Improving the National Nuclear Laboratory Project Management Capability - 11017

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ABSTRACT

In July 2008, the UK's National Nuclear Laboratory (NNL) was officially launched by the Rt. Hon. John Hutton MP, Secretary of State for Business, Enterprise and Regulatory Reform. This marked a significant milestone on the journey the organization has taken from the early days as a Research department within the large organization of British Nuclear Fuels Limited (BNFL), into a separate medium sized commercial business. Along the way, the business has transformed itself, not least in the area of project management where now the business has a highly developed matrix based organization with a dedicated project management capability focused on customer delivery.

Virtually all of NNL work is for customers in the nuclear industry with supports for all parts of the fuel cycle, from manufacture of fuel to waste management and decommissioning. For a significant amount of the customer work the technical expertise required is highly specialized and the content focused onto specific outputs and deliverables. Along with the unique facilities that are operated, NNL has needed to develop a project management capability that can cope with the wide range of customer needs and the very varied types of projects. These can cover anything from;

- 5+yr multi country EU funded fundamental research
- Large scale industry process development and testing
- Residue and orphan waste treatment
- Laboratory scale research
- Plant construction & modification
- PIE and other irradiated material investigations
- Expert technical advice
- Customer plant interventions/inspections

The establishment of a project management capability has been very successful, providing the business with the opportunity to standardize its approach to project management and to raise the overall delivery performance. All customer work is now managed and delivered by the project management team with clear accountability for profit and loss. A rigorous bid and estimating processes ensure that the scope is clear and achievable and that customer requirements will be met in full. This provides the business with both an effective delivery structure focused on achieving customer work to time cost and quality, and clarity of business level reporting and planning.

An enabler for the capability was the choice of software tools to be used. The decision was made to standardize the use of project management software and to use systems that fitted the new business better. This including changing to a financial management system suited to the size of the business and the move to a fully integrated multi-site Enterprise Project Management system giving an integrated planning capability. This is used to plan all projects in NNL enabling detailed resource & facility planning with conflict resolution, critical path analysis, and external procurement planning. In addition the use of a software tool that integrates the planning tool to the financial actuals provides variance analysis including earned value along with other integrated reports for both customer and internal consumption.

Recognizing the benefits derived from the past management of the corporate R&D programmes, the NNL has also piloted a technical programme management process across a number of customer areas. This aims to group customer work into technical programmes of work and then to manage them within the overall structure of a programme whilst maintaining project management rigor for the individual projects. By taking this top-level approach

understanding the challenges which need to be addressed and prioritizing these according to the objectives of the programme, the NNL is able to yield the best value achievable for the customers by:

- maximizing the benefits from projects and activities
- allowing clear flow through of objectives from strategic need to individual project deliverables
- minimizing rework through the control of technical data and information
- identifying strategically important key technical activities
- ensuring evolving technical needs are controlled and managed
- identifying programme level key technical risks
- maintaining project management discipline for individual projects

The NNL now has excellent project management underpinning the very foundation of the business. This paper will describe the journey that NNL has taken in establishing this capability, some of the tools and techniques used with real examples, and the future strategy for further development. Examples of the performance now achieved from projects will be provided, along with some lessons learnt to benefit other businesses in a similar position.

INTRODUCTION

The history of the NNL has its roots around 1996 when various research departments were brought together from within BNFL and formed into a Research and Technology Division (R&TD) [ref 1]. BNFL was a large limited company wholly owned by the UK Government [ref 2]. At this time the project management of the various projects in R&TD was sporadic, variable and non-uniform. Most of the work undertaken was for other departments within BNFL, and only the larger engineering type projects had any form of modern project management approach. Over the next 7 years the division started to bring together the various ways of managing projects and started to apply some project management to most projects. However it was not until 2003 when the department started to separate from BNFL, changing its identity to Nuclear Science and Technology Services (NSTS), that project management within the newly formed business started to become the capability that is recognizable today.

At the time of the formation of NSTS in 2003, the role of the project manager within the technical delivery teams had become a standard approach. Some standard tools had also started to be used by the business for project management, including project planning software, along with deliverable tracking & cost variance analysis. Over the next 2 years the business moved into operating under shadow subsidiary, and then finally full subsidiary status with the launch of the business, Nexia Solutions, in 2005 [ref 3]. At the same time a reorganization of the business took place with the formation of a project centric matrix type management structure with dedicated business management, operational delivery and technical resource teams. The project management elements of the business, at that time distributed throughout the business, were brought together into a single team with the objective that all work delivered for customers was managed by this team. The team structure with the roles of Head of Projects, Senior Project Manager, Project Manager and Project Engineer was established along with a project support function including planners and cost engineers. Finally, in 2009 the journey from large corporate department into a standalone business was completed, with the award of a Government Owned Contractor Operated (GOCO) contract for operation of the National Nuclear Laboratory and the transfer of shares from BNFL to HM Government.

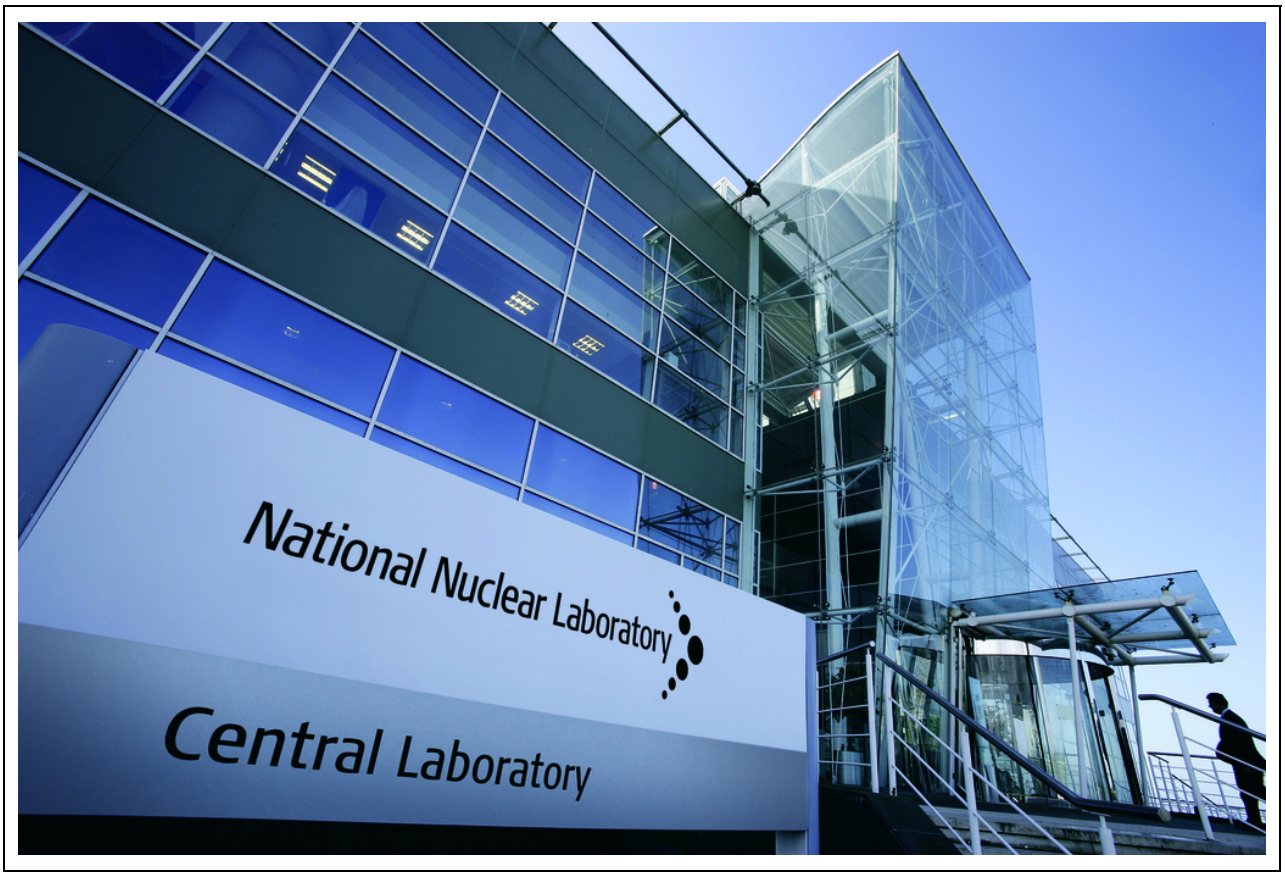

FIGURE 1. NNL Central Laboratory

STANDARDIZATION

The establishment of a project management team in 2005 provided the business with the opportunity to standardize its approach to project management and to raise the overall standard. Whilst project management had been in evidence before this, there were various approaches in operation across the business with a variety of tools and techniques in use. It was clear that the newly formed organizations' project management capability was in its infancy and needed a rapid development to achieve its role at the heart of the business. A plan was therefore agreed to address this on three levels: training & experience, tools and techniques, and process & procedures.

Specific training & experience requirements were established for each of the roles within the team, including standardizing on the Association of Project Management's APMP qualification for basic project management skills along with IOSH training to cover specific safety accountabilities. To develop the individuals further and provide the experience part of SQEP, on the job type training was also included, ranging from mentoring by experienced project managers through to secondments into other parts of the business to help develop wider awareness.

The business had over a number of years developed a number of supporting project management tools. Some had been inherited from BNFL others had grown from pockets within the business. The decision was made to standardize the use of project management software and to use systems that fitted the new business better.

To support the matrix style organization and the establishment of the project management team, a number of new processes and procedures had to be developed and embedded within the organization. These were important for two reasons, first to ensure that everyone in the organization knew what they and others should do and second to ensure that legal requirements are complied with. The NNL is in a unique position, operating as a business on a number of

nuclear license sites which are owned by different companies. This creates a number of unique challenges with respect to the command and control of work on and off the site and compliance with regulators, including Nuclear Installation Inspectorate (NII) requirements. The new processes and procedures established the responsibilities and accountabilities within the organization for the delivery of work in these situations.

These 3 key areas, along with other associated developments, have enabled the business to achieve a track record of high quality delivery to customers, a sustained financial performance, and a consistence of approach. This has provided a baseline performance for the project management team and an ideal position to develop the function further, improving efficiencies and responsiveness.

PROCESS & PROCEDURES

NNL has made the clear decision to put projects at the centre of its business. All work for customers is delivered through its project management function which draws from the technical teams the required specialist engineers and scientists that are required for delivery. This project rigor has enabled the new business to achieve a very high standard of delivery to customers during its first few years of operation. During 2009/10 over 600 projects were delivered with 1163 customer deliverables and an on time hit rate of 98.3%. By standardizing processes, skills and tools in the project management capability, the business has provided a bedrock for further development. Whilst a standardized approach brings a great range of benefits, it also has a tendency to provide unnecessary constraints when one size does not actually fit all. With a strong base of skills, the option to relax some of the constraints and provide greater flexibility is available.

A highly challenging aspect for project management within the NNL is the huge diversity of different project types delivered on behalf of customers. These cover anything from;

- Multi year and multi country EU funded fundamental research
- Large scale industry process development
- Pilot plant operation
- Laboratory scale research
- Plant construction & modification
- Expert technical advice
- Customer plant interventions

Providing flexibility to better suit this variety of projects is therefore key to ensuring commercial viability. A “LiteTouch” process (often called Agile Project Management) has therefore been developed that provides a simpler approach to the process of estimating and delivering some projects. At the concept stage, if the project is considered to meet a number of criteria then it can follow the LiteTouch process. This reduces some of the requirements of the process of project management without removing key steps, thereby saving time and cost and providing a flexible ‘fit for purpose’ approach to achieve the best overall outcome.

In forming the project centric business, NNL has invested heavily in processes and tools to support the project management capability. The decision was made to standardize project management software and to use systems that fitted the new business better. This included changing to a financial management system suited to the size of the business and the move to a fully integrated multi-site Enterprise Project Management (EPM) system giving an integrated planning capability. This is used to plan all projects in NNL enabling detailed resource & facility planning with conflict resolution, critical path analysis, and external procurement planning. In addition the use of a software tool that integrates the planning tool to the financial actuals provides variance analysis including earned value along with other integrated reports for both customer and internal consumption, see figure 2 below.

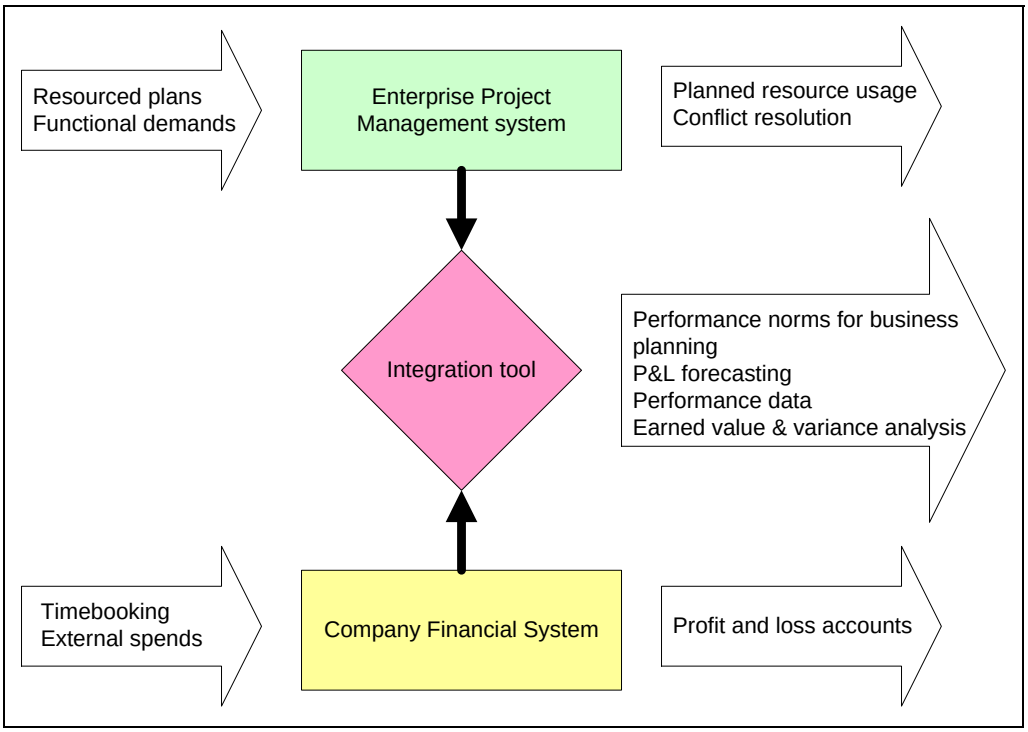

FIGURE 2. Inputs and outputs from integrated tools

In selecting the most appropriate software applications to use for the business a full assessment was completed of the various requirements that were needed. This allowed criteria to be developed for the application that balance the various sometimes conflicting needs of the business. The software applications chosen are detailed in table I below.

TABLE I. Tools and applications used for project management

Tool	**Application**	**Benefits**
Enterprise Project Management	Microsoft Project and Project Server	Company wide planning and resource information.
Financial system	Agresso	Financial management, project costing and billing
Integration	Qlikview	Cross system reporting and integration
Risk analysis	@Risk	Risk prediction and management

The EPM tool needed to provide a regular planning capability to the project function, complete with all the normal functionality associated with this, along with an integrated business level resource management capability. The resource management had to work across multiple sites and cover all the individual facilities and people resources in the business, grouping these against the various management levels for ease of reporting. It also needed to provide clear allocation of committed resources along with forward projection for business planning purposes. With multiple customers and projects, defining the normal functionality required from the planning tool was complex since applications that were suited to large and long duration construction type work were not necessarily suitable for smaller & simpler projects. To meet this variable need, over the years a number of different standalone planning applications had developed and were in use within the business providing local project planning capability. The selection of Microsoft Project and Project Server provided a suitable compromise of functionality and capability across the whole business, replacing the need for local applications.

At the time of formation of NNL, BNFL had in place a business financial system based on an industry standard application suitable for a business its size that was internally focused as cost centres. With the separation of NNL from BNFL it was clear that the functionality it required from a financial system would be very different. The new tool needed to provide profit and loss management along with a flexible project centric costing and billing system

and be sized to an organization such as NNL. The choice of the Agresso Business World application provided a suitable tool that had a modular approach, allowing capability to be added as the need arose. With the focus around project costing & billing and the integration of procurement, time booking and invoicing activities, the ability for the project team to manage costs, budgets and income for individual projects was significantly enhanced.

Whilst some integration is possible between the EPM and the financial system, to deliver further benefit from these centralized applications an integration tool was required. Qlikview, a business intelligence application, was selected for this since it is able to interrogate the data from a variety of sources and provide combined analysis reports for project performance and business planning purposes. This enables, for example, actual costs and plan data to be combined providing cost and schedule variances, or actual resource utilization and forward planned resources to be combined providing business planning information. The use of @Risk gives further support to the area of risk analysis and planning, especially for use on complex or difficult projects.

TOOLS & TECHNIQUES

Some of the benefits of a large corporate R&D work programme is that they create a very flexible, responsive, and technically innovative environment. Under these schemes in the past, frightening as it may seem now, there was little concern about fiscal or delivery performance from individual projects. So long as the end objective of the programme was met and the overall budget not exceeded, everyone was happy. Technical specialists were able to engage and support a wide variety of projects outside of their core work, individual projects were integrated such that data and results flowed freely between them, and projects were aligned against an overall strategy. For NNL, the move to delivering work for customers as discrete projects focused on specific individual deliverables restricted the ability to understand and bring together disparate work streams to achieve a collective benefit. Trying to get back to this utopia without forfeiting the high standard of customer delivery enjoyed today has required NNL to look again its process for the technical management of customer work.

For a significant amount of the customer work undertaken by the NNL, the technical content and expertise required is highly specialized and focused onto specific needs. To yield the best value (financial and technical) for the customers, the NNL uses a type of technical programme management, grouping customer work into technical programmes of work and then managing as a collective for individual technical programme areas. Normal project management performance measures are utilized to manage the technical programme and monitor variance. All individual projects have fit for purpose baseline project plans. These are used to provide, where appropriate, variance analysis data to control and monitor performance at the individual project level.

This type of technical programme management is used by the NNL to coordinated, organize, and manage a collective of technical projects and activities, with the objective to yield an output greater than the combined value of individual projects. The technical programme is more than a disparate collection of projects acting independently. It is the co-ordination of project inputs and outputs, the creation of crosscutting technical development activities, and the definition of high level strategic objectives. It also provides an environment in which to help the customer make selections of the most appropriate individual projects in which to invest and the direction of shared resources to achieve optimized technical benefit.
A technical programme management system provides a wide range of benefits. These include;

- Maximizing the benefits from projects and activities
- Clear flow through of objectives from strategic need to individual project deliverables
- Minimization of rework through the control of technical data and information
- A clear, common and effective delivery infrastructure across all the projects
- Identification of strategically important key technical activities
- Ensuring evolving technical needs are controlled and managed with alignment to overall strategic need
- Prioritization of shared and scarce technical resources
- Identification of key technical risks

A real example of technical programme management is the technical programme of work for a waste processing plant on the Sellafield site. They have a number of challenges unique to the material that is handled in the plant.

These results in the technical work delivered under this programme being very diverse, needing studies at a wide range of scales from chemical modelling to large scale experimental facilities. By bring the work together under a technical programme, the NNL has been able to provide seamless sharing of data between the work elements, and create a better focus on the individual objectives that align against the programme aims.

This diversity and specialist nature of work is typical of the type of customer work the NNL delivers. In the creation of the NNL a number of key facilities unique to the UK were incorporated into the business. These included a 6000m2 rig hall equipped with craneage of 60tonnes and a deep pit for underwater experiments, a high activity cave and hot cell complex able to handle highly radioactive nuclear material, and a wide range of fumehoods and gloveboxes suitable for various nuclear and non-nuclear materials. These facilities are supported by an unrivalled breadth of technical expertise, including many skills unique to the UK.

FIGURE 3. NNL Workington Laboratory

The range of facilities and the specialist technical nature of the work challenge the business to undertake customer work more effectively and to achieve the optimum technical benefit. The technical programme management process provides the glue to join all the thinking together. This arises from the emphasis given in the technical programmes on defining the overall challenge more precisely and the engagement of technical specialists. By maintaining an understanding of why the individual work packages are required, what the output will be and how it is intended to be used, the technical programme ensures that the proposed output matches the customer’s expectations and that efficiencies are identified.

FIGURE 4. high secure Category 1 plutonium facility

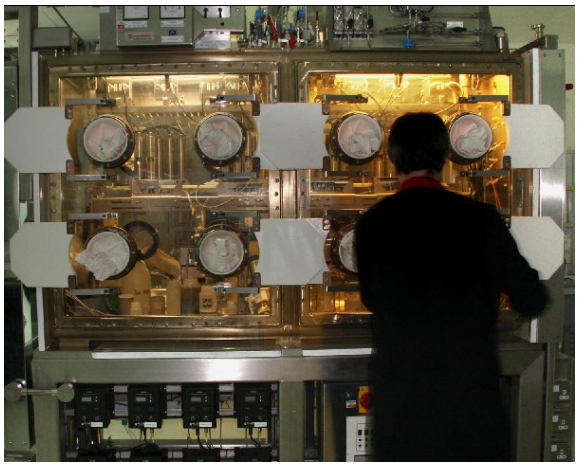

FIGURE 5. Plutonium and Minor Actinides Laboratory

THE JOURNEY IS JUST BEGINNING

The journey the NNL has taken from its early days as a research department has allowed the business to learn from past successes. For example, the technical programme management process has been developed following a look back at some of the advantages from how technical work was delivered in the past. Real benefits have been released for customers from the piloted programmes, ranging from significant financial saving by using a waste from one project as a feed stock for another, to improved efficiency by the greater integration of parallel experimental and modelling work. The technical programme management approach would be equally applicable to any technical delivery business or industry looking to create increased value for its customers.

Project management is inherent in everything the company does. This can clearly be seen in the impressive delivery performance achieved by the business, with year on year deliverables on time to cost and quality being greater than 98%. This impressive performance has not come easy, having been achieved through the development of a trained and experienced team, the creation of appropriate tools and techniques, and the alignment of the business to focus on customer delivery. For any business setting out on a similar path, all of these aspects should be considered and incorporated into its change programme. In considering any programme of change, the following could be taken as lessons learned from NNL's experience:

- Nothing stays the same very long. Make sure any project management processes are flexible and ready to adapt to change.
- The balance between fit for purpose and standardization needs to be considered.
- Project management tools are near useless without proper training and experience in place.
- Roles and responsibilities are important – be clear who does what
- Just because the software can do it does not mean that you need it.
- If the software can't do what you want, be very sure that you do actually need it.
- People manage projects, not the systems.

However, for NNL the end for the journey has not been reached. The role of project management within the organization must continue to develop and adapt to the changing business needs. It is likely that the types of projects managed by the organization will diversify further, placing more demands on the balance between standardization and flexibility. The environment that the business operates will also become increasingly competitive, with customers looking for further improvements in value against their requirements, along with the pressure of increased competitive tendering. The management of projects will demand greater use of efficient and effective tools and technique in the quest for increased value, the management of risk, and the delivery of high quality output to customers. To support this, further investment in the core skills of individual project managers will be enabled by the

creation of a NNL Project Academy and accreditation by APM. This will focus on the training and development needs for the project community, and will extend into the wider NNL community where key project management skills are required.

SUMMARY

Project Management within the NNL has come a long way in the last decade. The NNL now has excellent project management underpinning the very foundation of the business. The future for the NNL will be both challenging and exciting, with real opportunity to continue the success achieved so far. Project management will be an essential element to help the NNL deliver this success.

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