**OPIM5270 – Topics for Team Projects / Presentations**

1. **Big Dig**

The Big Dig was the most expensive highway project in the U.S. and was plagued by escalating costs, scheduling overruns, leaks, design flaws, charges of poor execution and use of substandard materials, criminal arrests, and one death. The project was originally scheduled to be completed in 199; however, was completed only in December 2007 with a cost overrun of nearly 190%. The Boston Globe estimated that the project will ultimately cost $22 billion, including interest, and that it will not be paid off until 2038. As a result of the death, leaks, and other design flaws, the consortium that oversaw the project agreed to pay $407 million in restitution, and several smaller companies agreed to pay a combined sum of approximately $51 million. The cost and schedule performance problems may be attributed to many different sources, including the low original estimate, inflation, cost of mitigation, unexpected technical complexities, delays in making decisions, and changes during construction.

1. **FBI Virtual case file**

Virtual Case File (or VCF) was a software application developed by the United States Federal Bureau of Investigation (FBI) between 2000 and 2005. The project was officially abandoned in April 2005 while still in development stage—it cost the federal government nearly $170 million. Overall, this project was categorized as “inadequate and so poorly designed that it would be essentially unusable under real-world conditions”. Even in rudimentary tests, the system did not comply with basic requirements. It did not include network-management or archiving systems—a flaw that would have put crucial law enforcement and national security data at risk

The project demonstrated failures in the following areas:

* Lack of a strong technical architecture ("blueprint") from the outset led to poor architectural decisions
* Repeated changes in specification
* Repeated turnover of management, which contributed to the specification problem
* Micromanagement of software developers
* The inclusion of many FBI Personnel who had little or no formal training in computer science as managers and even engineers on the project
* Scope creep as requirements were continually added to the system even as it was falling behind schedule
* Code bloat due to changing specifications and scope creep—at one point it was estimated the software had over 700,000 lines of code.
* Planned use of a flash cutover deployment made it difficult to adopt the system until it was perfected.

1. **Dept. Homeland Security – Railhead**

In 2006, the National Counter Terrorism Center (NCTC) initiated a five-year, $500 million program called "Railhead" to upgrade Terrorist Identities Datamart Environment (TIDE) and other information technology systems, and to improve the sharing of counterterrorism intelligence data throughout the government. However, internal documents showed that the Railhead project suffered from additional technical problems, contractor mismanagement, and weak government oversight. For example:

* The new database will not provide access to the websites and data sources of the CIA, DIA, FBI, NSA, and other agencies
* Software tests uncovered critical errors in the new database's storage and search functions
* Five task orders worth an estimated $92.9 million were significantly off-plan
* Nearly a dozen government positions on the Railhead project have remained vacant for over a year
* Insiders have raised questions about the government's apparent use of nearly $200 million to retrofit a Boeing office building in Herndon, Virginia, so that it could house some of the 800 contractor employees working on the Railhead project.

The flaws and failures on Railhead have been exacerbated by weak government oversight, poor contractor management and lack of contractor accountability for the program's performance. Battles among contractors, particularly between the design team and development team, hampered the sharing of critical technical data that impaired the success of the Railhead program. In addition, one list of Railhead staff from January 2008 identifies a virtual army of 814 private contract employees from dozens of companies involved in Railhead and only 48 government officials keeping tabs on this colossal and critically important national security program. In fact, an estimated one dozen government slots on Railhead have been vacant for more than one year. A combination of these management problems and technical troubles contributed to the failure of the Railhead program.

1. **Fox-Meyer Drug**

A $65M investment in an Enterprise Resource Planning System (ERP) and new warehousing facilities resulted in the destruction of a $40B business. Fox-Meyer Drug, a medical supplies distribution company, is an example of a poorly managed project that failed at improving business. Delays in delivery and the failure to fully realize the business benefits resulted in the organization’s inability to profitably execute contracts it had engaged with. Operating under the flawed assumption that the project would be delivered on time, improve efficiencies and reduce costs, Fox-Meyer blindly and mistakenly committed to a large contract with a customer. When the system was delayed and failed to meet performance requirements, the company was unable to service the contract profitably. Ultimately, cash flow issues forced the company into bankruptcy. The company that had been worth $40B prior to the project was then sold off for just $80M to rival McKesson Corp. Fox-Meyer blames the problem on the integrator and suppliers they had engaged to perform the work.

Reasons for project failure included: 1) poorly-considered and un-validated assumptions, 2) early adoption of ERP at a time when the systems had not been properly developed for the distribution industry, 3) lack of stakeholder engagement 4) failure to identify and address system performance requirements 5) failure to listen to expert advice 6) lack of risk management.

1. **Millennium Dome**

The Millennium Dome in London was a purpose-built structure created to house a “Millennium Experience” exhibition aimed to celebrate the year 2000 milestone through interactive exhibits, shows and other entertainment built around three primary themes: 1) who we are, 2) what we do and 3) where we live. The event was designed to draw tourists into London during the Millennium year and was intended to be a celebration of mankind’s achievements.

When the Millennium Experience opened on 31st Dec 1999, initial reaction from the press was poor. Lack of content, lack of clear themes and lack of creativity were common criticisms.

Following the exhibition, the original plan was to transform the Millennium Dome into a soccer pitch for use a London-based teams. In the end, none of the teams were interested. For many years the venue remained empty while the British government sought an appropriate buyer. The cost to maintain the structure was reported to be £1M per month and as a result the venue remained a liability that the opposing political parties were more than willing to leverage.

The main cause of the financial difficulties is the failure to achieve the visitor numbers and income required. The targets were ambitious and inherently risky. This inevitably meant a significant degree of financial exposure on the project. It is also evident that the task of managing the project was further complicated by the complex organizational arrangements put in place from the outset, and by the failure to put in sufficiently robust financial management.

In sum, the following factors contributed to the project's failure: 1) Lack of vision, 2) poor execution, 3) failure to manage expectations 4) failure to plan properly for the post event disposition of the venue.

1. **Expeditionary Combat Support System (ECSS)**

The Expeditionary Combat Support System (ECSS) was a failed enterprise resource planning software project undertaken by the United States Air Force (USAF) between 2005 and 2012. The goal of the project was to automate and streamline the USAF's logistics operations by consolidating and replacing over 200 separate legacy systems. Development of the system was originally contracted to the Oracle Corporation in 2005, and was later supervised by Computer Sciences Corporation.

At the outset of the project, the Air Force did not know how many legacy systems the new system would replace. On different occasions, a wide range of estimates on the number of existing legacy programs was used, ranging from 175 to over 900 legacy systems.

The Air Force had a limited understanding about how that legacy environment—particularly at the process level—needed to be changed for ECSS to work.

As a consequence, the Air Force had to add, reduce, or remove program capabilities. These changes in scope, dramatically increased ECSS’s costs, delayed the program’s deployment, and continuously pushed the program further away from delivering required capability. Additionally, the ECSS program lacked strong leadership within the Air Force, which was desperately needed to prevent the program from plummeting into disaster. The Air Force’s use of six program managers for ECSS over its eight-year lifecycle led to a dilution of attention and authority to enforcing business process reengineering (BPR).

After spending $1.1 billion on its development, the USAF concluded, in 2012, that the system "has not yielded any significant military capability" and estimated that, "it would require an additional $1.1B for about a quarter of the original scope to continue and fielding would not be until 2020." Based on that conclusion, the USAF canceled the program in November 2012. United States Senate Committee on Armed Services members Carl Levin and John McCain characterized the failed project as, "one of the most egregious examples of mismanagement in recent memory."

1. **Project Orca: 2012 US Presidential Campaign**

The 2012 US Presidential election illustrates how the failure to properly test a key system can cause an embarrassing failure at a critical point in time. To help manage the logistics of their Election Day “get out the vote” push, both the Obama and Romney campaigns developed “operational management” systems that would provide real time tracking of voter turnout in the key battleground states. Providing critical insight into what was happening in the field, the systems fed real time data from volunteers at the polling stations back to campaign headquarters. Allowing the campaign to optimize the use of the available field workers, the systems provided the data needed to ensure volunteers were directed to those precincts and counties where they were needed most.

With smart-phone enabled volunteers at each polling station, the systems channeled streams of real-time data back to campaign headquarters. Crunching the numbers the systems gave their respective campaigns the “big picture” view as the day progressed. With the systems up and running the campaign had information and control. If the system failed there they were in the dark having to piece things together based on hundreds of phone conversations.

According to available reports the Obama system (called “Narwhal”) was thoroughly tested before the big day. Dress rehearsals were conducted weeks in advance and the team developed procedures for every possible mode of failure they could think of. On the day, those investments paid off and the system functioned as planned.

At Romney headquarters the story was different. Users of the system (called “Orca”) reported outages, slow responses and other technical issues that prevented them using the system effectively. At times, connectivity to the field workers was lost and according to reports, at one point the Internet Service Provider (ISP) connecting the system to the internet shut down access as they thought the high level of traffic was caused by a “denial of service” type attack. Frustration from the users rose rapidly and trying to fix the issues took critical resources away from managing the campaign.

The day after the election, stories about the system began to surface. At the core of the problem was a failure to subject the system (or it’s users and support personnel) to the same level of testing as Narwhal had received. There had been no full dress rehearsals and election day was the first time Orca had been run on the full set of systems infrastructure used at Romney’s Boston headquarters. In addition, reports indicated that the campaign had failed to communicate with their ISP and as a result the ISP was not expecting the high volume of traffic that would be flowing.

The Orca story is a reminder to all organizations of the need to ensure they do thoroughly test critical operational systems before releasing them into their live environments. Failure to do so can dramatically raise stress levels at critical points in time, divert resources away from core business functions and lead to embarrassing public relations failures.

1. **Project Name: Healthcare.gov**

When the President of the United States has to address the issue in front of the whole nation, you know you’ve created a serious mess. The Affordable Care act of 2010 is President Obama’s signature legislative accomplishment. Aimed at brining affordable health care to millions of people who otherwise would go unprotected, the law creates a healthcare marketplace in which individual citizens can purchase the healthcare insurance they want. At the heart of the program is the healthcare.gov website.

The healthcare.gov site connects the buying public with the private insurance companies offering policies through the program. More than just an e-commerce site selling insurance, the system includes a complex set of rules aimed at determining if a consumer is eligible for government subsidized coverage. To enforce the rules the system requires a complex set of interfaces to other government systems across a wide range of different government departments.

Launched on Oct 1st 2013 (amidst the 2013 US government shutdown), reports of problems with the website started to surface on its very first day. Overwhelmed with interested consumers the system suffered from slow responses, access denied errors and other mysterious glitches that prevented some users from completing their transactions.

While teething problems are common in new systems, the highly political nature of the project and the fact that it has played out on the national stage has earned this one its place in the catalogue of catastrophe. Three weeks after its launch the problems are persisting forcing the President to address the growing backlash before it undermines the very premise of the new system. Promising a “tech-surge” in which the “best and the brightest” will be drafted in to fix the problems, the President had to admit that the performance of the system was below what would be expected.

1. **Project Name: Boeing 787 Dreamliner**

The 787 has had a difficult birth. Plans to build the plane were first announced to the public in January 2003. At that time the development costs were projected to be $5B and the aircraft was to enter commercial service in 2008. While sales of the aircraft were strong, the development of the aircraft turned out to be significantly more challenging than anticipated. The use of composite materials instead of the traditional metals and decisions Boeing made about how to share the development of the aircraft’s with suppliers, resulted in a project that was considerably more complex than anticipated. More than 3 years late and many billions of dollars over budget, the 787 finally entered commercial service in Sep 2011.

For Boeing, the week of January 14, 2013 has been a bad one. Images of firefighters tackling a fire onboard a Japan Airlines 787 in Boston and pictures of an All Nippon 787 with its emergency exit slides deployed in Japan have flashed across the Internet. For the second time in a little over a week the meltdown of a lithium ion battery has resulted in an onboard emergency for one of the company’s flagship 787 aircraft. Combined with a string of other problems (787 problems info-graphic) media outlets have focused public attention by cataloguing problems with the aircraft type. In the interests of public safety, a Federal Aviation Authority (FAA) directive has resulted in a worldwide grounding of the 787 fleet (the first such grounding of a large commercial aircraft type since 1979).

One of the most significant strategic decisions Boeing made in the 787 project related to out-sourcing. Historically Boeing had both designed and manufactured most of the parts for their aircraft. For the 787 project a decision was made to move further towards a systems integration model. In the integration model Boeing would partner with third party suppliers around the world who would help design, manufacture and supply components for the aircraft. Those components would be shipped to Boeing factories in the USA and assembled into the final product. On paper the decision to act as a “systems integrator” rather than manufacturer had appeal. It spreads the risk and moves costs to the suppliers while reducing the investment needed by Boeing. In financial language the out-sourcing of work can also increase “Return on Net Assets” (RONA), a measure of financial performance or efficiency for an organization. Increasing RONA is often regarded by senior leadership as a positive thing as it makes a company appear to be financially more efficient. According to available sources it was a desire to increase RONA that set the context within which the out-sourcing decisions were made.

1. **Project Name: New Zealand Education, Payroll System**

The Novopay system was intended to be a tool that would streamline payments to the 110,000 teachers, administrators and staff throughout New Zealand’s educational system. The project had its origins in a 2005 decision that the existing payroll facilities needed modernization. Following a bid process Australia’s Talent2 was selected to both implement the new system and then operate it on a service contract basis until 2020. The original project called for the system to be implemented in 2010, but following a number of delays the project only reached operationally status in Aug of 2012.

Immediately following its operational launch problems were encountered. Some school employees reported receiving incorrect payments while others were paid nothing at all. Those problems continued to grow and the issues became headline news in New Zealand as affected employees struggled to maintain their personal finances in the face of the cash flow problems the systems failures were causing. Dubbed the Novopay debacle, at one point affected staff had reported more than 18,000 payroll errors and the operational staff supporting the system appear to have been overwhelmed by the amount of manual intervention needed to correct those errors.

Tracking and analysis of the errors identified after the launch, identified more than 500 distinct defects in the system. Of those 44 were deemed to be very serious. In Aug of 2012 when the system went live reports indicate that only 147 defects were known meaning that Quality Assurance testing had failed to identify several hundred problems in the system. Many of those problems were traced back to errors in the original project requirements and the design of the new system that allowed incorrect data to be entered into the system thereby leading to incorrect payroll payments and related problems. A March 2013 review performed by Deloitte raised serious questions about the stability of the system.

1. **Project Name: Denver Airport Baggage System**

Originally billed as the most advanced system in the world, the baggage handling system at the new Denver International Airport was to become one of the most notorious examples of project failure. Originally planned to automate the handling of baggage through the entire airport, the system proved to be far more complex than some had original believed. The problems building the system resulted in the newly complete airport sitting idle for 16 months while engineers worked on getting the baggage system to work.

The delay added approximately $560M USD to the cost of the airport and became a feature article in Scientific American titled the Software’s Chronic Crisis. At the end of the day, the system that was finally implemented was a shadow of what was originally planned. Rather than integrating all three concourses into a single system, the system supported outbound flights on a single concourse only. All other baggage was handled by a manual tug and trolley system that was hurriedly built when it became clear the automated system would never meet its goals.

Even the portion of the system that was implemented never functioned properly and in Aug 2005 the system was scrapped altogether. The $1M monthly cost to maintain the system was outweighing the value the remaining parts of the system offered and using a manual system actually cut costs.

1. **Project Name: Department of Defense: Australia, Seasprite Helicopters**

Australian Navy first grounds (May 2006) and then scraps (Mar 2008) a fleet of 10 helicopters because of safety concerns arising from the avionics software used. The project involved the purchase of 10-second hand Seasprite helicopters that were first designed in the 1960′s. The helicopters were to be upgraded with the latest weapons and avionics software to enable them to take on the demands of the Australian Navy. Unspecified “technical problems” resulted in the aircraft only being cleared to fly from land (not great considering the customer was the Navy), in daylight on clear days and only for transport missions.

1. **Project Name: US Census Bureau, Field Data Collection**

Requiring up to 1 million temporary workers to be hired, trained, deployed and managed, the US decennial census is one of the world’s grandest administrative tasks. Taking a snapshot of American life, the census requires every living person in America to be accounted for. Conducting the census is a $10B project that takes a full ten years to plan, execute and complete. The data produced provides the basis for the allocation of resources both within the US government and private commerce.

Due to concerns about escalating costs and questions about the accuracy of the data being collected, in 2001 the US Census Bureau decided to undertake a major modernization program in preparation for the 2010 census. Leveraging technology the transformation was to eliminate the paper-based system used by field workers and replace it with modern handheld computing devices. Simultaneously improving accuracy and efficiency the Field Data Collection Automation project (FDCA) was a key component in the plan.

While the business processes being implemented were relatively simply, introducing technology turned out to be more complex than the Bureau had envisaged. Having first attempted to do the project in-house, field-testing in 2004 demonstrated that the project was more complex than anticipated. As a result the Bureau changed direction and engaged an external provider to complete the project. Taking a further year to get the Request for Proposal published time remaining before dress rehearsals in 2006 and 2008 was running short.

The project’s problems continued even after engaging an outside supplier to complete the work. Lack of due diligence on behalf of the Bureau and failure to establish effective communications with the supplier resulted in a significant number of missing requirements. Despite warnings from external auditors the problems were allowed to persist and ultimately time ran out. At that point the Bureau was left with no choice other than reverting back to using pen and paper. The failure of the project resulted in the Bureau having to request an addition $3B in funding to complete the work using the existing manual procedures.

1. **Project Name: USA Marine One (2009)**

To allow for rapid and safe transport of the President and other VIP’s, the US Government maintains a fleet of VIP transport helicopters. The current fleet of Sea King and Blackhawk helicopters was first deployed in the 1970′s. Following the 9/11 attacks, the US Government decided that the existing helicopters lacked the capability to fully protect the President and as a result a project to acquire a new fleet was initiated.

Following the solicitation process a $6.1B contract to develop the new helicopters was awarded to a consortium lead by Lockheed Martin (who reportedly had no prior experience developing helicopters). The Lockheed Martin design was based on the existing European Eh-101 helicopter and incorporated significant design upgrades to meet the security, safety and communications requirements for use as Presidential transport. Designated the “VH-71 Kestrel” the new helicopters were to be the world’s most advanced helicopter design. Following the signing of the contract the process of requirements and design continued. Throughout the design process it was found that the necessary upgrades were more complex than originally thought and along with a growing list of complex requirements, the cost of the project spiraled upward.

1. **Project Name: State of California, Payroll and benefits system**

As with many large organizations, the state of California has over the years built up a complex interconnected set of IT systems to support their daily operations. Managing multiple systems can however be costly. There is often duplicated data spread across different databases, complex business processes to help bridge between systems and elevated maintenance and training costs. As has been the trend for the past 15 years, the State of California decided to integrate their systems into a single Enterprise Resource Planning (ERP) solution. Merging 13 separate systems into a single system, the 21st Century Project was to improve efficiency and reduce the cost of handling payroll and benefit payments for the state’s 243,000 employees.

The origins of the 21st Century Project date back to 2004 when $70 million was spent in an initial attempt to integrate payroll functions. The contractor responsible for that initial attempt was terminated in 2009 due to a lack of progress and a fresh attempt was made under the title MyCalPAYS and with a new plan to use an SAP based system. Said to be the largest payroll project in the US in 2012, the MyCalPAYS system was deployed in a phase 1 release in June 2012. Deployed to a single organizational unit with just 1,300 staff (managed under 2 union agreements), the system immediately ran into problems. Staff were being paid incorrectly, simple math functions are reported to have been inoperable and incorrect allowances were being handed out. An announcement from the State Controller’s Office noted that “The errors in the SAP system affect everyday lives. Not only have SCO employees been paid too much, or too little, they and their family members also have been denied medical services despite paying for the insurance coverage. Payments to the State’s dental, vision and deferred compensation partners have been incorrect and delivered late. Improper deductions have been taken, payments have been made to the wrong payee, payroll and pensionable wages have been incorrectly calculated, and union deductions incorrectly determined.”

1. **Project Name: Europe’s Unmanned rocket, Ariane 5**

On the 4th June 1996 at 1233 GMT (UTC) the European Space Agency launched a new rocket, Ariane 5, on its maiden unmanned flight. Ariane exploded after 40 seconds of its lift-off. Although this was an unmanned flight and therefore there were no human casualties, there is no reason to expect that the outcome would have been any different if the flight had been manned. In such an event all on flight crew and passengers would have been killed. Remember as we proceed through this case that this was a project of the very experienced European Space Agency. [1] The project cost was $ 7 billion. Part of the payload were four satellites, Cluster, that would engage in a scientific investigation. These satellites had taken many years to develop and cost around $ 100 million. They were irreplaceable. In a report, James Gleick has said: ―It took the European Space Agency(ESA) 10 years and $7 billion to produce Ariane 5, a giant rocket capable of hurling a pair of three-ton satellites into orbit with each launch and intended to give Europe overwhelming supremacy in the commercial space business. All it took to explode that rocket less than a minute into its maiden voyage last June, scattering fiery rubble across the mangrove swamps of French Guiana, was a small computer program trying to stuff a 64-bit number into a 16-bit space. One bug, one crash. Of all the careless lines of code recorded in the annals of computer science, this one may stand as the most devastatingly efficient. “ Purpose of Ariane 5 was to deliver satellite to space.