses from an observation (premise) to a general theory. Inductive arguments may have true premises but can produce false conclusions. Induction does not necessarily preserve truth.

The truth about Qantas. Qantas continues its laudable safety record through each working day of operation as a direct result of a massive focus on safety by all its people. If any airline loses this focus it becomes a target for tragedy. And given the inevitability of human mistakes there is always a probability that accidents will occur.

> *The serial killer argument is often used to justify relaxation of engineering discipline with the accompanying degradation of safe design and operating procedures. It has been the root cause of many industrial accidents (Bhopal being the worst). It must therefore be opposed.*

Rebutting the fallacy. This fallacy is a favourite utterance of accountants and non-technical managers focussed more on profit than safety. Looking for a counterargument? Try this:

> *Things that have never happened before, happen all the time.*

Using deductive reasoning. Deductive reasoning works from the general to the specific - also called a "top-down" approach. We propose a candidate theory about topic and then narrow it down to specific hypothesis that can be tested.

A more in-depth rebuttal using deductive reasoning might go like this:

> **Theory:** An airline will not suffer accidents if it maintains an active safety management program.

> **Hypothesis:** To ensure safe operation an airline must have enforceable safety policies, standards, procedures, training, validation of competency, safety audit and feedback systems.

Observation: We tested our hypothesis by observing the whole-of-life training and competency management of both Air Asia and Qantas staff. We concluded Qantas standards are higher than that of Air Asia's.

Confirmation: Passenger deaths in the last 10 years:

Qantas: 0

Air Asia: 162

8.5. Opposing Deus Ex Machina: *Speaking Truth to Power*

(Pronounced: *day ooze x mar kin a*)

The Deus Ex Machina metaphor. Deus Ex Machina is a Latin phrase in common use in the classical theatres of Greece and Rome (400 BC to 400 AD). Its meaning: "god from machine" refers to a plot device commonly used by bad playwrights to extract themselves from story problems – usually endings. Bereft of ideas, they would simply manufacture climaxes by having actors portraying gods lowered onto the stage on a platform with ropes and pulleys (hence the term "god from machine"). Apollo or Athena would then settle everything determining who lives, who dies, who marries and who is damned for eternity.

Even at the time, this was recognised as contrived, aesthetically unsatisfactory bad practice, indicative of a playwright lacking in creativity. Greek philosopher and polymath Aristotle, student of Plato and teacher of Alexander the Great criticized the device in his "Poetics", arguing that the resolution of a plot must arise internally, following from the previous logic of the play. He said:

> It is obvious that the solutions of plots too should come about as a result of the plot itself, and not from a contrivance, as in the "Medea" and in the passage about sailing home in the "Iliad".

In short, emotionally satisfying climaxes convey meaning, Deus Ex Machina does not. Any modern storyteller employing this pattern will be called inauthentic - one who does not speak the truth.

> Deus ex machina not only erases all meaning and emotion, it's an insult to the audience. Each of us knows we must choose and act, for better or worse, to determine the meaning of our lives...Deus ex machina is an insult because it is a lie."
>   — Robert McKee, *Story: Style, Structure, Substance, and the Principles of Screenwriting*

Engineering function. The Deus Ex Machina metaphor classifies a common dangerous scenario in safety/security critical projects. Technical specialists in possession of the facts make informed evaluations of safety and security risks and formulate risk management strategies. The recommendations made to management are ignored. The reasons: a) cost/time pressure, b) ambition, c) political expediency, d) greed, e) hubris, f) ignorance of the technical issues in play, g) ego.

Pathological behaviours. Management cuts corners. Design, construction and operational risks are taken. For example, risk management programs are cut short or eliminated to save money, schedules are crashed, test programs are not completed and safety critical systems are deployed prematurely.

The hazard. Left unopposed the Deus Ex Machina pathology is likely to cause dangerous failures which result in loss of life, destruction of property and environmental damage. Examples: Bhopal, Chernobyl, Deepwater Horizon.

Post-incident behaviours often include telling lies and attempts to shift the blame from managers to technical people. Protestations that, "I didn't know it was going on," are common. For example, the Volkswagen vehicle emissions scandal.

Case study: Volkswagen vehicle emissions scandal.

October 2015	In explaining how software designed to cheat tough US vehicle emissions standards came to be installed in 11 million diesel cars, Volkswagen's US CEO Michael Horn tells a congressional panel. "To my understanding this was not a corporate decision, this was something individuals did," Horn added that he felt personally deceived.
January 2017	Volkswagen AG agrees to plead guilty and pay US$4.3 billion in criminal and civil penalties. A federal grand jury returns an indictment charging six VW executives and employees for their roles in the 10-year conspiracy Indictees are: Heinz-Jakob Neusser: **Head of Development for VW Brand**, past head of Engine Development for VW - the most senior executive indicted. Neusser managed 10,000 people at Volkswagen's vast development complex in Wolfsburg, Germany. He assumed responsibility for developing new engines for Volkswagen brand cars in 2011, after the illegal software had been deployed in millions of cars around the world. But, according to prosecutors, he played a major role in refining the software and concealing its existence from regulators. Jens Hadler: **Head of Engine Development** for VW. The engineer who oversaw the development of the EA-189 diesel engine at the centre of the investigation. Richard Dorenkamp: **Head of VW's Engine Development After-Treatment Department** in Wolfsburg. According to prosecutors Dorenkamp, an emissions systems specialist, played a lead role in developing the new engine for the American market. He is well-known in industry circles, speaking at universities and conferences, and writing articles in technical journals. Dorenkamp's name is on numerous patents related to engine technology. Bernd Gottweis: **Supervisor with responsibility for Quality Management** and Product Safety. Gottweis (nicknamed "the fireman") was admired within VW for his risk management and troubleshooting skills. These he demonstrated in an email (included in federal court filings) warning of the risk of discovery and lamenting the reality that there was nothing VW could do to make the cars legal. Oliver Schmidt: **General Manager in charge of the Environment and Engineering Office -** the executive responsible for compliance with the US government's emissions standards. The FBI arrested Schmidt in Miami as he attempted to board an aircraft for Germany. He is currently in custody without bail as a flight risk. Jürgen Peter: Member, **VW Quality Management and Product Safety Group.** Peter is indicted for his work behind the scenes at VW headquarters to concoct excuses for the disparity between pollution readings in Volkswagen vehicles on the road and in lab dynamometer testing. As US regulators closed in, Peter became famous within VW for his empassioned email to colleagues, "Come up with the story please." The grand jury indictment alleges that: VW engineers working under Dorenkamp and Hadler designed and implemented

> software to recognize whether a vehicle was undergoing standard U.S. emissions testing on a dynamometer or it was being driven on the road under normal driving conditions. The software accomplished this by recognizing the standard published drive cycles. Based on these inputs, if the vehicle's software detected that it was being tested, the vehicle performed in "dyno mode", which satisfied U.S. NOx emissions standards. If the software detected that the vehicle was not being tested, it operated in a different "street mode", in which the vehicle's emissions control systems were reduced substantially, causing the vehicle to emit NOx up to 40 times higher than U.S. standards. **Disagreements over the direction of the project were articulated** at a meeting over which Hadler presided, and which Dorenkamp attended. Hadler authorized Dorenkamp to proceed with the project knowing that only the use of the defeat device software would enable VW diesel vehicles to pass U.S. emissions tests.
>
> Source: www.justice.gov/opa/pr/volkswagen-ag-agrees-plead-guilty-and-pay-43-billion-criminal-and-civil-penalties-six

What possessed VW to do such a thing? It turns out that, in a push to become the world's biggest car company, VW needed to dramatically increase its market share in the US. This could not be achieved without a low emissions engine given the US government's ever tightening emissions reduction regime and the increasingly stiff competition from hybrid technology. According to the indictment, sometime in 2007, Hadler realized that VW's diesel engine technology could not meet the tough American emissions standards - so they implemented Deus Ex Machina and cheated.

Taking a storyteller's perspective let us return to Aristotle's pronouncement that:

> *... the solutions of plots should come about as a result of the plot itself, and not from a contrivance*

In engineering terms the plot is proper systems engineering process which includes honesty and transparency and the contrivance is cutting corners and lying about it. To requote Bob McKee: *Deus ex machina is an insult because it is a lie.* In VW's case the audience was the US government which reacts badly to insults.

No one stood up. A salient feature of this study in corporate greed is its ten year time span. How did it endure without a single whistleblower? Given it involved the introduction of a whole new mode of operation for a mass market vehicle (dyno mode), the presence of the conspiracy must have been common knowledge among tens if not hundreds of VW engineers. They wrote requirements, others did designs, software developers implemented code, testers tested, verification and validation specialists certified the result, build managers baselined the software and production engineers deployed it in millions of vehicles. What did the test reports say, "Test result: Pass. Comment: it cheats as per the specification." And further, when "dyno mode" failed in deployed vehicles, accidentally triggering under normal driving conditions, a maintenance upgrade had to be issued involving even more people in the development and maintenance life cycle.

Addressing human frailty. US prosecutors report that there was dissent in meetings but no one chose to stand up for what is right. Proper engineering process

developed over decades was thrust aside and buried in the rush for corporate profits. All this points to the inescapable fact that there is a another dimension to our profession that we must now address: human frailty and our constant temptation to give in to the dark side of our natures. The VW saga proves yet again that engineering excellence based in irrefutable logic and mathematical truth counts for nothing if we allow it to be ignored in a gold rush.

Engineering function: Detecting Deus Ex Machina. If a safety critical project were a play and the plot a Functional Safety Program Plan, its passage home should be the full implementation and testing of the recommended safety features in the deliverable product. The abrupt termination of the story by the contrived, illogical and unsafe intervention of the uninformed was recognised as bad practice in 300 BCE and remains so today. The analogy of "safety interrupted" to a Greek tragedy is prophetic. Greek tragedies typically end with half the cast dead and the rest damned for eternity, the living dead, cursed to live with what they've done.

The key to dealing with bad behaviour is to first recognise it for what it is. For example, psychologists use archetypes as a diagnostic tool for treating mental illness. As I have said an archetype is a model of human behaviour. An understanding of the archetype informs the treatment process. I was fascinated to note that just the act of informing a manager that he was acting out documented pathological archetypal behaviour gave him pause to consider his actions.

Actions. Ok. So a so-called management god has parachuted into your project and is telling you to do things you know are wrong and potentially dangerous. You've recognised the Deus Ex Machina archetype . Now what do you do?

MIT social scientist Albert O. Hirschman offers three options to employees who disagree with company policy:

1. Loyalty. Remain a loyal "team player" (shut up and do what you're told)
2. Voice. Try to change the policy (speak truth to power - engage the antagonist in the innermost cave - name and broadcast the archetypal behaviour)
3. Exit. Tender a principled resignation (quit).

Attitudes of mind. Those who commit Deus Ex Machina are not evil, they are unknowing. In this environment we systems engineers are responsible for keeping people safe. Only we truly understand the technology, its potential for good and its dark side. Everyone else is helpless. Knowingly or unknowingly they trust us.

We have an ethical duty to come out of our mathematical sandboxes and take more social responsibility for the systems we build – even if this means career threatening conflict with a powerful antagonist. Knowledge is the traditional currency of engineering, but we must also deal in belief. The techniques of persuasion must become part of the engineering toolbox. If the safety integrity of a system is compromised by a bad management decision it is our duty to speak truth to power and change belief systems. The alternative is to risk enduring regret for the shortened lives of the people who put their faith in our skills.

On a personal level ask yourself these questions:

> *Cowardice asks: Is it safe?*
>
> *Expediency asks: Is it politic?*
>
> *But Conscience asks: Is it right?*
>
> William Punshon

Management action. In my experience the overwhelming majority of management wants to do the right thing. Apart from being against nature, dishonesty is bad for business. Breaking the laws of the land can be expensive as VW has discovered. I weep for board members sitting atop giant corporations such as VW. They can never be across all aspects of the company's operations. How do they inoculate their company against the evil that, from time to time, a small number of employees will inevitably do? My advice is to consider this:

> *It doesn't matter what orders the powerful may issue, if the technical*
> *people doing the work refuse to behave unethically, management is*
> *rendered powerless and a VW emissions scandal simply cannot happen.*

Hence the need for a grass roots mechanism to classify and resist bad behaviour at all levels of an organisation. This is a role of story. My next case study: *Something has to Change* covers the details.

Endnote.

A full treatment of this subject may be found at my blog:
http://www.systemsengineeringblog.com/deus_ex_machina/

8.6. A Death in the Workplace: *Something Must Change*

One day you may have to stand in front of a group of people and say words that radically change their behaviour. Someone didn't follow standard operating procedures, there was an accident, a worker was killed, the ambulance has departed and here you are addressing your people. Their faces are tilted up waiting for you to tell them, "where we go from here?"

You are the boss, you have two levers, the power to direct their activities in the workplace and words; words that must calm, reassure, change attitudes and trigger action. It's hard, it's uncomfortable but don't be scared, this has happened many times before. It has played out in myths, legends and stories of all kinds over the past two millennia. Athenian politician Pericles honoured the dead of the Peloponnesian War (circa 430 BCE), Abraham Lincoln did the same for the army of the north in his Gettysburg Address (1863) and Winston Churchill strengthened the resolve of the British people in the darkest hours of World War II, paying homage to the fighter pilots of the Royal Air Force (1940) with, " Never in the field of human conflict was so much owed by so many to so few." The common wisdom of these stories can guide you on what to do next.

The situation	**You are at a plot point in your story.** **A plot point** signals a change in the hero: his desires, character flaws and attitudes of mind. A plot point is always a major reversal of fortune, involving conflict and jeopardy. Recognise which plot point you are experiencing. The choices are: Inciting incident, crisis or climax. (5.3. Plot Points) **Inciting incident.** A death in the workplace is an inciting incident. Think of the worst possible thing that could happen, and here it is. This horrendous event has thrown your workaday world out of balance and, if you're not careful will introduce chaos into your well ordered company operations (your normal world). (5.4. The Inciting Incident) **Action.** Shut down the business and gather your people. Don't let chaos and fear creep into your operations where it can trigger further incidents.
Your situation	**Premise.** This inciting incident has just demonstrated your story's premise, "What would happen if someone was killed in my workplace ..." (4.5. Premise) **Action.** Before the fact there was always a finite probability that you would be at the centre of this story. You should therefore have the answer to this question and be following a prepared response. **Aesthetic emotion.** You are emotional, it's hard to be emotional and logical at the same time (the state of aesthetic emotion). There may have been tears. But you cannot seem weak in front of your people. They want a strong leader who knows what to do. If there is no disaster plan in place, take some time to calm yourself and reflect. Practice what you've got to say over and over, the tears will stop. If you have a disaster plan the story has already been told, experts have reflected on its meaning, you are calm and ready to act in the moment. The Romans knew this two thousand years ago: *Let your drills be bloodless battles, and your battles bloody drills* - Flavius Josephus, speaking of Roman training methods (3.9. Truth that Sparks Action: *Aesthetic emotion*) **Hero.** You are the hero of this story. You must embark on a quest to restore balance to your normal world. Doing nothing is not an option, you must move the

story forward by your actions!

(7.2. Hero)

Commitment to change. Heroes confront the reality that something must be done and commit to that change even though they may not know exactly how it will be achieved. For unshakeable resolve to manifest in your words, the certainty of that commitment must be in your heart.

Character arc. You may be full of self doubt. You may have guilt. You may feel that this incident was a result of your character flaw, a lapse of discipline perhaps - it's an unknown. But it is as it is, take this situation to be your character inflection point. You are being tested. Through your actions you will learn and grow and you will know yourself more deeply by what you do under this pressure. You probably don't realize how strong you are.

(6.1. Character Arc)

Unconscious desire. It's possible that this incident has aroused unconscious desires, for example, "Why me. How do I get out of this with my career intact?" Your people are at a high state of awareness, they will see any pathological character traits in your voice - in your body language. Talk to a mentor or search your soul. Find an audience of one who can see your unconscious desires. To be authentic is to be vulnerable, to be honest, to be humble.

Conscious Desire. It is certain that this incident has awakened in you a strong conscious desire for this never to happen again. What then is the elixir that will restore balance to your normal world and how do you express it in an authentic way?

Elixir. Be clear on the nature of that elixir.

> *Safety incidents cannot occur if the people at the coalface are incapable of an unsafe act.*

The elixir is therefore an attitude of mind in all your people that holds safety as a part of their strongest beliefs.

(4.7. The Elixir)

Crossing the threshold. You must cross the threshold from your comfortable normal world into the supernatural world of strong corrective action. There is no turning back.

(5.2. Story In Five Acts)

Foreshadowing the crisis. You are undoubtedly headed for confrontation with antagonists that will trigger a crisis. You may come close to career death. Get ready for "the obligatory scene" in the innermost cave with antagonists. For example, accountants who can make strong cases against spending more money on safety.

(3.4. Foreshadowing: *Hinting at the Future*)

Your audience	**Mapping character transformation.** Your task is character transformation in all your people; in story terms, to trigger a transition between two attitudes of mind: **From** the negative state of being blasé about safety **To** the positive state of never performing or walking past an unsafe act or situation. **Desire.** Your audience probably has a vague notion that something should change but they are looking to you to tell them exactly what it is. Their desire for change is not strong but at least they are ready to receive your advice. **Character.** The inciting incident did not alert them to any of their own character flaws. Ask them and they'll tell you they are committed to safety. But this is characterisation not character. Their words are no indication of how they will act

when faced by a future unsafe situation.
(6.1. Character Arc)
Early climax. The exception is anyone who has witnessed the death. For them this was not an inciting incident, it was a climax. They are experiencing the ordeal death and rebirth. They need to retain the lessons of the climax but without the debilitating emotional baggage of the death experience.
(5.6. The Climax)
Action: Like returning warriors they need to be cleansed of the horrors they experienced to ease their integration with peaceful society. Get them counselling.

What to say	**Hooking your audience.** Cruel fate has served you a well designed inciting incident. You will never have a better chance to put a deep hook into your audience and answer their dramatic question, "how will this turn out".

Aesthetic emotion in story telling. Your words must wrap the idea: "I must never perform an unsafe act," around the emotional charge of, "I could be killed," or worse, "live the rest of my life in a living hell of guilt over responsibility for the death of another."
(3.9. Truth that Sparks Action: *Aesthetic emotion*)
Story Throughline. Your audience is looking for guidance on what this all means to each one of them, personally. Use the story "through line" concept to convey your central idea clearly and succinctly. For example, working from why, to how, to what, you could say:

- "You have a right to come to work and go home safely." (why - belief).
- "We need to look after ourselves and each other." (how - beliefs reflected in actions)
- "We will analyse how this happened and improve our safe operating procedures so it can't happen again." (what to do)

(4.3. The Elevator Pitch - *Story Throughline*)

Corrective action	**The supernatural world.** A death in the workplace is objective evidence of a failed safety program. Radical change is required. In affecting change you will enter a supernatural world populated with character archetypes who will oppose your initiatives - who are against change.

The quest. Eliminating safety incidents is an eternal quest, not a one-off speech. A single address from you on the day of a fatality is not sufficient to trigger lasting change. You must have a sustained safety management program that is planned, staffed and executed every day from now until forever.
Tests and trials. When designing the "ordeals" that will help your people grow, be clear on the required change in character value and the force that will cause it to happen. Remember:

$$\text{Growth} = f(\text{character-value-transition, cause})$$

(6.2. Character Arc in Personal Development)

The core character value transition required in safety management is from characterisation of safety (being cognisant of safety principles) to character (believing in and following safe operating procedures - SOPs - under pressure)
So, teach them the revised SOPs and require them to recite them by heart. Expose them to exemplars - people who have suffered the ordeal death and rebirth in the cauldron of many safety related quests. On a weekly basis have them review incident reports and reflect on how accidents could have been prevented. Turn them out into the workplace and make them find hazards. Make safety risk

assessment a normal project activity. Have safety representatives monitor their actions in the workplace. Add safety performance to their job performance reviews.

Conscious and unconscious desires. At least one other person must "know" each member of your staff. Someone must have visibility of worker X. Is safety awareness part of X's characterisation or an immutable component of X's character? How will X react in a crisis?

(5.4. The Inciting Incident)

Crisis. In establishing (or upgrading) your safety management program there will be a confrontation with an antagonist in an innermost cave (most often, the executive suite). The antagonist will have something you want, the key to your elixir: money and time. Safety and security, like quality, is free - but not in the short term. In the long term you will avoid disasters like Bhopal which killed thousands and destroyed a multinational corporation – Union Carbide. In the short term safety programs consume large sums of money and thousands of working hours. They require full-time staff and take valuable workers out of revenue earning activities. And if they are successful, "nothing bad will happen." A hard sell.

(5.5. The Crisis)

The antagonist will be a powerful person who has everything that you lack: managerial power, financial oversight, big business picture perspective, highly developed persuasive skills, contacts, charisma.

(7.8. The Antagonist or Shadow)

In the belly of the beast you will push hard for funding and, in the process may almost suffer career death. To survive you must absorb the skills of your antagonist, develop persuasive arguments, both moral and financial and use mentors to exert influence. Most important of all remember that heroes always move the story forward by their actions, they never back down.

Climax	**The final confrontation.** There will come a time when you and your finely crafted safety program will be tested. Common scenarios are: • You employ contractors who perform unsafe acts. • Your company participates in an alliance project with immature organisations. The integrated project does not have an across-the-board safety culture. • Your foreign parent company tells your management to increase profit margins or be shut down and doesn't care how it's done. Cuts in safety spending are an obvious target for cost savings. This was the direct cause of the Bhopal climax (there was ordeal and death but no rebirth). **Sacrifice.** A true hero is prepared to give up something he values for the good of another. A true hero puts his career on the line, suffering the ordeal, death and rebirth and in the process is transformed from amateur to professional. **Catharsis.** Your triumph in the climax will provide a feeling of expansion of awareness, a peak experience of higher consciousness - sometimes called transcendence. (5.6. The Climax)
Anti-pattern	**Returning without an elixir.** If you, as hero, return to the normal world without the elixir there will be no healing of the troubled land. Your organisation will be universally doomed to repeat this ordeal until it does learn. Reflect on this. Do you want to preside over another death?

The Resolution   **Returning with the elixir.** In story, the resolution demonstrates how the elixir has healed the troubles of the ordinary world. Back in your normal world, as part of the every-day, you will measure the health of your safety management program with metrics that that track lead indicators like lost time injury and near misses. As a matter of routine, even minor anomalies will trigger early corrective action. (5.7. The Resolution)

Controlling idea. The story pattern dictates that the climax and resolution are proof of a story's controlling idea. In your normal world, from this point on, your stewardship of safety will prove the controlling idea of your story:

> *A fully operational safety program reduces the probability of injury and death in the workplace.*

(3.8. Expressing truth: *Controlling Idea*)

9. Sample Step Outline: Casablanca

Excerpts follow from the step outline of the movie Casablanca by Julius Epstein, Philip Epstein and Howard Koch, from the play by Murray Burnett and Joan Alison.

The full text is at:
http://www.thestickingplace.com/wp-content/uploads/2015/12/Mackendrick-Casablanca-step-outline.pdf , available, 17 Sep, 2016

INTERNAL: Rick's Café American, Casablanca

Scene 7   ILSA and LASZLO enter the café. ILSA sees SAM, who ignores her. ILSA inquires about the piano player and he tells her that his name is SAM and that he came to Casablanca with RICK. ILSA looks thoughtful.

Scene 9   ILSA requests that the piano player come to her table. The waiter goes to fetch him.

Scene 11   SAM wheels his piano over to where ILSA is seated. They say hello, and ILSA asks how RICK is, confirming that she knows him. SAM is evasive and ILSA requests that he play "As Time Goes By." After a bit of hedging, he complies. RICK explodes into the café and begins to tell SAM that he told him never to play that song, but seeing ILSA he stops short.

Scene 12   Inside the closed café RICK is getting drunk while SAM cleans up. RICK tells SAM that he is waiting for ILSA. SAM tries to dissuade him. RICK is not to be deterred and makes SAM play "As Time Goes By." RICK begins to reminisce.

10. Montrepreneur

A meditation for pilgrims who embark alone to create something new.

Montrepreneur

My idea is strong
though relations are messy
my found needs
are pure

I see in them
what they cannot give
I care not
for what they can take away

Nothing beyond time
was ever created for money
my needs are small
a tent, a single gas burner

It is no job
it is my vocation
deep passion in the bones
alone with the wonder

In predawn thoughts, rampant, loose, wandering
crouch the horrors. "Scat, you're unwelcome in this meditation!"
calm, the intelligent are full of self doubt
relax, incompetence is far away, with the charismatics

Focus now, how sweet the intimacy
tween the artist and his art
real beauty in less
emergent as I think more

And when I feel nothing
it's in my power to switch off obsession
then in the sublime stillness of the empty mind
soon it will come back, richer

I will listen to friends
as they savage it
but doubt cannot visit
without my consent

I will not fear my smallness
storms destroy large things
the unencumbered
are easily made good

I accept that I have left the building
the discipline of the context change in commute
the fellowship of the water cooler
the leadership of others
the regular wage

Now I look up to a scary but richer
independent
creative
life

Les Chambers

11. Glossary

aesthetic emotion	An emotional response to a situation when thought and feeling come together to create meaning. Aesthetic emotion is kindled while viewing an artwork, reading a story, listening to music. Aesthetic emotion is a device used in story telling - as Bob McKee says, "When an idea wraps itself around an emotional charge, it becomes all the more powerful, all the more profound, all the more memorable. ... It harmonises what you know with what you feel ..."
archetype	A statement, situation, state of mind, manner of thinking, pattern of behavior, or prototype which other statements, patterns of behavior, and objects copy or emulate. A collectively-inherited unconscious idea, pattern of thought, image, symbol etc., that is universally present in individual psyches, as in Jungian psychology. In various seemingly unrelated cases in classic storytelling, media, etc., characters or ideas sharing similar traits recur. See also: story archetype
antagonist	The person, group or force of nature who actively opposes or is hostile to the protagonist. Synonyms: villain, adversary, opponent, enemy, foe, nemesis, rival.
character arc	The transformation of the hero's character through the arc of a story. For example, in the movie *Star Wars*, Han Solo transforms from a selfish intergalactic smuggler to a selfless hero joining the battle with the Death Star at the final moment.
climax	The climax depicts the final confrontation between protagonist and the antagonist. It answers the question posed by the inciting incident, the hero finally understands the supernatural world, knows what he must do and executes. The story's controlling idea or truth is expressed through his actions. While the crisis makes the hero aware of his character flaws, the climax is the point where he deals with them and changes forever.
controlling idea	The fundamental story theme describing, in one sentence, how the human experience depicted in the story changes from one condition (or story value) at the beginning to another at the end under the influence of some driving force. Example: Macbeth's character transforms from good to evil because of his unchecked ambition.
crisis	The point of maximum jeopardy for a protagonist when he engages in conflict with the antagonist. The crisis is triggered because the antagonist possesses the elixir. The protagonist seizes the elixir and sets out on the road home. The choices made by the protagonist under the extreme pressure of a crisis are a window into his deep character, his essential nature, the ultimate expression of who he is. The hero has the elixir but the antagonist has not been defeated. There are many outstanding issues not the least of which is the hero's internal struggle with his character flaw which is recognised but as yet not resolved.

inciting incident   A dramatic event occurring early in a story that radically upset's the balance in the hero's life. It awakens desire in the hero and launches him on a quest to right that imbalance. It also gives the audience a clear indication of what the story is about.

plot point   Scenes where major events occur. The dramatic function of a plot point is to move the story ahead. A plot point also signals a change in the hero: his desires, character flaws, attitudes of mind. The plot point is always a major reversal of fortune, involving conflict and jeopardy. For example, the Titanic sinks, Darth Vader kills Obi-Wan Kenobi, Michael Corleone kills Sollozzo, Thelma and Louise drive off a cliff ...
                      Stories may have many plot points but the natural laws of storytelling require at least an inciting incident, a crisis and a climax.

premise   A story's premise expresses the creative spark, the exciting idea that inspired a writer to tell a story. It's an idea to be explored, often expressed as an open question: "What if ...". For example, what if we could clone dinosaurs (the movie *Jurassic Park*).

protagonist   The central character of a story.
                      Synonym: hero
                      Antonym: antagonist, villain, shadow

step outline   A structuring device used by scriptwriters to lay out the skeleton of a story. A step is an event in the arc of a story. Each step may ultimately translate to more than one scene (refer: Section *9. Sample Step Outline: Casablanca*). Each step is described with one or two sentences.

story arc   The structure of a story: beginning, middle, end. For example, movies and plays are structured in acts, scenes and beats. Where a beat is a single stimulus/response interaction between two characters. Story designers also often use a series of events to structure their storytelling.

story archetype   A story archetype is an abstraction of a universal human experience. The individual stories informed by archetypes are unique culture-specific projections or expressions of a particular archetype. For example the archetypal story of the man who's life is destroyed by his unchecked lust for power is projected onto medieval times by Shakespeare's play *Macbeth* and 1980's America by Francis Ford Copola's movie *The Godfather*.

story values   A mental or physical state of human experience, for example an attitude of mind, an emotional state, a physical situation, the emotional impact of an environment. Story value may be viewed as negative or positive from a character's point of view. The protagonist's need to change a value from positive to negative or negative to positive drives a story forward. Story values may change from one moment to the next, from one scene to the next or across the entire arc of a story. At the beginning of the movie *The Godfather* Michael Corleone has a sense of powerlessness. As the trilogy progresses he works to convert that value to powerfulness or total domination of the criminal underworld.
                      Other examples are: alive/dead (positive/negative) love/hate, freedom/slavery, truth/lie, courage/cowardice, loyalty/betrayal, wisdom/stupidity,

strength/weakness, excitement/boredom, good/evil, right/wrong, hope/despair.

The concept of story value is discussed in detail by Bob McKee.[24]

throughline   A throughline tells what the story is about in one or two sentences. It typically describes the desire-driven quest of the hero. It's the text often seen on a movie poster. Its purpose is to convey a story's central idea to an agent, publisher, producer, movie studio executive or moviegoer.

The throughline describes the unifying idea or super-objective that holds the story together.

Synonyms: spine of the story, logline.

---

[24] Bob McKee, Story

12. Reading

[Bell 07]   Bell, Susan (2007), *The Artful Edit: On the practice of editing yourself*, W.W. Norton & Company, Inc

This is an excellent reference on editing techniques. It discusses several storytelling devices including foreshadowing. Bell uses many examples from F Scott Fitzgerald's classic, *The Great Gatsby*. A great deal is known about the writing of this book as Fitzgerald exchanged letters with his editor Max Perkins. Max is the gold standard in editors, he seemed to know how to improve the work of a genius.

[Campbell 48]   Campbell, Joseph (1948), *The Hero With a Thousand Faces*, Princeton University Press

This is where anthropology and mythology met Hollywood with astounding results. Campbell profoundly influenced George Lucas' rendering of the Star Wars movies and the rest was history. This is the seminal text on story. Videos of Campbell's *Power of Myth* series with Bill Moyers are available online. Some might find this tome a little inaccessible, after all it's written by an anthropologist. Sensing this Chris Vogler summarised Campbell for Hollywood scriptwriters in *The Writer's Journey*.

[HBR 03]   Harvard Business Review (2003), *Storytelling That Moves People: A Conversation with Screenwriting Coach Robert McKee*, June 2003, pp. 51-55

This article was the genesis of my idea that storytelling could be useful to engineers. It was my call to adventure and the beginning of my journey into story theory. It was also my first introduction to Bob McKee, and his incredible insights on human nature. What inspired me in particular? Well, it turns out that some American companies hire Hollywood storytellers to help them pitch investment opportunities to Wall Street bankers. On the meanest street in the world some of these guys have 100% success rates. What if engineers could be that persuasive ... ???

[McKee 98]   McKee, Robert (1998), *Story: Substance, structure, style, and the principles of screenwriting*, Methuen Publishing Ltd

Bob McKee opened my eyes to the power of persuasion through storytelling and the insights it gives into human nature. I found it fascinating to read how professional scriptwriters manipulate our feelings with well understood devices such as aesthetic emotion. Through Bob you get a highly entertaining window into the analytical psychology that is practiced with each new movie. As I read I recalled many situations that I could have handled better in my professional life if I'd only had the ability to abstract them into story patterns.
Bob speaks with authority, his seminar alumni include the originators of classics such as: Forrest Gump, Breaking Bad and game of Thrones. Attendance at his seminars is a rite of passage for Pixar storytellers -

creators of TOY STORY 1, 2, & 3, FINDING NEMO.
This is a highly recommended read for engineers.

[McKee 16]   McKee, Robert (2016), *Dialogue: The art of verbal action for the page, stage, and screen*, Hachette Book Group, Inc

This book is useful for its insights into what people say and what they actually mean (the subtexts). It will assist you in writing dialogue for presentations and for interpreting the pronouncements of subject matter experts in requirements capture forums. It also expands on some of Bob's story concepts from his first book.

[Pierre 16]   Pierre, DBC (2016), *Release the Bats: Writing your way out of it*, Faber and Faber Ltd

Pierre won the Booker Prize for his first novel *Vernon God Little*.
His thoughts on writing dialogue, character development and storytelling devices such as surprise are useful.

[Vogler 98]   Vogler, Christopher (1998), *The Writer's Journey*, Michael Wiese Productions
**Start reading
here!**

Vogler, a Disney script analyst, created a seven-page company memo based on Joseph Campbell's work entitled: *A Practical Guide to The Hero With a Thousand Faces*. His ideas found application in Disney's 1994 film *The Lion King*. He later expanded the memo into this book which has been called "Campbell for dummies". It's thin, concise and to the point. If you want to know more about story in a hurry, this is the best place to start.

[Yorke 13]   Yorke, John (2013), *Into The Woods: A Five-Act Journey into Story*, Penguin Books

Yorke provides interesting perspectives on placing Vogler's 12-step writer's journey into the five act play structure.

Epilogue

The eagle finds its nest on the lines of the earth's magnetic field. Man moves through time along the lines of story. It's patterns delight us, it's rhythms comfort us. Primal as the tempo of breathing; elemental as the beat of our heart. And with it we make sense of our life inside the chaos, as with the marching song of the soldier, as with the chant of the poet engineer.

Whisper

This is the reason I was born
I come to live here till I die
I am the brush stroke on the dawn
I am the whisper in the sky

I hear you in the waking dawn
From far beyond the galaxy
I miss you, tears and heart forlorn
Dear one I'll soon return to thee

To light the mind and feed the soul
The synthesis of dreams
To write the stories still untold
For systems in the human stream

Where workings of our heat's design
Will keep life safe and true and full
With metaphors sustained in time
Because they're simple and they're beautiful

Les Chambers

Cheers

Les

Lab Exercise: Does One Life Matter?

Overview   The first death due to failure of a motor vehicle autopilot system sparked a debate on the ethical and regulatory issues that surround this rapidly developing technology. The vehicle's manufacturer, Tesla Motors (CEO Elon Musk) expressed sympathy but argued that, while tragic, this incident should not impede the development of driverless car technology. Further, the technology, when mastered and rolled out across the world, will save millions of lives every year.

Some commentators (for example Patrick Lin[25]) have argued that this approach is cavalier and that more regulation is required. Lin's view is that one life matters if that life is taken due to bad design or failing technology.

Task   1. Choose a protagonist (either Elon Musk or Patrick Lin)
Description   2. Make your protagonist's case with a story.

Remember that this is a life-and-death matter. Elon Musk is fighting for the survival of his company. Bad press and overregulation could destroy Tesla's profitability. In contrast, Patrick Lin is deeply concerned about the lives that may be taken in the future through failed technology, if Silicon Valley cowboys are allowed to continue with their unregulated "innovation".

Your story should engage and persuade your audience at the deepest possible level.

Deliverables   1. Answers to the questions posed in section *3.10. Story Checklist*
2. A story treatment

---

[25] Dr. Patrick Lin is the director of the Ethics and Emerging Sciences Group and a philosophy professor at California Polytechnic State University, San Luis Obispo.

The Back Story.

Joshua Brown was killed in a motor vehicle accident 7 May, 2016. He was driving a Tesla Model S electric car operating in autopilot mode (refer Exhibit A).
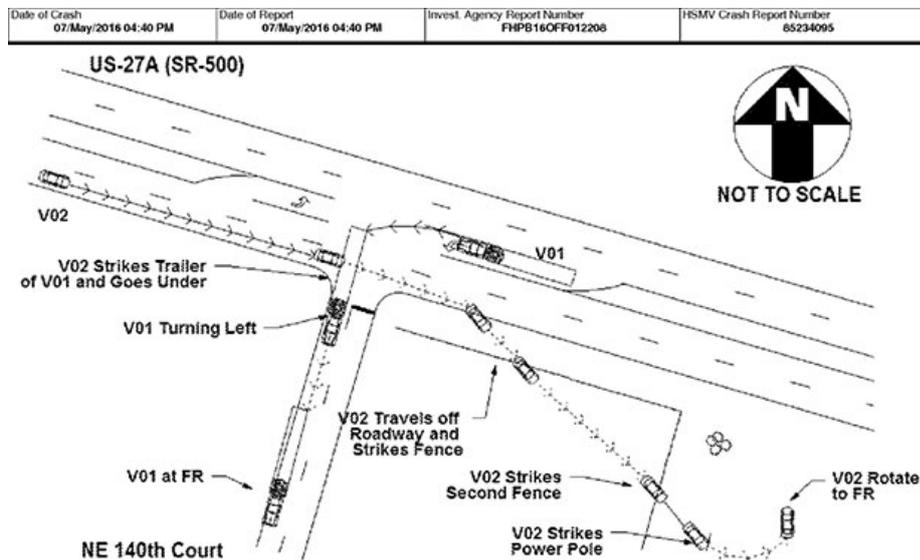
Exhibit A. Crash Investigation Graphic

Image: Florida Highway Patrol

A tractor-trailer truck made a left turn onto a side road, crossing in front of the oncoming Tesla in the eastbound lane. The roof of the Tesla was sheared off as it passed under the center of the trailer at windshield height. The Tesla came to rest at the side of the road after hitting a fence and a pole. It travelled approximately a quarter mile after impact before coming to a stop. According to the National Transportation Safety Board (NTSB) report, Brown's car was traveling at 74 mph when it impacted the tractor trailer. The posted speed limit at the crash site was 65 mph.

Exhibit B. Joshua Brown's Tesla

NTSB Image

Crash analysis determined that neither the autopilot nor Brown had applied the brakes. There were reports that Brown did not see the truck because he was watching a Harry Potter movie.

Exhibit C. Damage to the Impacted Truck

NTSB Image

Sensor failure. Forensic analysis concluded that the Tesla's camera and radar sensors were not able to detect the white side of the tractor trailer against a bright lit sky. The radar may have detected the obstruction but according to Tesla CEO, Elon Musk, "Radar tunes out what looks like an overhead road sign to avoid false breaking events."

Joshua Brown background. Brown, 40, was an ex-U.S. Navy Seal. He owned a technology company called Nexu Innovations. On his company's website Brown said that he started it "... with two things in mind: to make a difference and to have fun. When I look at the world around me I see what it could be. I focus on what could be done to make this world a better place." Brown attended the University of New Mexico, Albuquerque for three years, studying physics and computer science. He then enlisted in the U.S. Navy following his junior year. He served 11.5 years in the Navy on active duty as a master explosive ordnance disposal technician. He was deployed overseas in "both warfighting and non-combatant roles" with Social Operations Forces units. His published obituary says that Joshua Brown was survived by his parents Warren and Sueanne Brown of Stow, Ohio, and a sister, Amanda Lee, as well as numerous nieces, nephews, aunts, uncles and cousins. The New York Times reported that Brown was a generous, enthusiastic risk-taker. His specialty while in the military was disarming weapons. He was unmarried.

US road fatality statistics. Dr. Mark Rosekind, administrator of the U.S. National Highway Traffic Safety Administration, reports that car crashes kill the equivalent of a 747 jet-plane full of people every week in the United States. That is more than 32,000 road deaths per year.

Tesla Response

Elon Musk	[Responding to a reporter's question] Indeed, if anyone bothered to do the math (obviously, you did not) they would realize that of the over one million auto deaths per year worldwide, **approximately half a million people would have been saved if the Tesla autopilot was universally available.** Please, take 5 minutess and do the bloody math before you write an article that misleads the public.
Elon Musk	The Autopilot feature introduced in the Tesla Model S last fall was "**probably better than a person right now**."
Tesla Company Statement	It is important to note that Tesla disables Autopilot by default and requires explicit acknowledgement that the system is new technology and **still in a public beta phase** before it can be enabled. When drivers activate Autopilot, the acknowledgment box explains, among other things, that Autopilot "is an assist feature that requires you to keep your hands on the steering wheel at all times," and that "you need to maintain control and responsibility for your vehicle" while using it. Additionally, every time that Autopilot is engaged, the car reminds the driver to "Always keep your hands on the wheel. Be prepared to take over at any time." The system also makes frequent checks to ensure that the driver's hands remain on the wheel and provides visual and audible alerts if hands-on is not detected. It then gradually slows down the car until hands-on is detected again.
Tesla Company Statement	This is the first known fatality in just over 130 million miles where Autopilot was activated. Among all vehicles in the US, there is a fatality every 94 million miles. Worldwide, there is a fatality approximately every 60 million miles.
Tesla Company Statement	The customer who died in this crash had a loving family and we are beyond saddened by their loss. He was a friend to Tesla and the broader EV community, a person who spent his life focused on innovation and the promise of technology and who believed strongly in Tesla's mission. We would like to extend our **deepest sympathies to his family and friends**.
Elon Musk[26]	[Four months after the crash] "We're making much more effective use of radar," Musk told journalists on a phone call. "It will be a dramatic improvement in the safety of the system done entirely through software." Musk said it was "very likely" the improved Autopilot would have prevented the death of Joshua Brown ... "Perfect safety is really an impossible goal ... It's about improving the probability of safety. There won't ever be zero fatalities, there won't ever be zero injuries."

---

[26] fortune.com/2016/09/12/elon-musk-tesla-new-autopilot-death/ Sep 12, 2016

Opposing Views

Patrick Lin[27]	Yes, it could be that autonomous cars will save many more lives than they take. But "the ends justify the means" is a **dangerous approach in ethics, capable of justifying any evil as long as the math worked out**.
Patrick Lin	When we speculate whether the broader public would accept robot cars that are imperfect but still safer than today's cars, we should remember that it's more than about the numbers. **Would we really accept higher statistical safety, if that came with new risks and accident types that we could easily avoid today?** **...** people injured or killed will probably not be the same ones who would otherwise be victims, and this needs to be considered.
Patrick Lin	Human irrationality may also explain why Tesla retains some responsibility in the accident. Before allowing its customers to use Autopilot, **Tesla requires them to promise to always be alert** . . . And users happily agree to this. **But if we're not physically capable of doing what we agreed to, that's not a rational or informed agreement.**
Patrick Lin	We can't cut corners just because we want to rush a life-saving product to market. ... "The perfect is the enemy of the good," as famously declared by Voltaire, is also a common reaction to ethical critiques of autonomous cars. But this is a straw-man argument: no one is demanding perfection, just due diligence, especially if death is on the line. Just as with cancer drugs or anything else on the market, a product doesn't have to be perfect, though that's not an excuse to not be more careful.
Les Chambers	In defending the safety integrity of their vehicles Tesla, by inference, repeatedly makes proven-in-use claims. For example: *This is the first known fatality in just over 130 million miles where Autopilot was activated.* Given that the behaviour of these vehicles is totally dependent on software and the software undergoes regular updates, these claims are fraudulent. A proven-in-use argument is valid if and only if the target system's hardware and software is not modified in any way over the period (or distance) claimed. This argument therefore fits the classical "Serial Killer" archetype (refer *8.4. The Serial Killer Fallacy: Unsafe Inductive Reasoning*). While I am as enthusiastic as any engineer about the advancement of this technology I believe that both prospective and current Tesla owners should be better informed so they can make their own decisions as to whether or not they use the autopilot feature or trust their lives to any vehicle running "beta software".

---

[27] spectrum.ieee.org/cars-that-think/transportation/self-driving/tesla-autopilot-crash-why-we-should-worry-about-a-single-death

Resources

[1]   spectrum.ieee.org/cars-that-think/transportation/self-driving/tesla-autopilot-crash-why-we-should-worry-about-a-single-death

[2]   spectrum.ieee.org/cars-that-think/transportation/self-driving/fatal-tesla-autopilot-crash-reminds-us-that-robots-arent-perfect

[3]   www.theverge.com/2016/7/26/12287118/tesla-autopilot-crash-images-speed-limit-ntsb

[4]   www.tesla.com/blog/tragic-loss

[5]   fortune.com/2016/09/12/elon-musk-tesla-new-autopilot-death