

## **1.1 Factors in Software Project Outcomes**

Information Technology (IT) projects have a justified reputation for being delivered late and costing more than expected. Cancelled projects, code that does not work, systems that users reject; these are all examples of ways in which projects can fail to match expectations. Paul Williams, a member of the team who lead the inquiry into the (in)famous London Ambulance Service (LAS) disaster in 1993 [1] recently returned to the subject with his survey of common reasons for project failure [2]. Commenting on the state of affairs within the Child Support Agency (CSA) project and drawing parallels with the failings identified in the post-mortem report of LAS, Williams found a catalogue of surprisingly familiar problems. It is his opinion that the public sector's failure to learn from past mistakes dooms them to be repeated. Identified problems included advocating a 'big bang' solution rather than a phased incremental implementation, looking for the lowest cost solution, and a lack of clear project ownership. The list of problems was extensive and it closely mirrored the findings of the original LAS enquiry almost a decade earlier.

There is a lot at stake when a project fails to be delivered or live up to expectations; public trust, the ability of the Government to deliver its public service reforms, and a great deal of public money. Project failure is a problem that appears intractable. It is made worse by the scale of projects undertaken in government which tend to dwarf those undertaken in the private sector. The public sector often takes on projects that are much bigger than the private sector. One commentator has described the undertaking of projects in the region of hundreds of millions of pounds as undertaking initiatives 'where angels fear to tread' [3]. The bigger a project is, the greater the risk that it will fail [4, 5]. There is little doubt that in the U.K. there is no bigger IT customer than the public sector. In 2002 the Public Accounts Committee (PAC) of the House of Commons reported 100 major IT projects underway in Government with a total value of £10 billion [6].

Government departments have often found themselves lumbered with poor contracts that offer little protection; that cannot be enforced. One such horror story of mis-negotiated contracts recounts the dilemma of the Probation Service, who were liable to pay their support engineers £11,000 every time an engineer was called out on a weekend [3]. There are many reasons for project failure, and with many projects in the pipeline, there is a pressing need to propose and implement changes that will offer

improvement to a situation characterised by waste. Enough evidence has been accumulated [4, 7] for patterns of failure to have emerged. However, knowing what tends to go wrong in past projects is not the same as advocating effective future remedial action. When projects have failed in the past, instead of a serious review of the responsibility, strategy and technology that lead to the failure, there has been a tendency to make excuses [3].

The Standish Group is an American consultancy that has published its 'Chaos' report series since 1994, with regular updates approximately every four years thereafter. The Chaos series of reports contributed the system of categorisation to describe IT project outcomes as either successful, challenged or failed. A project deemed successful is one where the requirements have been met on time and to budget. A failed project is cancelled before anything is delivered. A challenged project fails to meet one or more of the conditions of a successful project, being late, which normally translates as also over budget, and/or failing to deliver some of the originally envisaged functionality. Having contributed definitions of possible project outcomes, the Chaos series have continued to gather and report project statistics to indicate whether there has been any improvement over the years. The sample included organisations in the United States of different sizes and from different sectors of industry, ranging from financial to manufacturing and from retail to governmental. The total sample size was 365 respondents representing 8,380 projects. The respondents to the Standish Group survey were IT executives. In addition focus groups and personal interviews were used to provide qualitative context for the survey results.

According to Standish, in 1994, 16% of projects could be considered successful, 30% were cancelled (failed), and the remainder were considered 'challenged'. The authors considered that as much as 50% of all IT expenditure was wasted. The report found that the size of the organisation was related to the rate of project failure; larger organisations have more difficulty delivering projects successfully. In the 1998 Chaos report the number of successful projects had risen to 26% and again in 2003 there was a further, lesser rise to around 30% [6]. The major factors in delivering a successful project according to the Chaos series are adequate user involvement, executive management support and a clear statement of requirements. The major defining failure factors tended to be the inverse of the successful factors; a lack of user input, incomplete requirements and the mismanagement of requirements. The Chaos reports are encouraging with respect to improvements in delivering successful projects, citing a fall of wasted IT expenditure from 50% in 1994 to only 20% in 2003. This drop in wasted expenditure does not mean that project managers need not look for further improvements as these studies, undertaken in

the United States, still point to a waste of many billions of dollars. In the U.K. there is evidence that the Chaos figures are overly optimistic, where in a survey of 1027 projects the figure for success has been reported as 15%, outright failure of 10% with the balance falling into the challenged category [5].

In contrasting private sector and public sector IT projects, there is no evidence to suggest that the private sector is any better at delivery, or to put it another way, that the government is any worse [8]. Government failure is perhaps simply more dramatic, more expensive and subject to greater scrutiny.

It could be that the definition of success and the setting of appropriate criteria are different in public sector projects than in the private sector. In the private sector a project is often undertaken due to the result of some cost/benefit analysis, while in the public sector the reasons for undertaking a project may be less straightforward.

In the public sector, major IT projects may be launched solely to comply with government policy, to reflect government changes or to deliver social benefit. The commitment to deliver services electronically has been the driver for a great many projects in central and local government, yet the delivery of services via an electronic channel cannot be an end in itself. Where operational benefits are ill-defined, completion of the project itself becomes the goal even if it under-delivers the intended benefit. Potentially, the uncertainty around success criteria makes it easier for public sector projects to drift off-course.

According to Intellect, (the U.K. IT industry body), Government projects differ from public sector projects in that they must conform to E.U. and U.K. competition legislation, are undertaken in an environment that can be termed more 'risk averse', and are not cancelled with the same enthusiasm that characterises the private sector's pragmatic approach [9]. The issue of poor performance by the Government in delivering successful IT projects was the subject of recent comment by Edward Davey, Liberal Democrat shadow chief secretary to the Treasury, who said "We all want the Government to use technology for the benefit of the taxpayer. But by failing to deliver a successful project the Government is actually letting down the taxpayer" [10].

The Government has gone some way to define what needs to be done to reduce the risk of software project failure. The advice given by Government is useful, though not necessarily comprehensive. Certainly project failures have continued. In 2004 the Government will make heavy demands on IT; tackling NHS waiting lists, civil service costs, benefit fraud, and commitments to the delivery of

comprehensive e-government by the end of 2005. Much has been made by the Home Secretary in arguing the case for a national identity scheme, perhaps the most ambitious IT project ever contemplated in the U.K. At the beginning of 2005, the multi-billion pound Ministry of Defence information infrastructure will attempt to integrate the systems of the army, RAF, and navy [11]. There is much at stake.

Defining how improvements can be made and ensuring recommendations are properly applied are quite different tasks. In future the time may come when best practice is accepted across the public sector, however, this does not guarantee a situation where projects are more successful. What is of more concern is whether what today constitutes best practice is enough to make a significant difference. Although the probability of project failure is understood, the suspicion persists that the same mistakes continue to be made [2]. There is a tendency for Government advice to be short on implementation detail characterised as an approach that is strong strategically but weak tactically. Recommendations to improve the situation are designed to be implemented from the very moment a project idea becomes a twinkle in a ministerial eye [12, 13], leaving vulnerable those that fail to start off on the right foot.

The question of organisational culture and human nature has a significant role in IT project outcomes that scarcely receives the attention it deserves. Much light has been shed onto the reasons why IT projects fail by reports from the National Audit Office (NAO) and various committees of Parliament. Equally, there are forces that might prefer the situation to remain unchanged [14] whereby services may never be delivered, yet invoices continue to be paid and careers continue unburdened by the taint of failure. One commentator believes that Ministers only innovate when they see benefit to their careers [15]. Scarcely will they admit to ownership of an initiative that has failed. Criticism or open discussion is seen as tantamount to sabotage. Evidence points to the silencing of debate at the Office of the e-Envoy, forced to remain quiet on the subject of two failing national IT projects for the simple reason that the e-Envoy is not allowed to report anything but success [15]. Openness can lead to criticism, and criticism can bruise egos. However, to learn from mistakes they must be discussed, understood and remedial action agreed.

## ***Case Studies in Project Failure***

### **Inland Revenue - National Insurance Recording System (NIRS2)**

Anderson Consulting were commissioned to deliver a system to support the work of the Department of Social Security (DSS) by maintaining 65 million National Insurance accounts accounting for virtually every adult in the country. Their quote was £100 million less than their nearest competitor [16], a decision Anderson apparently took because they intended to keep the intellectual property rights (IPR) which they valued equally at £100 million [17]. This would later prove a false economy. The replacement system would be implemented following the 'big bang' approach which was known to carry with it greater risk. In January 1996, after work had begun, Anderson appraised the project to be bigger than they had first realised and so decided on a phased delivery approach to reduce risk. The customer accepted the proposal to vary the timetable. One module, identified in the new delivery approach was the National Insurance Fund Recording System (NIRS2).

By 1999 nothing operational had been delivered. The House of Commons Public Accounts Committee (PAC) made two reports. By the time of the second report the situation had become grave. It was reported the accumulated backlog could take years to clear and there were at least 1500 'bugs' in the application itself. It was calculated that by January 1999 an estimated 172,000 pensioners could be underpaid by between £0.01 and £100 per week. The Agency had to agree to compensate customers of personal pension schemes to the value of an estimated £38 million. The type of contract negotiated, under what is termed the Public Finance Initiative (PFI), was implicated as delivering no benefit to the public as there were no penalties in place for late delivery [18]. Equally, in the original procurement stage, the Agency was criticised for taking a long time to decide who would undertake the contract, meaning the entire system was scheduled to be in place within 22 months, a time period that in retrospect looked hopelessly optimistic.

In May 1999 the Inland Revenue took over from the DSS in running the project. By January 2000, Anderson had paid £3.9 million in compensation for delays in 1998/99 but the DSS admitted that 83,000 pensioners were still affected by problems with NIRS2. It transpired that this was not the scale of the whole problem. With the Inland Revenue in charge, in the summer of 2000, Anderson tried to connect the new NIRS2 system with the Revenue's own existing system, known as 'COP', managed by EDS. In May 1998 the Revenue recorded 2.5 million revenue cases that could not be finalised and

closed, primarily due to missing files. By the summer of 2000 this figure had reached 8.04 million missing records. Neither supplier was willing to admit the problem was the responsibility of the system in their charge. The net effect of this problem was to render the accounts of 5.2 million people for tax year 1998/1999 lost. Due to internal management accounting targets this meant potentially striking the records off (Z-ing in Inland Revenue parlance) [19].

In August 2000 the PAC warned the Government that it risked being held to ransom by its IT suppliers. Given that Anderson had reserved the IPR in the system for themselves, should the Inland Revenue wish to engage a different supplier, they would have to buy the rights to use the system from Anderson. Geraint Davies, Labour MP and member of the PAC summarised the situation "... Andersen Consulting comes along, claims it can do this system for less money than it actually can, quicker than it actually can do it and shares some of these costs, but ends up owning the intellectual property which it can test on the back of the taxpayers' problems and then export that product to South America ... and make a lot of money ..." Mr Davies described the situation as having resulted from "hopeless negotiation by the Inland Revenue".

### **Post Office - Benefits Payment Card (Pathway)**

In May 1996 two public sector organisations, the Benefits Agency and Post Office Counters Ltd., joined together to award a PFI contract to ICL (later Fujitsu) to provide a replacement for the paper-based method of paying social security benefits. This project became known as 'Pathway'. The new system was scheduled for delivery in 1999. Vast in scale, and with an estimated cost of £1 billion, the Pathway project was ambitious. The business objectives of Pathway were to provide a system of payment that was automated, hence cheaper to administer, with the added advantage of being resistant to fraud. The operational system was required to pay 24 different benefits across 19,000 post offices. A live trial of this capability was predicted, at the time of contract signing, to be possible within 10 months. The first milestone was passed in October 1996 to pay child benefit in 10 post offices. That was the last milestone passed successfully. In February 1997 a three month delay was negotiated. The project plan required a trial of sustained child benefit payments in 300 post offices. By November it seemed the project was no closer and formal notice of breach of contract was served on ICL. In turn ICL denied liability and counter-asserted breach of obligation by the purchasers. In December 1997

ICL wrote to the Benefits Agency threatening to end the project unless they were paid an additional 30% or the contract was extended by 5 years and the original price rose 5%.

In July 1998 the project came to the attention of the Treasury, the Department of Trade and Industry, and the Prime Minister's office. An independent panel of experts concluded the project could succeed but was unlikely to do so much before 2001 and neither the eventual outcome nor cost was certain. In May 1999 it was decided the best way forward was to continue with the automation of post offices without the introduction of the Benefits card, as this would be cheaper than simply cancelling the whole project from which no benefit would be derived. The NAO concluded that the fact the project was large, complex and a PFI project were only partially responsible for the problems. In addition to these substantial contributing factors, the project was flawed in having different objectives due to there being more than one organisation in the role of customer. A key recommendation from the NAO report is that realistic timescales must be allowed to provide sufficient time for adequate planning and detailed specification. Proper planning, it was considered, would ultimately pay dividends in time, quality and cost [20].

This project failure was public and expensive. The NAO branded it as wasting an enormous sum of public money from which it is essential that organisations learn the lessons. The NAO report asserts the project was too ambitious and that it should have been broken down into its constituent parts. It highlighted the fact that an IT project could not be relied upon to deliver business change in and of itself. Rather, that an IT project must be viewed as one component of wider business change. Shortcomings in the definition, negotiation and management of the commercial contract were identified which resulted in the customer being unable to escape. The dangers of relying upon IT managers to negotiate change better handled by senior management were recognised. Equally the requirement for talented project management to tackle day to day issues and the management of risk suggests criticism of the standard exhibited by those projects that had formed the basis of their study.

The Trade and Industry Select Committee investigating the Pathway project described it as "the largest IT disaster ever for the Government", commenting that there was no shortage of competition for that dubious title [14].

### **Passport Agency – Processing of new passport applications**

In 1997, a contract was agreed with Siemens Business Services to introduce a new computer system for the management of passport applications by the Passport Agency. The agency planned to roll-out new software to all its offices within a tight deadline, but was frustrated when problems were encountered in the first two offices. In the spring and summer of 1999, serious delays were encountered in issuing passports. Staff found the new software difficult and slow to use, complaining it was more difficult than the system it replaced. Even though it was not thoroughly tested and encountered problems in the first offices where it was installed, the agency pressed ahead with the installation plan. The PAC found in 1999 [18] that the project suffered from insufficient risk assessment leading to poor decision making. At the peak of the crisis the time required to have a passport processed was between 25 and 50 days against a target of 10 days which lead to a backlog of 565,000 applications. The problems are estimated to have cost the passport agency £12.6 million, a debt implicated as the cause of the recent increases made to the charges for a new passport. Three years after expected, the new IT system was completed in late 2001 [21, 22].

### **Inland Revenue - Online Tax Returns**

Up until recently the partnership between EDS and the Inland Revenue has been seen as an exemplar of good practice, innovation, and delivery in the public service. Quantifiable targets were set to provide 50% of Inland Revenue services online by 31 December 2002, with the balance by the end of 2005. The department had made calculations to suggest that when take-up of its services electronically reached 50% overall, this might enable savings equivalent to 1300 jobs. However setting targets and achieving them are quite different. A report by the NAO made clear in February of 2002 that only 30% of its services were available, calling into doubt the ability of either EDS or the Revenue to meet their targets [23].

One of the Inland Revenue's most highly visible services is for the provision of tax returns to be filed by individual tax payers online. There were major perceived business benefits from providing this type of service, as a similar service offered to companies to allow them to communicate their employee details electronically had improved accuracy by 50%. This was a project that took 3 years to complete and cost £17 million. However, by February 2002 the NAO was concerned by the low level of usage of the service by the public. Initially it was not an easy system to use [19]. In tax year 1999-2000 nearly

four out of five attempted submissions did not initially succeed. The NAO suggested that the motivation that would encourage private tax payers to file electronically was not the same as that which motivated companies. More incentives were required according to the authors of the NAO report, such as time or direct cost savings. The report also suggested the department should in future conduct 'customer needs analysis' to ensure that what was being delivered was what was wanted and not simply an expedient of the Inland Revenue.

In August 2002 Edward Davey, Liberal Democrat shadow chief secretary to the Treasury made the assertion that the Inland Revenue online system was not offering good value. He made the argument that given 80,000 people had used the system and it had cost £17 million, the cost per filing was £212 for each person compared with the paper process that cost £60 per person. The clear implication was that the Revenue needed to attract more people to use the service [10]. His withering summation was accompanied by the words "Only New Labour could make a cost-cutting exercise more expensive than the original system." Within days the Revenue service admitted the investment could only be justified by attracting more users. However, they pointed to figures suggesting that take-up in the second year was 100% greater than in the first and that to date (August 2002) demand had risen by a further 160%.

By late September the situation had changed dramatically. The Inland Revenue was left looking embarrassed by a big increase in demand for its services that caused the system to be overwhelmed. The message on the site at the time read "Due to an unprecedented increase in the number of customers wanting to use SA Online, at certain times some are currently unable to gain access. We are working around the clock to remedy this." Just when demand for the service was increasing to a level where it could be justified, it was found unable to cope, yet the actual percentage of U.K. taxpayers trying to use the system was just 2% of the overall total [24] which is far fewer than might be expected in the near future. From time to time Government departments open themselves up to a loss of reputation such as that resulting from the unhelpful message to users "please try to avoid accessing SA Online between 19:00 and 23:00 ..." [24] when it is reasonable to assume this is the time period most people have available to file their tax returns. It is sobering to set this example against the experience of the Americans who have many more taxpayers overall, and a far higher percentage (25%) of whom file electronically.

By January of 2003 the Inland Revenue had received 324,710 returns electronically [25], an increase of around 400% over the year before, sufficient to deflect the criticism that had earlier been levelled at the department.

### **Child Support Agency (CSA)**

The Child Support Agency (CSA) is the Government department responsible for ensuring that estranged parents contribute to the cost of raising their children. The department had been criticised for operating a payment formula that was too complicated and punishing to absent parents. In an effort to address this, the Government commissioned a new software system to implement a more transparent payment formula. According to this regime the liable parent would be assessed to pay 15% for one child, 20% for two and 25% for three, which in many cases is less than under the old regime. The contract went to EDS and it called for the system to be introduced in April 2002. The project was more than £50 million over budget on an original estimate of £200 million and was ultimately delivered more than a year late. The late delivery of this system had been blamed on a monolithic design that violated the maxim that systems should be built in a modular way, an approach that has since become public policy [26]. This principle states that large-scale projects should be broken down into manageable chunks. EDS complained that the CSA's requirements had shifted over the course of the project although changing requirements should come as no surprise in an IT public sector project where changing requirements are a fact of life as they seek to remain consistent with changing Government policy. This is a fact of large public sector projects [27]. Other commentators make the same point that this project appears to have foundered on the twin rocks of changing requirements and an architecture that was not configurable [28]. Since 1995 it has been recognised that this is a common situation that can be solved by treating algorithms as though they are expected to change, rather than being monolithic and immutable. For instance, the *Strategy* pattern, within the field of software design patterns [29], specifically defines the processing algorithm as a variable whose value can be changed without undue difficulty.

The consequences of this failure to implement the new IT system is that parents with an existing child support order were unable to be reassessed under the new simplified funding regime. The Government, in the person of Alistair Darling, minister for work and pensions at the time and the man with ultimate responsibility for the CSA project, described the delay as "frustrating and regrettable". Richard Allan,

Liberal Democrat IT spokesman, was more forthright when he called on the Government to explain who was at fault for the delay, to which he was ready to supply his own answers. "Responsibility for this delay lies with the officials who commissioned the project and who are overseeing its implementation," he said. "They must either make it clear that the contractors are at fault and what penalties will be paid or accept the responsibility themselves." [27].

### **National Air Transport Service (NATS) 'Enroute'**

The Civil Aviation Authority is responsible for providing air navigation services in and around the British Isles. The National Air Traffic Services (NATS) are responsible for delivering this service from its three centres at West Drayton, Manchester and Prestwick. In 1996/97, NATS handled over 4 million aircraft movements; it employs 5000 staff and has an annual turnover of £500 million. In response to predictions of growing traffic and in an effort to replace the ageing facility at West Drayton, a new centre in Hampshire was proposed. Thus began the saga to open a new centre at Swanwick, where the new building was ready by 1994, without the software to guide the aircraft. The first software delivery dates were set and then put back repeatedly; first the project was scheduled for delivery in 1996, followed by 1998, then 1999, and when that date was missed, once more in 2000. Eventually the software was scheduled for delivery on January 27<sup>th</sup> 2002. Dubbed the "world's most advanced air traffic control system" it was perhaps inevitable it would suffer from technical problems, which was the reason given each time a delivery date was missed and the project fell behind by six years.

Due to continuing delays and the high profile of this project, the Transport Sub-committee of the Environment, Transport and Regional Affairs Committee held an inquiry into the building of the software for NATS in July 1997 [30]. Originally the contract was awarded to IBM and Thomson CSF in 1991 with a delivery date proposed for late 1995. In 1992, the follow-on implementation contract was let to IBM at which time the delivery date had not changed. By the time the first deadline had passed the division of IBM building the software had been sold, first bought by LORAL Corporation in 1994, and later by Lockheed Martin in 1996.

When the technology was chosen, it was thought the United States' Federal Aviation Administration (FAA) would be installing something similar, known as an Advanced Automation System, and that NATS would follow suit. In 1995, the FAA subsequently "ran into considerable difficulties with this project and in the end abandoned it". In November 1995, NATS' acceptance of their system was also

halted but by January 1996 the project was revived with a new delivery date of June 1997 and subsequent operation planned for December of the same year. Although the FAA had viewed their project to build a new system as too risky and cancelled it, and though this did initially lead NATS to pause, within two months the project was back on again. The scope and technology of both projects was similar, yet one agency decided to stop while another did not.

NATS themselves admitted that this system was "more advanced than anything that is being tried anywhere in the world" when they reported to the committee. It is hard to estimate how long any software project will take, but delivering one unlike any delivered before cannot be estimated with any confidence [31] making the definition of a delivery date less reliable in inverse proportion to the novelty and complexity of the system being built. In other words, the more novel and complex the system, the harder it is to identify a delivery date.

There is some indication in the evidence given by the Chairman of the CAA, Sir Malcolm Field, that "95% of the known defects in the software found in 1995 had been eliminated" [32], that the problem with the software was not that the scope of its functionality was yet to be built, but rather that what had been built did not work. On one hand it is encouraging to know that such a high percentage of the 'known' faults had been rectified, yet given that there is no sense of the severity of one fault over another or recognition of the inter-related nature of software faults, little can be concluded. Sir Malcolm was not unduly concerned by the level of errors believing them to be "a common problem in large software projects..." and added that he expected that "there will be a significant number of defects found during test and development and that these take time to eradicate. Moreover, it is also a fact that new problems will be identified and that change requests will add to the scale of the software revision task". Unfazed by the problems to date and believing them to be normal for this class of endeavour, Sir Malcolm offered his prediction that "There is clear evidence that the stability and performance of the system, on the currently specified level of software, demonstrates that the system will work and will deliver its capacity". The committee does not appear to have been privy to the nature of the 'clear evidence', and they were subsequently persuaded that Sir Malcolm's assessment might not be the most accurate interpretation of the available evidence.

With the December 1997 deadline date passed, in February 1998, NATS told the committee that it was "still working on the programme to bring the new centre into operation in the winter of 1999/2000", and that this was an achievable date, but that "there are inevitably risks along the road ...". With a

record of missing delivery dates, NATS qualified its assessment by clarifying that it would know by April whether the software was viable and by October whether the delivery date was achievable.

The variables in a software project are time, cost, quality and functionality. In this project, time had slipped, meaning costs were mounting. A further submission to the committee cast doubt over whether the new system would really deliver the radical new functionality that had been promised. Formed in 1992, the Aviation Study Group (ASG) is comprised of aviation specialists devoted to the study of technological change and its effect on aviation personnel. A representative of ASG told the committee, that although the specification for the new software had detailed a wide variety of features to help controllers, that "progressively the functionality of the system has been reduced bit by bit in order to try and bring it into use" and that there was a danger that this would reduce the amount of additional air traffic control capacity that the centre would offer. There was further evidence that the system that would emerge might offer facilities and support information at such a reduced level that there was doubt as to whether what remained would be usable. This assessment lead NATS to respond strongly that they were "...not reducing the functionality of the system ... as part of the programme we have identified a number of functionality changes and functionality additions which have to be made to the system now that it is being exposed to use by operational air traffic controllers. ... Some additions were being made and some features surpluses to requirements were being removed. 90% of the original system specification from the early 1990s was still relevant."

The investigation continued to uncover discrepancies in project reports that testified to the project team being subjected to increasing pressure. Professor Ladkin, Professor of Computer Networks and Distributed Systems at Bielefeld University in Germany, wrote to the committee. He was commenting on an earlier trial in which the operating system had been successfully installed on 30 workstations but when the test had been tried again on 100 workstations was found not to work. Taking the view that software faults can sometimes be so serious that they cannot be repaired, ultimately rendering the software of no value, he said "there is no reliable method for estimating how or if such problems can be safely engineered out of the system." He continued making the point that the problem might not be as simple as removing a certain number of 'bugs' from lines of computer code; unwanted behaviour in software systems was often more complex than that. It was possible that the system might never work satisfactorily. He stressed the importance of the users of the system (air traffic controllers) trusting it and finding it easy to use if they were to operate it safely and efficiently. He expected that many

problems would be found by the users during the training phase and that therefore as much delay could be expected at this stage of the project as at previous ones. He concluded that the project was bound to miss its next delivery date and that there must be some question as to whether it would ever be delivered. With this possibility in mind the Professor offered the opinion that he would have included in the list of possible options in addition to adding new resources, or reducing functionality (both of which carried with them considerable drawbacks), the option of abandoning the project and starting again.

The pressure continued to mount when the Executive Editor of Computer Weekly (an industry magazine) wrote to inform the committee that in the publication's experience one of the most common causes of public sector computer failure was the inability of project teams to pass bad news up and down the chain of command. Although NATS had told the sub-committee that only 5% of the computer bugs remained in the system, independent specialists had estimated that fixing those 5% could take 95% of the time available to the project team to resolve all outstanding IT issues. He recommended an independent audit of the project's progress. NATS disagreed, arguing that an audit was unnecessary, and because of the software's complexity, it would take too long. Independent advice was taken as to how long an audit might take and an assessment was made that it might take up to a year to perform. The committee decided that an audit was a sensible way forward given that "the Swanwick project shows some of the classic early warning signs of a public sector computing disaster" including repeated missing of revised internal deadlines soon after assurances that the project was on target, serious problems being treated as teething troubles, continual modifications to the system to meet the demands of end users who had not been adequately consulted when the specifications were drawn up, and strong resistance to an independent audit itself." The representatives of Computer Weekly magazine told the committee that "It is a common facet in failures of large projects that they are not abandoned early enough because of the lack of an independent auditor asking the fundamental question: is the project ever likely to be completed satisfactorily or should we pull the plug now?"

In August 2000 there were a reported 200 bugs, each with a severity sufficient to jeopardise the 'go live' date yet again in a system that reportedly is over 2 million lines of code.

### Magistrates' Courts – 'Libra'

At the time of signing the Libra contract the minister responsible, Geoff Hoon, said "The Libra system will mean that a single supplier will take full responsibility for the development of software, the supply of hardware and the work that is necessary to ensure that systems are integrated". Libra was the third failed attempt to provide an integrated system for magistrates' courts over the last 10 years [33]. The Chairman of the Public Accounts Committee (PAC) stated in the summer of 2003 that the ongoing project to deliver a replacement system to Magistrates courts was "one of the worst IT projects I have ever seen". Libra was foreseen as a national IT system for magistrates' courts to include PCs, office software, bespoke case management software and support. It was expected to not only support court work, but also casework, accounting and feature electronic links to other justice agencies. The contract was won by ICL/Fujitsu in 1998, who were initially reported to be the only company that submitted a bid.

In May 1998, the contract was let for £148 million yet after being named preferred bidder, the price rose 25% to £184 million. The contract was negotiated under PFI and was to run for 10.5 years. No statement as to when the service would be available was stipulated. The contract was renegotiated twice. Renegotiation became necessary when ICL threatened to walk away from the deal unless the contract price was increased. The result of the first renegotiation, in May 2000, was an extension of the contract term to 14.5 years and an inflating of the price to £319 million. ICL returned within ten months stating that it was in financial difficulties nonetheless. The Department declined to renegotiate the entire contract; they did however, agree to allow ICL to deliver the infrastructure component, at a cost of £232 million over a period of 8.5 years. A separate contract with another supplier to deliver the core application was agreed, with the later prospect of appointing a system integrator to roll out the application [34].

Table 1.1.1: This table illustrates the proposal to substantially increase costs while at the same time reduce the period of time that service would be provided.

	May 1998	July 2002
Total projected cost	£146 million	£390 million
Service contract length	11 years	8.5 years

Table 1.1.1 shows that the cost of Libra had more than doubled, yet the term of the contract had reduced by almost 25%. When reduced to an annual figure, in 1998 the cost of one year's service would have been approximately £13 million; by 2002 it was projected to be £46 million per year, an increase of around 350%. Both the PAC and the NAO took a profound interest in this project. The NAO, seeking once again to draw lessons from the experience, warned that the fact there was only one bidder for the contract should have been taken as a warning sign [26] and yet in retrospect it appears there was another bid at the time. A bid from EDS for £120 million was considered to be too high risk [35] although in consideration of the concurrent trouble ICL was experiencing, being unable to deliver the hugely expensive Pathway project for the Post Office and Benefits Agency [36], the ICL bid could hardly have been considered risk free. This appears to be an example of failing to take up a prospective supplier's references with severe consequences.

By July 2001 ICL was in breach of their contractual commitments, yet still the contract was not terminated due to fear of "severe disruption to service delivery and the potential for ICL to counterclaim" [34]. The PAC implied there might have been grounds for a counterclaim when they admonished the Department for being unable to achieve a single view of the requirements for the new system.

There does not appear to have been anyone in charge of Libra. No individual was called to take responsibility for a project that could be characterised as being free of effective management. This is in stark contrast to the experience of the private sector. When a major internet-based project at Prudential Europe collapsed in 2001 an entire layer of senior executives lost their jobs and had to leave the building within minutes of being told [37].

The fact that prospective end-users were unable to have any confidence in Libra was a mark of a project spiralling out of control. Employees of the magistrates' courts were driven to writing to the magazine *Computer Weekly* about their difficulties in obtaining accurate information about Libra. The tone of the correspondence is reported as suggesting that secrecy contributed to profound disillusionment. The reaction of the project management team of Libra was to hold seminars and visit key individuals to give assurances that all was proceeding according to plan, when the evidence to the contrary was compelling.

### ***Analysing and Responding to IT Project Failure***

Between 1992-2001, the 'National Software Quality Experiment' was undertaken in the United States on behalf of the Department of Defence with the stated aim of reducing software errors by a factor of ten [38]. Code from all over the country was contributed to a central repository where, through the process of peer review, it was analysed. At the end of the experiment, there was no evidence to suggest the stated goal had been achieved or even that any significant progress had been made. Writing good software is difficult and resistant to quick fixes. Certainly the central tenet of Brooks' paper 'No Silver Bullet' is as true now as ever before [39]. When Brooks was writing about new developments on the horizon of computing and analysing whether any of them individually would *solve* the software crisis, he did not hold out much hope. He foresaw improvement being a function of combining techniques that would work together. Much has happened since 1986 and some of the technologies on Brooks' horizon are now readily accepted as best practice or have passed into history without having made any obvious contribution.

The advent of an engineering approach to building software represents a significant evolution. In the early years of programming, software was smaller and more often built by individuals than teams. In earlier days code might have been incomprehensible to anyone but the program's author. Provided it performed the function for which it was intended there was often no complaint, until the author moved jobs and it was necessary to make alterations. As the uses to which software is put have grown and become more complex, the need for teams to undertake projects has grown. This has presented its own challenges -the challenges of project management. Teams are required to communicate so they can work efficiently together without duplicating effort. An engineering approach demands software is built to a design, thereby introducing an abstraction into the process that did not previously exist. There are many other aspects to a software engineering approach besides formal design and certainly harnessing the talents of individuals into a productive team is no trivial task, yet the widespread acceptance of a software engineering approach cannot demonstrate any tangible improvement in the delivery of successful IT projects. This could be because the types of projects being undertaken are not comparable to those of the past in terms of scope or because the discipline is still in its infancy. Perhaps the engineering techniques drawn from other disciplines, such as civil engineering [40] are not directly transferable. On the other hand it may be that the principles of software engineering are not properly

implemented in real world projects. As Brooks [39] concluded, there is still no single answer to the problems of delivering successful IT projects. It is for good reason that computer professionals with some experience are suspicious of innovation that promises to fundamentally improve the delivery situation. This is due to the disappointment of past innovations which have promised much and delivered little.

The Select Committee on Public Accounts (PAC) of the U.K. Parliament conducted a review of 24 failed IT projects in the British public sector [18]. They find much with which to agree in the sentiments expressed by the Chaos series and go further still. Where the Chaos report advocates the need for adequate user involvement, the committee recommended that it was essential that *all* parties have a clear understanding of their roles, responsibilities, key terms, and deadlines. They further highlighted that within the public sector, end users must be identified and the correct emphasis placed on the development and maintenance of a coherent business rationale to justify IT investment. Executive management support was a key factor in project success identified by the Chaos reports and with this the PAC report agreed emphatically.

Chaos studies identify the need for a clear statement of requirements to project success. The PAC report agrees. In the detailed comments concerning the 24 projects analysed 53% specifically cite poor requirements management as a contributory reason for difficulty. The report makes a specific recommendation stressing the importance of ensuring requirements are part of the commercial contract whilst at the same time recognising this was not an easy thing to accomplish in practice. The concept of contract management was introduced to cope with the inevitability of requirements that change as a project progresses. However, the committee falls short of spelling out how a contract can be agreed that balances the tensions of specifying requirements in detail with the inevitability of requirements that change. The committee is clear in its recommendations that contracts should be negotiated with a high degree of professionalism in requirements definition and the process by which the contract will be managed. They warn that a lack of clarity leads to expensive misunderstandings that may lead to resolution in court, although in practice, as in the Libra example (*see: Magistrates' Courts – 'Libra' on page 15*), this seldom happens.

Further recommendations include maintaining a close relationship with suppliers but avoiding undue reliance on them while at the same time maintaining overall ownership of project progress; quite a balancing act. To do this they recommend that it is essential to employ skilled project managers, the

assumption being that there is a need for a project manager who works for the customer and another who works for the supplier but without actually stating that this is what is intended. There is a recognition that the scale of a project has a major influence on success whereby more complex projects have a lesser chance of being delivered. The committee report is adamant that recurring identified failures should be the basis of lessons learned that could be employed to avoid a wearisome cycle of repetition. The PAC report went further than the Chaos reports in making recommendations as to how IT projects could be improved to increase the chances of success. The report can be seen as a strong piece of analysis conducted on a representative sample. What were missing were examples of best practice with specific advice that could be taken up and acted upon.

In a study of 1027 projects in the U.K., more evidence was uncovered into the factors that affect an IT project's success [5]. Using the same definitions of project outcome as the Chaos series this report claimed a success rate of only 12.7%, or 130 projects. Of the reportedly successful projects only a small fraction were new bespoke software builds even though this class of project represented half of the total sample. The most successful projects were less ambitious such as those that were classified as 'data conversion' projects. This report identifies clear and detailed requirements specification as the strongest factor in project success with the management of changing requirements close behind. The report goes on to detail other factors that affect a project's chances of success, such as the skill of the project manager, the commitment of management, and the project's complexity. The report's author resists the conclusion that 'requirements management' would dramatically increase project success in itself, preferring to conclude that improvement must come across the spectrum of identified areas. However, requirements management, to include specification and the management of change, is cited significantly more often than any other category for improvement. The necessity to manage changing requirements is illustrated by the response to a survey question stating that 76% of project managers had never worked on a project that delivered the exact functionality of the original specification [41]. This evidence adds weight to the notion that requirements management and contract management are closely related.

Responding to the increasing body of analysis of failed projects that has led to the identification of target areas for improving IT project outcomes, the minister responsible in the U.K. launched a report that came to bear his name; the 'McCartney report'. This report was written at the same time as the Government was placing increased emphasis on the ability of IT to improve public services, along with

making available substantial funding. The McCartney report [42] was in direct response to criticisms levelled by the PAC report [18]. For the IT industry the increased, Government investment was a heaven-sent opportunity at a time when many were suffering from the fracture of the 'dot com bubble'. The report made 30 specific recommendations which principally attempt to improve different aspects of project management. Many recommendations address the same perceived failing.

Responsibility of project ownership deserves attention first. The recommendation that all projects must have senior responsible owners (SRO) is a commonsensical prerequisite without which no one can be held accountable. Many projects have been effectively leaderless; responsibilities ultimately belonging to Government ministers, who cannot in practice devote sufficient effort to make a practical difference. The *de facto* situation is that no one is in charge at senior level and responsibility only becomes an issue when the project goes wrong. Previously the project manager has assumed the responsibilities for project governance without necessarily having the power to ensure compliance. The role of project manager specifies responsibility for day-to-day, tactical management but not for compliance with the tenets of strategic project governance. Some projects have had 'champions' drawn from the business, whose role it is to represent the project within the business and ensure what is built delivers what is required. Neither of these roles can easily be reworked into the role of project 'governor' responsible for strategic management and adherence to best practice. The requirement for SROs addresses this problem although it is unrealistic to believe they can perform their function without training. Consequently training for SROs is also mandated by the McCartney report. The SRO should stay in the job long enough to provide continuity, preferably until the project is complete. The responsibilities of the SRO should be part of an individual's personal job objectives.

Addressing day to day project management, another recommendation requires that, unless there is a suitably identified alternative, projects are run in accordance with the Prince 2 project management methodology [43]. This insistence on using Prince 2 is unlikely to significantly improve IT delivery in itself given that the examples of project failure explored earlier were all subject to this recommendation at the time the problems were experienced. The requirement that all project personnel must receive project management training nevertheless demonstrates that it continues to be a cornerstone of improving project delivery.

Further recommendations were proposed. All departments need to foster better relationships with their suppliers. Projects should be modular and incremental, avoiding 'big bang' (all at once)

implementations and when finished, a post-implementation review must take place. Members of project teams must include individuals who can offer business skills and are capable of writing business cases that focus on the delivery of business change. This is particularly important for projects that cut across departmental divides where the business case needs to be kept up to date. All projects should be assessed against the Project Profile Model (PMM) to understand the degree of risk a particular project represents. The Treasury would seek to produce advice that would improve contract management, to provide training and background information in relation to the performance of major IT suppliers.

Recommendation 21 stands out as an important principle that states that contracts should not be signed until a realistic project plan has been produced. As a project plan is dependent on a knowledge of what work must be undertaken, this can only be creditably accomplished when the magnitude of the task is properly appreciated through an understanding of the user requirements. This recommendation stands out as being laudable without being obviously achievable. The magnitude of the task is dependent on the customer's specific requirements expressed in a manner from which an estimate of effort can be made. Historically this level of detail has not been available at the time of tender, nor at the time of contracts, but rather only after the analysis stage of the formal software engineering lifecycle. Therefore a project plan might well be produced at the time of the contract signing although a determination of whether the plan is *realistic* remains difficult to qualify.

Additionally the report places upon the treasury a responsibility to take into account the past success of departments in delivering IT projects when considering their applications for funds to support future projects. Were this recommendation in place the fact the Lord Chancellor's Department had twice failed to delivery projects in the 1990's may well have precluded the Libra fiasco. Finally the recommendations require the publication of a consolidated and unambiguous set of material for IT, making clear which elements of the programme are mandatory.

The McCartney report is important, beyond the individual recommendations made, because of a Government commitment to see its recommendations implemented. Ian McCartney himself wrote of his expectations admitting that Government had made mistakes in the past and that in future such failures would not be 'tolerated'. He has great faith in the concept of SRO citing the success this approach had demonstrated when adopted by the Government of Singapore [44]. It is unfortunate that the recommendations do not touch specifically on the need to implement structured requirements management. Perhaps this was in the belief that first it was necessary to tackle deficiencies in project

management, namely the prerequisite to identify a single individual in charge. A project owner is a prerequisite without which no strategic structure can reliably be built.

### **Action Stemming from the McCartney Report**

At the same time as the McCartney report, a review was underway into the shortcomings of the Government procurement service. Known as the 'Gershon review' (after its principal Peter Gershon, the former Managing Director of Marconi Electronic Systems), its remit to rationalise the various Treasury departments and Cabinet Office agencies that held central responsibility for procurement across Government. The Office of Government Commerce (OGC) was formed in 1999 as an independent branch of the Treasury. By April 2001 this single organisation was organised around six Directorates and a trading arm including the IT Directorate and the 'Supplier Relations and E-commerce Directorate'. On 24<sup>th</sup> April 2001 the Prime Minister, making good on Ian McCartney's vow that his report would not gather dust on a Whitehall shelf, announced the OGC would be responsible for driving forward the recommendations it contained.

The OGC instigated an initiative to publicise and support the McCartney report recommendations called the 'Successful Projects in an IT Environment' (SPRITE) programme which started in January 2001. Ensuring that every project has a SRO who will take ownership for the project's outcome is a key result of SPRITE. The SRO is responsible for scope and requirements, budget, timescales and risk management with the aim of bringing the project to a successful conclusion. The concept of being 'accountable' was not readily understood in the public sector. The OGC initiated a series of SRO master classes to train individuals in the duties associated with the role.

Best practice in procurement guidelines have been published and the treasury has guidance on ensuring suppliers must produce realistic plans before projects are commissioned. Information on suppliers has been collated and is available through a database managed by OGC. Although established, the cross-Government project database may struggle to satisfy ambitions due to limitations of the data that is currently captured. It does not currently act as a central repository of information from which the track record of a particular supplier can be checked. This was the intention of McCartney but is not possible from the way the resource is currently structured.

The SPRITE programme has made progress in implementing the McCartney recommendations. The way in which mandatory recommendations are satisfied however, remains undefined. Much good work

has been done and made available to those who actively seek it out. This includes information on the formation of 'Centres of Excellence', and the publication of a new series of Best Practice Guidelines including 'Why IT Projects Fail' [45] and 'Value for Money Evaluation in Complex Procurement' [46].

### **The Software Industry Responds**

The Government made clear to the wider IT industry that they were considered immature in comparison with other sectors that supplied Government. There was a feeling that suppliers were tendering unrealistic bids, upon which they could not deliver, and that the promises of quality staff and committed levels of staffing were not being honoured. The feeling was that the relationship had to be more open to allow problems to be shared at an earlier stage. There was an urgent need for a change control procedure to avoid informal changes to specifications being used as an excuse for non-delivery and in the invalidation of existing contracts.

Responding directly to the McCartney report the IT industry forum found much with which to agree in 'McCartney' but were less enthusiastic to accept the more informal criticism. They agreed that projects could not exist in isolation from the business, that strong leadership was important, and that the public service needed more and better business oriented project managers. They believed that improvements in the method of public sector project procurement were needed as they did not encourage a value-based approach. They further agreed that a robust change control programme, firmly applied, is important to keep a project on track. The industry was keen not to be blamed for past failures as they felt that NAO and PAC reports were unfairly harsh. The suggestion was that the reports themselves were jeopardising future project success, an odd stance to take given that NAO/PAC reports are always undertaken retrospectively.

Industry responses to the problem of contracts were ambiguous. The prevailing business climate along with technological change was cited as being responsible for contract problems, concluding that these factors drive requirements change. As these factors are not obviously linked, this is a feat of deduction difficult to follow. While they agreed the importance of ensuring that contract details are accurately specified to avoid ambiguity, they warned of the danger of specifying detailed requirements at the start of a contract and that a dogged insistence on their delivery may result in contractual compliance but rarely business success. This argument carries little weight as projects had neither succeeded against the measure of contractual compliance nor that of business success. The industry returned to firmer

ground when it highlighted that the adherence to best practice was no guarantee of project success as there had been plenty of projects that took advantage of Prince 2 but that had still failed. They suggested rather that the emphasis of factors in failure had neglected to place sufficient emphasis on the public sectors' management of their own internal business change programmes.

In a list of factors that contribute to a project's outcome, the supplier's organisation, Intellect, responded in their own report [9] by highlighting the importance of the management of requirements, both in their early specification and in their later management to project delivery success. They reported that a success indicator with respect to requirements was that they should benefit from being well-specified, have clear acceptance criteria, and be under management control. Conversely, requirements that are expressed at too abstract a level, that are ambiguous and open to interpretation, and which are in a state of flux all contribute to project failure.

Having set out its stall, Intellect was prepared to enter into discussion with the Government on its concerns. It could hardly do otherwise considering the importance of the Government as a valued customer in an otherwise depressed IT sector. Into this environment was born the Senior IT Forum which includes equal representation from both industry and Government, originally chaired by Peter Gershon, the OGC chief executive. According to Douglas Alexander, Minister of State for e-Transformation in Government, one of the purposes of the forum was to "build more open (not cosy) relationships" [47]. A concrete outcome of the forum has been the recognition of the need for an industry representative equivalent of the project's SRO. Thus the definition of the senior responsible industry executive (SRIE) came into being with whom the SRO can discuss progress and problems.

The Senior IT Forum has published the "Government Procurement Code of Good Practice" [48] which specifically addresses the connection between the process of procurement and project failure. This is a 'high level' document, a statement of worthy intentions that contains few commitments against which compliance can be measured. It includes commitments to fairness, honesty, openness, efficiency, effectiveness and professionalism. Within the code more specific commitments are given, broadly divided into actions to which customer and supplier jointly commit, and further action directed at their separate roles. Jointly, customer and supplier agree to provide accurate and timely information in appropriate detail. They undertake to advise each other about reservations they may hold with respect to project requirements, and to raise any issues of concern at an early stage. Parties commit to dealing in 'good faith' and to consider changes in commercial contracts 'constructively'. This is an

acknowledgement of changes that need to be made to contracts when requirements, that form part of the contract, changes as it is not feasible to draft a new contract every time a requirement changes. Together the customer and supplier community pledge themselves to work in a way that reduces duplication of resources and effort.

To address the perception that customers only ever choose the winner of a tender on the basis of the lowest price the customer commits to indicating how tendered bids will be evaluated and to ensure requirements are specified in a way that enables suppliers to propose 'best value solutions'. In turn the suppliers undertake to make any assumptions they have made in the preparation of their bids clear and to only bid to build a solution they are confident they can deliver.

Laudable commitments in themselves, unfortunately the undertakings of the code are not binding. For example, there are customers who have confused the lowest initial bid price with being synonymous with offering the best value for money only to discover the supplier has not held to the bid price. Equally there is suspicion that suppliers have bid low prices to win contracts in the knowledge that the price bid will not be binding, for example in the case of requirements change (which are virtually inevitable). There has, therefore, been a degree of disingenuousness built into the procurement process.

### ***An Analysis of Strategies for Improvement***

In an earlier section the failure of Pathway and later the travails of the Libra project (see: Magistrates' Courts – 'Libra' on page 15), both undertaken by ICL/Fujitsu, were presented. On occasion scandal in high places breaks into the press and into the threat of legal action. One such example is that of ICL and its dealings with the Post Office. In this example the rumours of mis-deeds surface because of the revelations of an insider that point to accusations of dealings in less than 'good faith'. When the Pathway project was cancelled, ICL was left nursing an estimated loss of hundreds of millions of pounds. The Chief Executive of ICL, Richard Christou, had asked Warren Spencer, a senior executive, to participate in what Mr. Spencer described as the pretence that the Pathway computer disaster was solely attributable to the customer (the Department of Social Security (DSS)). Mr Spencer had been asked to instruct the solicitors, Masons, in preparation for upcoming litigation, but claimed he would find it "...ethically impossible to participate directly in the pretence that the [Pathway project] disaster was due to unforeseeable bad behaviour on the part of the DSS, which was the defendant's [ICL/Fujitsu] only route to survival" [14].

Working on Libra for the Lord Chancellor's Department in 1999, ICL reported that they could be facing a loss of £39 million over the lifetime of the deal. In 2001 ICL informed the department that the situation had changed and that if the contract were to continue until 2013 they might make losses in the order of £200 million. Unless the Department negotiated to cover the loss the parent company (Fujitsu) would repudiate the contract. Given that the supplier entered into the contract of their free will it is hard to understand why the Department would consider itself liable for failures of the supplier to comprehend the significance of the contract into which they entered. Despite the problems ICL had experienced their enthusiasm for large projects remained undimmed. Mr. Christou was quoted as saying "[big projects are] better than small deals because the cost of sale is similar." He continued "We have to deliver all the time. It's about the service ethos." [49]. Secretary of State for Northern Ireland, Paul Murphy announced on September 16<sup>th</sup> 2003 that a new IT project to improve information flow between the province's justice organisations was to be built by ICL with a budget of £35 million to begin in the Spring of 2004 and be finished in 2006 [50]. It was not reported whether commercial references were provided. It is sobering to consider that in 2002-2003, after five years of losses, ICL posted a preliminary profit of £30.5 million.

The Gateway review process is a major initiative by Government to improve the state of affairs of IT project delivery, driven by the necessity to respond to critical reports. Much hope has been invested in the Gateway review process. For certain projects the review is mandatory, however, the way the recommendations are implemented is left to the discretion of the implementer. The question remains 'would a new project started today that followed all recommendations and was subject to Gateway review succeed?' The OGC is aware of the risk that Gateway review may come to be seen as a 'box ticking exercise' should high profile projects continue to fail. Other concerns emerge such as the question of competence. Gateway reviewers may be capable in the assessment of management issues but may lack the skill to assess technical ones. It is unlikely that any thorough assessment of an IT project can avoid the necessity of becoming familiar with the details of the technical solution. IT project success has both managerial and technical dimensions [6]. Introduced in February 2001, the Government soon accepted that Gateway reviews were not sufficient to deliver project success when they agreed a further six key action points in December 2002. These included the establishment of centres of excellence, the abandonment of 'big bang' implementations, the insistence on a properly formulated risk analysis complete with options, and the mandatory assignment of responsible ministers,

SROs and project managers with a successful track record. The Government has committed itself to not basing new projects on common causes of project failure. It will be interesting to see how this action point is enforced.

The Libra project failed a Gateway review even though the project was underway and had not originally been subject to earlier Gateway quality hurdles. If there is a requirement for Gateway review while a project is in progress, this should be built into the Gateway review process itself. This is likely to become a necessity as it is not easily defensible to construct an argument whereby review is only profitable up to the conclusion of procurement and then again only after successful delivery but not during the 'construction' phase.

Certain problems have been uniquely associated with public sector IT projects such as their long procurement timescales, high publicity, need for accountability, and the political environment against which they take place. Historically apologists for problems delivering successful IT projects have pointed to changing technologies, the difficulties in defining requirements and the inherent complexity of IT. These factors are becoming increasingly difficult to justify with the exception of the problems that persist associated with requirements definition. A high proportion of the project failures reported have been subject to contracts negotiated under the PFI. The Treasury has now accepted that this is less effective for IT than for other sectors, citing as the reason the difficulty in defining requirements that makes risk transfer and contract enforcement problematic [51].

Little progress will be made training individuals to play the part of SROs if they do not have the prerequisite education to carry out the function. In December 2003 it was announced that senior civil servants would henceforth be required to pass examinations of competence in such subjects as accountancy, the law, and resources management before they would be allowed to progress in their careers where previously no such requirement had existed. The Guardian newspaper described the state of affairs that had existed as a century's tradition of "gifted amateurism" that had allowed civil servants to perform top management jobs without professional qualifications. In future the cabinet secretary, Sir Andrew Turnbull, insisted that experienced professionals alone should be considered for top finance, personnel, IT and management jobs [52].

Returning briefly to the lessons from the Libra project to computerise magistrates courts, when the PAC took evidence from the accounting officer working on the project they found they could not rely

on the answers they were given. The accounting officer accepted that he could have handled the situation differently, stating he “regretted giving incorrect information and stressed that he had not deliberately sought to mislead the committee”. There is a growing cynicism in IT circles that if senior mandarins cannot be held accountable for their decisions, in part because MPs do not have the full facts with which to challenge statements they are given, one wonders whether IT disasters in the public sector such as Libra will ever end [33]. Richard Bacon, Conservative MP for South Norfolk, and a member of the PAC said “This [latest Libra contract] works out at over £21,000 per workstation during the life of the project. If you include the replacement kit, it still works out at around £10,500 per PC, although you could go down to ‘PC World’ and get a personal computer for £700. Even with the associated support, it is impossible to see how this price is justified. Mr. Bacon said “The time has come to consider whether the Government should be awarding further contracts to this company” [36].

The shortage of individuals with the requisite skills within Government is a significant risk. Examples of shortcomings in the negotiation of commercial contracts have been highlighted and there are also threats from there being too few project managers (successful or otherwise) in Government. The presence of SROs is not going to deliver any measurable difference unless they are skilled at the implementation of best practice in project governance. The fact that the number of IT professionals in Government fell from 12,000 in the 1990’s to 3000 by the year 2000 speaks for itself [42]. The recommended solution to this dilemma is for departments to bring in outside expertise to help procure IT services and manage suppliers. One remedy advocated is for departments to select advisors who assist with defining requirements, designing the architecture and procuring the main supplier. They would then go on to help manage the supplier and the project on the customer’s behalf. These are advisors who need very specific skills and experience along with impartiality and independence. Another suggestion is that making projects smaller will make them easier to specify and easier to manage. To achieve this, departments will have to make the distinction between systems that are large in a functional sense and those that are large in a non-functional sense. From a functional perspective, the fact that NIRS2 manages 65 million records does not make it a large system whereas in a non-functional sense it is a large system (*see: .Inland Revenue - National Insurance Recording System (NIRS2) on page 5*).

The identification of common problems and the action necessary to obviate them can be expressed at different levels of precision. For instance, a problem may be identified such as ‘debt makes the

individual unhappy', and the solution proposed 'do not borrow money', however, the solution is defective if an individual's spending is in excess of their earnings. Therefore more specific instructions may be necessary to avoid the identified problem. More specifically the advice 'do not get into the situation where borrowing is necessary by ensuring outgoings are less than incomings' may offer a level of precision sufficient to ensure the appropriate action is taken. Although the common problems of project failure are recognised, it is unclear whether action has been specified at the appropriate level of precision. This is most telling in the sphere of requirements specification and requirements change management. Both areas are strongly implicated in project failure but the mechanism, for instance, by which requirements should be unambiguously defined in the project specification phase, is not addressed. Therefore it is a problem area left open to solution through individual interpretation. The fact that no unambiguous method of requirements' expression is defined implies that one is not available.

The question of what aspects of the McCartney report and the Gateway review are mandatory is complicated by the imprecision of the actions required to obviate a specific risk. Therefore a SRO can correctly claim they have complied with mandatory aspects of the programme regardless of the feebleness of the compliance. Although OGC publishes thousands of pages of advice, suspicion persists that many IT failures are a result of failure to comply with existing good practice. It is imperative that those with specific responsibilities are able to access the information they require in a timely manner and that the information includes clear precise advice, possibly including examples, case studies and expert contacts who can be called upon to advise on specific projects. However, the fact that best practice resources are available does not imply they will be followed. Ignorance is still a defence.

Consider a fictitious project where the business case has been agreed, the stakeholders have been kept fully informed, the project team is capable and experienced, the milestones of success have been agreed and the project has been broken down into manageable steps. At the end of each stage Gateway auditors come and ensure the project is fit to proceed to the next stage. Would the project succeed? Would it be built to time and budget with the functionality promised and exhibit an acceptable level of quality? The results of individual reviews are confidential but OGC does publish summaries. The trends suggest more work needs to be done. More appropriate skills, better risk management, better success criteria and stronger project management are all needed. In addition the projects that have been

subject to Gateway would have benefited from better stakeholder involvement, better knowledge on which suppliers were most likely to perform and overall better financial control [6]. The advent of the SRO initiative could prove the difference but this will depend on how well the individual performing the function is able to influence project governance from the very outset. The Gateway process makes the definition of a project much broader than it has been seen in a narrow software engineering sense because it includes all the activity that takes place prior to a supplier being chosen i.e. it includes *procurement*. Four out of the six Gateway review milestones are concerned with the project's specification and procurement. Could it be that the seeds of a project's outcome are sown in the project's procurement? The nagging doubt is that the very clear message that comes from the case studies is that requirements specification and requirements management are the recurring and serious problems faced in project delivery [4, 5, 7, 26-28, 42]. Improvements to procurement need to be accompanied by improvements to requirements representation, yet, so far, no one is suggesting how this could be done. Unfortunately, at the beginning of a project, one thing that is in short supply is detail.

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