Disaster DNA - Decoding the DNA of failed technology projects

Robert Goatham – Calleam Consulting Ltd – Feature Article Dec 2008

Sequencing of the human genome is a marvel that has allowed science to understand the processes by which living organisms grow and develop. While mapping the genome has been a great advance in the field of physiology (the study of the healthy body), the greater value of the breakthrough lies in the field of pathology (the study of disease). While earlier advances in medical science explained illnesses caused by viruses, bacteria and environmental pollutants, DNA is the breakthrough that opens the door to understanding some of the most perplexing of illnesses.

Our understanding of the mechanisms that lead to technology project failure is also maturing. While the earliest works on the issue focused on overcoming the complexity of writing large computer programs [1, 2], much of today's thinking is based around the use of methodologies or project management techniques as a way to reduce risk and increase value [3, 4].

While these advances have all contributed knowledge and helped address many of the causes of project failure, failure remains a very real part of today's world. Reports indicate that delayed, failed and cancelled technology projects cost organizations billions of dollars annually and this year is no exception. From flipping a few newspapers, I quickly identified more than $8 billion dollars worth of recent project failures [5, 6, 7, 8, 9, 10, 11 and 12]. Ranging from the technical flaws that led to a write-off of as much as $5.6B at Her Majesty's Revenue Collection Agency in the UK [5] to the failure of Waste Management Inc.'s $100M Enterprise Resource Planning project in the USA [6], the costs can be high.

Much as DNA has helped medical science develop deeper insights, if the technology sector is to continue to improve success rates we need to understand projects at their most fundamental level. Seeing projects in their rawest form requires something of a gestalt shift. We are used to thinking about projects as sets of inter-dependent tasks (as represented by a Gantt chart), but at the most basic level, technology projects are built from thousands, if not millions of individual decisions [13]. Be it developing the project's vision, planning, designing, coding software, vendor selection, technology choice or even developing test cases, every step along the way requires decisions to be made.

Much like microscopic nucleotides of genetic information make up strands of DNA, the decisions made in a technology project form complex interwoven chains in which each decision becomes the basis (or context) for one or more subsequent decisions. The task centric Gantt chart view of a project is a radical simplification of this far more complex reality. Failure to understand the gap between the simplified view and reality is the breeding ground for project failure.

The Ailments behind Project Failure

Ineffective decision making, dysfunctional decision making and the problems that inhibit effective communications are the common problems that cause projects to fail. Much as the medical field has isolated different forms of illness from their associated symptoms, common patterns of project failure can also be identified. Those patterns represent the illnesses that afflict technology projects. Project Managers and teams who understand those patterns and who have the skills needed to identify their associated symptoms are far more likely to succeed than those that don't.

The following list illustrates a few examples of common project illnesses;

1. Top led failures
2. Focal imbalance failures
3. Disconnect failures
4. Bottom fed failures

Top led failures

Top led failures occur when an organization's Senior Management makes strategic blunders that set a project on course for disaster. One of the best documented examples is the Denver International Airport Baggage Handling system. Although the story dates back to the 1990's, it's a useful example because of the level of publically available information.

Faced with an aging Stapleton International Airport, the City of Denver decided to develop a new airport. Covering a total area of 140 Km^2, the new airport was to be one of the largest ever built. To ensure efficient operations planners decided to build an automated baggage handling system. While prior airports had used simple conveyor belts with manually operated tugs and trolleys, planners felt that due to the airport's size, automation was the only way to operate the airport efficiently.

Although on paper the project made sense, it represented the most complex baggage system ever built. Ten times larger than any other system, the chosen design involved a level of complexity never attempted before. Designed to integrate all three concourses and all airlines into one seamless system, the project collapsed because of the system's complexity and the failure to allow adequate time for its development. The completed Denver International Airport famously sat idle for 16 months while engineers tried to correct the problems. Eventually project scope was slashed and only a fraction of the system was deployed. All other baggage handling reverted to using the traditional tug and trolley system. The total cost of the debacle added at least $560M to the cost of the airport [14] and due to frequent operational problems, even the functioning portion of the system was abandoned in 2005 [15].

The epicentre of the fiasco can be traced to the strategic decisions made by the airport's Chief Engineer, the Project Management team and the vendor's Senior Management. Prior to proceeding, the City of Denver had commissioned a study of the project's feasibility [16]. The report advised that the project's complexity made it extremely risky and research would be required before such a system complex could be built successfully. Despite the report, similar advice from internal experts and an independent study that showed that none of the companies bidding for the project could build the system in the available time [14], the project's senior leadership team decided to proceed. That decision made at the very highest of levels in the project and the refusal to listen to expert advice prevented the project team exploring other options that may have been more feasible. The ultimate effect of the decisions set the project on a course for disaster.

Top led failures can be amongst the most difficult to correct. Because the flawed decisions were made at the most senior of levels, changing course requires an admission by the organization's senior leadership that an error was made. The political and psychological barriers needing to be crossed in order to make such an admission, prevents many such mistakes being corrected. Failure to brave that admission has however resulted in some of the largest project failures in history and has even seen complete organizations go out of business.

Focal Imbalance failures

"You know your project was a failure when ..." a member of the public writes a song about the mess you made and it becomes a viral hit on YouTube. British Airways (BA) and the British Airport Authority (BAA) suffered that embarrassment in March 2008 when BA operations moved into London Heathrow's newly constructed Terminal 5.

Despite great hype and interviews given by British Airways proudly touting how they had used the latest thinking in "lean" Project Management practice [17], the opening was best described as a shambles. Hundreds of flights were cancelled; 28,000 checked bags were lost and thousands of passengers waited in line for hours. After several days of ongoing problems, BA Chief Executive Willie Walsh admitted that the transition had "not been BA's finest hour" [18]. The debacle ended up costing several senior managers their jobs, resulted in $32M in losses and dented BA's reputation as a well run airline.

Although, the BA Terminal 5 transition project was afflicted by a number of illnesses, it represents a good example of a focal imbalance failure. Focal imbalance failures occur when the project management team fail to dedicate sufficient attention to one or more critical parts of the project. In the Terminal 5 case, staff training and the logistics necessary to prepare the staff for the opening were severely underestimated. While the project team focused on the technical aspects of the project (getting the building equipped, testing the building's services and planning which flights would be migrated first), little attention was paid to preparing the front line operational staff for the transition [19]. On the first day many staff were late for work because they were driving around trying to find the staff parking lots and even once they made it to their stations, new software prevented them signing in.

British Airways are not the only ones to have suffered a focal imbalance failure. When I recently had a problem with my phone line, the person I spoke to at the company's call center advised me that they had just migrated to a new system. After 15 minutes of trying to locate my missing account the agent gave up and in frustration let slip that she didn't know how to use the new system properly. Sensing a focal imbalance failure I enquired about the training she had received. She had only received a 20 minute briefing and because of a project delay, there had been a six month gap between the briefing and the actual cutover. If I could play the guitar I would have written a song.

Of course, focal imbalance failures are not limited to training issues and many other types of imbalance occur. Other common examples include focusing on development activities over comprehensive testing, focusing on the parts of the project that are well understood while ignoring elements which are less familiar and looking at projects as technology projects when they should be considered business process change projects.

Disconnect failures

As with top led failures, disconnect failures relate to the key strategic decisions made in the project. However, unlike the strategic blunders that drive a top led failure, the strategic and vision related decisions made in a disconnect failure are in fact good decisions. Disconnect failures occur when a project loses sight of its value proposition and ends up implementing a solution that fails to meet its rightful goals.

I accidently tripped over a case of a disconnect failure in a presentation once. I was asked to give a presentation to the senior managers of a global cargo shipper based in Asia. The presentation focused on the role of the project sponsor. During the presentation the organization's CEO started asking the other senior managers present about their SAP implementation project. The organization had recently implemented a large scale SAP system with the goal of attaining efficiencies by integrating previously disparate functions into one streamlined solution. During the discussions between the CEO and his management team, the CEO figured out that instead of integrating functions; the project team had simply mirrored their existing business processes into the SAP environment. The resulting system was no more efficient or streamlined than the older technology they had used.

This example is a classic example of a disconnect failure. Although the CEO felt that he had set the project on the right path, his vision of what the project should achieve and the actual results attained were two completely different things. That meeting transformed the CEO's perception of the project from success to failure. I'm not privy to what happened after I met with the organization, but I'm sure there will have been some difficult questions to be answered.

A disconnect failure such as the Asian cargo carrier case represents a breakdown in communications and governance. The problems are unfortunately all too common and because few organizations monitor the operational effectiveness of their technology investments disconnect failures often go undetected.

Bottom fed failures

The $5.6 billion dollar fiasco at Her Majesty's Revenue Collection Agency (HMRC) in the UK is a good example of a bottom fed failure. Bottom fed failures occur when substandard work at the implementation level results in quality problems. In software systems those quality problems are generally in the form of software bugs, but for other types of project they may take other forms.

In the HMRC case new child tax credits offered by the UK government required tax refunds to be sent to thousands of families. Bugs in the software used to make payments caused a number of problems [5];

1. Miscalculation of the sums to be refunded
2. Changing screens while entering data resulted in vital information being lost
3. The database ended up with "rogue" files that could not be deleted

The resulting errors meant that many families received considerably more money than they should. Unfortunately once the British Government realised the errors had been made, many families had already spent the money. Efforts to reclaim the money resulted in financial hardship for many of the UK's poorest families and in the end the British government was forced to accept massive write offs.

While top led failures, focal imbalance, disconnect failures and bottom fed failures are a few examples, many other such afflictions exist. Projects in poor health often suffer from more than one ailment and the worst run projects are riddled with such problems. Underlying these problems is usually a lack of understanding for the process of making decisions and a lack of understanding of how to recognise when decision making is going off the rails. Those failures are in turn often contributed to by the way we see the Project Management role.

Decision Dynamics

In large part the Project Manager's role has traditionally been seen in terms of planning and control. While that is true at one level, the Project Management role is also about orchestrating the team's decision making. By establishing the team, defining processes, planning roles and responsibilities, and facilitating meetings, the Project Manager plays a significant role in orchestrating the decision making occurring within the team.

Successful orchestration requires Project Managers to be in tune with the dynamics beneath the surface of the project. While Project Managers may not be experts in the technology in use and may not fully understand the project's every detail, successful Project Managers are the ones who have developed a sense for whether or not the team are making effective decisions. By listening to how the team communicates and watching the interactions between individuals, groups and stakeholders effective Project Managers are able to keep their finger on the pulse of the project.

A contributing factor in many project failures is that no one is directly aware of this level of interaction. Project Management in many cases has unfortunately become the simple task of delegation. Tasks are doled out to team members, but there is no subsequent monitor of the project's heart beat to see if the project is functioning in a healthy and sustainable way.

Preventing such failures requires Project Managers to be able to identify when dysfunctional decision making is taking place. Despite decision making's central role, few training programs explore the dynamics that influence how decisions are made in real world settings. Affected by politics, personality type, culture, organizational structures, contractual obligations and many other factors, it's something that can be a complicated story. However knowledge is everything and by training Project Managers (and all those who hold leadership roles in project environments), many of the most common dysfunctions can be not only identified, but also cured.

The starting point for recognizing dysfunction lies in learning to see the symptoms. Many of the floundering projects I'm asked to review are riddled with symptoms. Many are quite apparent, but oftentimes the Project Manager is either not aware of the symptom or doing little to find out what is causing the problems. Among the more readily identifiable symptoms are;

1. Prolonged indecision
2. Excessive volatility
3. Extremely high numbers of open decisions
4. Lack of clarity (resulting in confusion over the outcome of critical decisions)
5. Decision fragments (decisions in which some of the who, why, where, when and how components have been made, but others have not, resulting in confusion, inaction or other secondary problems)

Other symptoms are more subtle and require an experienced eye. In many such cases, seeing what's not happening is more important than seeing what is happening. Common examples include sensing when groups who ought to be collaborating closely are not communicating and seeing that questions that really ought to be asked are not being asked.

Another barometer of project health lies in looking at the number of options the team has considered when making critical decisions. As a general rule, better decisions come from evaluating a number of options and many blunders can be traced to a pattern of behaviour I call *"first option adoption"*. One of the hallmarks of expertise is the ability to rapidly generate alternative ideas about how to solve a problem. Unhealthy projects often lack that ability and rather than considering alternatives, the first option thought of becomes the only option thought of. Teams using such an approach are unlikely to be lucky enough to identify the best option first time, every time, and first option adoption is a pattern of behaviour that is deeply rooted in many project failures.

Cognitive Bias

As well as having an appreciation of the process of making decisions, Project Managers need an appreciation of the cognitive biases that can influence how people and groups make their decisions. Cognitive biases are the forces that unconsciously influence our decision making, often resulting in errors of judgment. Well known examples include;

1. The Bandwagon effect (the tendency to follow the crowd)
2. Ostrich effect (the tendency to ignore an obviously bad situation)
3. Confirmation bias (the tendency to seek out information that supports our opinion while ignoring evidence that might disprove it)
4. Mere exposure effect (the tendency to express a preference for something simply based on familiarity, also known as the comfort zone effect)

Of course there is also the all important "Rosy retrospection" (the tendency to look back on negative events in a more positive light than they had been viewed at the time they occurred) which in some organizations is sadly the only thing that keeps Project Managers taking on new projects.

Hundreds of such biases exist and they are a very real part of the dynamics in which project related decisions are made. One example I heard of a few years ago set a $100M project on a course to disaster. The project team in question was trying to decide how to break a large project into phases so that a legacy application could be safely migrated to a new application architecture. The new application was to be developed from scratch by a relatively new player in the industry while the legacy system was supported by a well established incumbent.

In advance of a joint planning meeting, the team who had supported the legacy application for many years did some brainstorming to identify options for how to break the project into phases while reducing risk. Those discussions generated many ideas, of which the simplest and safest was adopted as the recommended approach. The legacy team presented their recommendation at the joint planning session a few days later and was immediately greeted by a flat out rejection.

The problem the legacy team ran into that day is an example of the "not invented here" bias (the tendency to reject ideas because the source of the idea is an external party that is seen as the enemy). In the case in question the new company was very suspicious that the incumbent was trying to find ways to win the customer back and there was considerable distrust. In the end the new company settled on a plan against the recommendation of those who knew the application best.

The adopted plan called for the first phase to be delivered in six months. At the time of writing, several years after those meetings, the first phase is still not complete. The interesting part of the story is that two years into the project, the new company saw the light and to their credit, admitted that they had erred. Partly that change in heart may have been because several other organizations that had the same legacy system used the recommended approach and had already migrated to new platforms successfully.

In retrospect the problem came about because of the way the meeting was facilitated. Knowing that the meeting was likely to be adversarial, the session's facilitator should have worked towards building trust and an open discussion before allowing different camps to take their ground. Because the different camps pitched their opinions within the first five minutes, the meeting disintegrated into a long argument driven by the confirmation bias rather than an open identification and evaluation of options.

Such biases and the dysfunctional decision making that ensues, occur in most ailing projects. The disconnect failure that left the Asian cargo company with a modern system that inherited the same constraints as its legacy system may well have been influenced by those in the lower levels of the organization exercising the comfort zone bias (i.e. the desire to stick with their current processes because they were familiar). The strategic blunders made by those overseeing the Denver Baggage debacle may well have tripped over a bias known as "the planning fallacy" (the tendency to underestimate task completion times) or the "optimism bias" (the tendency to overestimate the likelihood of positive events and under-estimate the likelihood of negative ones).

Elements in successful decision making

Perhaps the most critical question those leading projects need to ask themselves is whether or not they have created the environment within which effective decisions can be made. Making effective decisions requires a number of ingredients be present. Where one or more ingredients are missing many of the symptoms of dysfunctional decision making will quickly take hold.

When asked to evaluate a project I often start by using the model shown in figure 1 below. I call this model the "Decision Engine" because it captures many of the core elements necessary for project success. For each element the typical problems that arise if the project is "challenged" in that element are noted in the table.

For many projects, creating a team that has strength in all of the elements outlined in figure 1 is half the battle. My experience has been that once those elements have been established many of the other factors needed for success often fall into place. Unfortunately, most junior Project Managers aren't directly aware of the elements and because of a lack of training and experience, struggle with the skills needed to assess their project in such a fundamental way.

In fairness to the Project Management community much of the problem lies in the broader context of the organization and the industry itself. Much of today's Project Management training is skewed towards methodologies, managing schedule and budget and passing certification exams rather than looking at the practicalities of how projects work in the real world. That skew leaves an enormous gap between the training provided and the realities of the situation and once again those gaps are the breeding grounds for problems to sprout.

Figure 1 – Core elements in effective decision making in a project environment

Group	Element	Description	Effect if element is missing or weak
Knowledge elements	Technical knowledge	The level of skill and knowledge the team has of the technologies and tools in use	Poor designs, low productivity, bad estimates, technical defects, technical omissions, undetected defects.
	Business domain knowledge	The depth of understanding the team has of the business environment in which the system or project deliverables will function	Functional errors and omissions, incorrect assumptions, missing scope, undetected defects, missed opportunities, etc.
Team elements	Engagement and participation	The degree to which the right stakeholders, suppliers & team members have been engaged and their ability to put aside sufficient time to participate in the project effectively	Delays in project start up, sporadic and intermittent progress, delays waiting for key decisions to be made, volatility due to stakeholders getting involved too late.
	Ownership and commitment	The level to which ownership of decisions is clear, the degree to which people accept that ownership and the willingness of people to make lasting commits to their decisions	Volatility, indecision, slow or intermittent progress, “not my job” syndrome, buck passing.
Communications elements	Collaborative relationships	The ability of the team to work together as an integrated unit and the capacity for information to flow freely	Silos, isolationism, politics, misunderstandings, disputes, errors and omissions, gaps or duplication of effort.
	Shared understandings	The level to which the team is able to build common understandings	Lack of clarity, confusion, rounds of “clarifications”, misunderstandings, gaps and duplication of effort.
Awareness elements	Situational awareness	The ability of the team to perceive and understand their true situation and the full context in which the project is operating	Failure to see warning signs of trouble, lack of understanding of project’s true status, failure to take corrective action, simplistic perspectives.
	Clear purpose and goal	The degree to which the team has a clear picture of what they are trying to achieve	Building the wrong product, conflicting or shifting priorities, missteps and false starts.
Quality	Quality focus	The extent to which the team thinks from a quality perspective and their ability to bring that perspective to bear in the decisions they make	Poor quality, product recalls, software bugs, high levels of rework, extended periods lost investigating problems, loss of customer confidence
Leadership	Technical, business and organizational leadership	The effectiveness of the project’s leadership team	Lack of direction, inability or unwillingness to make the difficult decisions, lack of coordination, failure to see or address critical problems, general project breakdown.

Many organizations also fail to build the necessary supporting infrastructure needed to ensure project success. Building a strong staff that has the communications skills, collaboration skills and background knowledge is not something that can be done the instant a new project begins. Instead, organizations need to be continually building those capabilities as an ongoing part of the organization's management practice.

I refer to the processes organizations use to develop the skills, knowledge and capabilities projects need to succeed as the organization's "Intellectual Infrastructure" [20]. Building those capabilities is something that does not happen automatically and the most the most successful organizations are the ones who recognise that developing the needed capabilities requires active management leadership. Although the temptation when a project fails is to look at the actions of the team, many failures are also strongly influenced by the practices used in the broader context of the organization.

Conclusion

Pulitzer Prize winner Jared Diamond once wrote, *"Although we tend to seek simple, single factored reasons for success, in most important things, success requires avoiding the many possible causes of failure".* Although Diamond was writing about societies as a whole [21], the underlying principle (called the "Anna Karenina principle" because of its origins in the famous Tolstoy novel) is as true in a project environment as it is in many other situations.

In the context of a technology project, the "many possible causes of failure" are the very many ways in which decision making can go wrong. Much as a flaw in one nucleotide on one strand of DNA can cause catastrophic health problems, errors in the complex chains of project related decisions can have serious consequences. The making of bad decisions, the failure to recognise those mistakes and the failure to address the problems those mistakes create are the mechanisms by which failure occurs.

Better decision making can be achieved in a number of ways. There is the old style, school of hard knocks, approach in which organizations go through the slow painful approach of living through project failures and there is the model in which organizations directly address the issues as part of a comprehensive training program. Realistically the hope for improving project success rates lies in providing teams with better training. The training regime used by most organizations places a heavy focus on the process of Project Management and the supporting tools. While these are an invaluable part of the toolkit, they represent Project Management 101 level skills. The urgent need in many organizations lies in going beyond that basic level of knowledge and developing the more advanced insights to be able to see the symptoms of project failure and the strategies for securing success.

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