ACTIVE Principles of Lean Thinking and how they are Applied in the Pharmaceutical Sector

A case study at GSK's Stevenage R&D site shows how ACTIVE principles of lean thinking can be used to improve the performance and competitiveness of capital projects.

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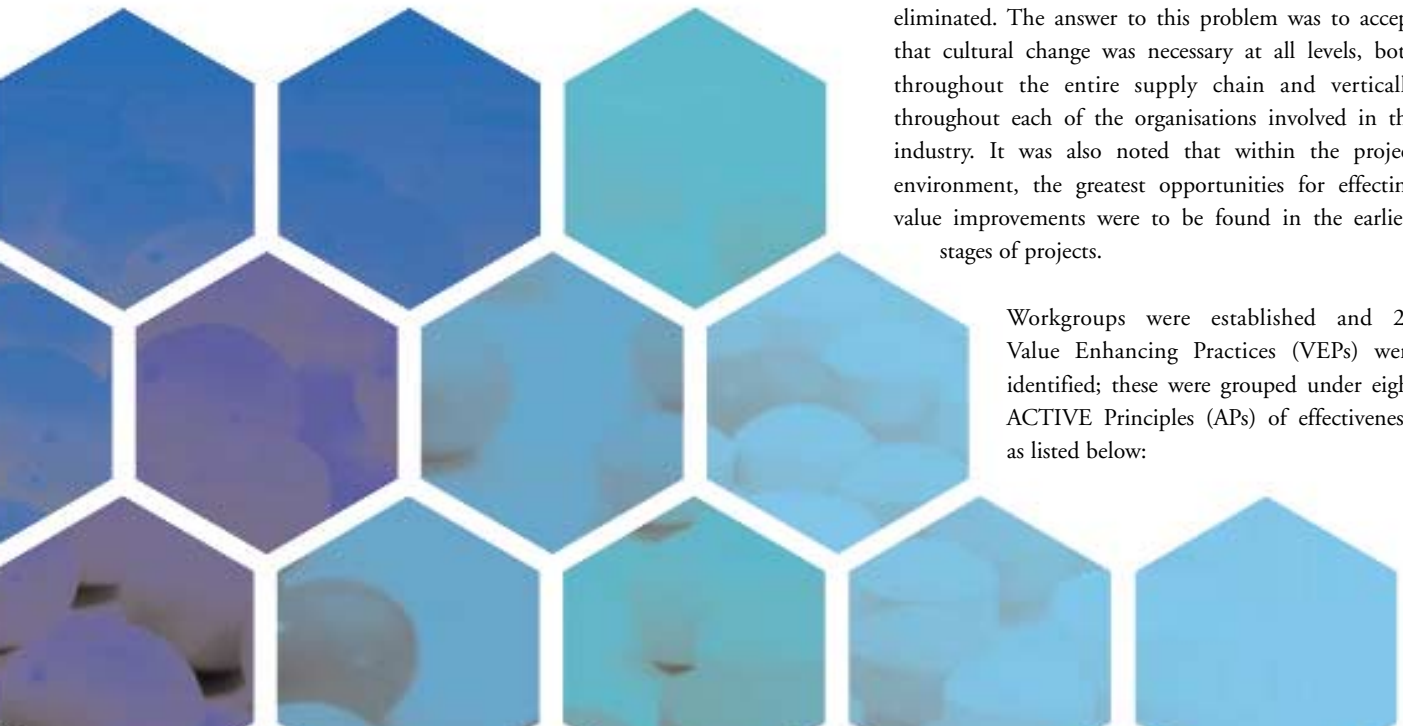
ACTIVE (Achieving Competitiveness Through Innovation and Value Enhancement) is an initiative aimed at improving the performance and competitiveness of capital projects in the onshore process, pharmaceutical, energy and utility industries by changing adversarial behaviours and applying best practice in project delivery. The ACTIVE Initiative ran in the UK from 1996 to 2001 when it was merged with the European Construction Institute (ECI). PROjEN PLC is a participating member of the ECI and is heavily involved in the ACTIVE Initiative.

ACTIVE is industry-led, being owned by fifty or so stakeholder companies representing a cross section of operators, contractors and supplier organisations. It has a simple vision for the industry as follows: "A world-class UK process engineering and construction industry, with satisfied clients and thriving contractors and suppliers". This is to be achieved through the ACTIVE mission which is: "To improve the competitiveness of the UK process and construction industries by transforming the way in which they execute projects for the process and energy sectors worldwide."

In 1996, ACTIVE identified key issues in its original Action Plan. The first recognised that inefficient business processes have produced a culture of confrontation, rather than cooperation, and therefore must be eliminated. The answer to this problem was to accept that cultural change was necessary at all levels, both throughout the entire supply chain and vertically throughout each of the organisations involved in the industry. It was also noted that within the project environment, the greatest opportunities for effecting value improvements were to be found in the earliest stages of projects.

Workgroups were established and 23 Value Enhancing Practices (VEPs) were identified; these were grouped under eight ACTIVE Principles (APs) of effectiveness, as listed below:



AP1 Effective project concept and definition: setting clear, aligned objectives and scope with defined, well understood implementation strategies.

AP2 Effective project team management: establishing and maintaining a single integrated team with clearly defined roles and responsibilities, and shared common objectives.

AP3 Effective supply chain relationships: ensuring that supply chain relationships work to maximise value and share equitably both the risks and the benefits.

AP4 Effective management and communication: timely management of relevant information using appropriate technology and clear documentation to aid communication throughout the team.

AP5 Effective project risk management: using a structured process for managing risk and assigning responsibility to those in the supply chain best able to manage it.

AP6 Effective innovation and continuous improvement: encouraging a challenge culture with processes for capturing, learning and rewarding innovative ideas throughout the supply chain.

AP7 Effective project execution: managing the implementation process to integrate activities efficiently to successfully achieve project objectives.

AP8 Effective performance measurement: defining key performance indicators which demonstrate the achievement of project goals and benchmarking performance to drive improvement.

COMPARISON OF 'CONSTRUCTION' AND 'PRODUCTION'

With its stated aim of improving competitiveness through the adoption of value-adding practice, there is a high degree of overlap between the ACTIVE Principles and Lean Thinking. There are also clear similarities between production and construction; for this reason, it is worth exploring the lean approach to project management.

GSK Case Study

PROjEN was awarded the ECI ACTIVE Project of the Year for 2004 for a project carried out on behalf of GlaxoSmithKline at their Stevenage R&D site (Hertfordshire, UK). The project involved a new services building and major modifications to the refrigeration and Heat Transfer Fluid (HTF) distribution system.

At the same site, PROjEN is presently managing a project to replace 40 glass condensers with an equal number made from exotic materials (tantalum or Hastelloy C22) to improve reliability. The existing piping and layout arrangement in the modules is extremely complex and space is at a premium (see Figure 1, page 118). There is a significant amount of equipment and piping that needs to be temporarily moved to enable removal of the existing condenser and allow the physical installation of the new metal condenser. Each installation is in a clean room environment, which is also classified as a hazardous area due to the flammable solvents used in the chemistry.

In order for the project to be completed successfully, three Critical Success Factors need to be achieved: minimal interruption of operations, implementation within the 2005 calendar year and delivery of the project within the sanctioned costs. (Previous similar projects executed without Lean Thinking strategies had struggled to meet cost and programme budgets due to their complex nature.)

The 'Lean' principles, as outlined above, have been utilised to great advantage on this project in a number of areas. A 'stage and gate' project framework has been employed (feasibility study followed by a scheme design and +/- 10% accuracy cost estimate); this has facilitated rapid decision-making based on accurate and timely information. By treating gates as entry points, parallel working and concurrent engineering have been possible.

GSK has developed a strong Project Sponsorship concept, with both its role and its responsibilities being well-defined. By working in conjunction with PROjEN, GSK has adopted a collaborative approach employing common systems and procedures, and shared project objectives. PROjEN ensured that the key stakeholders within GSK were contacted at the earliest possible opportunity to obtain buy-in and commitment to the project objectives. This included the early decision to make use of an innovative 3-D modelling technique to assist in the generation of detailed design deliverables.

An integrated and dedicated project team has been created with on-site presence. The team is highly motivated and empowered to identify concurrent engineering opportunities, thereby reducing the length of the schedule and minimising the shutdown period; it also helps to ensure that control of the project is defined as 'making things happen' rather than 'monitoring results'. The team has also played a key role in steering group meetings; these are held on a regular basis to review project progress and ensure that project objectives are being achieved. Early in the design phase, commissioning and validation were also matters for consideration.

The front-end design and long lead-time equipment costs were pre-sanctioned in order to avoid unnecessary delays and were assisted by the innovative approach of using photogrammetry to develop 3-D models of the modules using dedicated software and Autoplant((see Figures 2, page 118 and 3, page 120). This aided visualisation of the phased demolition and construction, and assisted stakeholder communication. The package has also been used for the generation of detailed isometric drawings of the individual pipe routes. In practice, the model has been shown to be accurate to within a few millimetres, thus minimising re-working of pipe spools and components.

Analysis of the detailed project schedule and the 3-D models enabled accurate definition of installation material requirements (see Figure 4, page 120), and defined the periods required for construction, validation and commissioning/hand-over. The production schedule for pilot plant chemistry was also reviewed to assess the availability of modules for construction work. This resulted in significant cost savings and a programme reduction of 25%.

All suppliers and construction management were involved in the front-end development and model reviews; this helped to shorten the design phase, minimise risk and maximise opportunities. Constructability and Buildability were considered to be key factors; risk management and control techniques were also given a very high profile throughout. Wherever possible, suppliers were selected with whom there were existing partnership agreements.

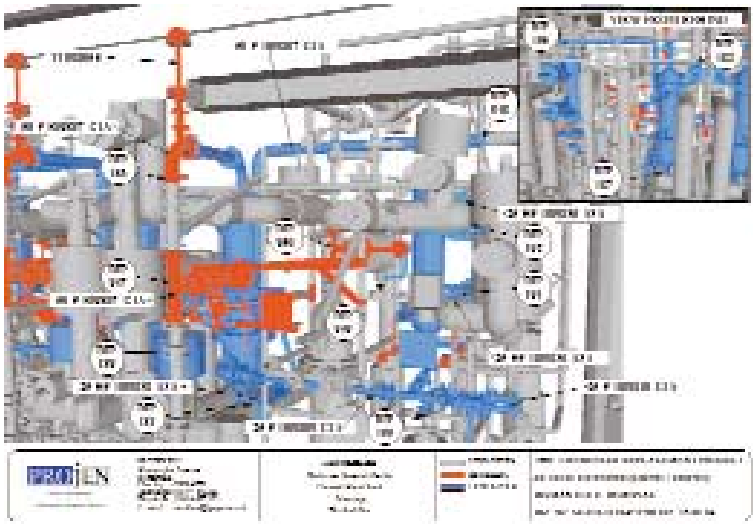
Before work on the project commenced, the location and layout of the construction site were carefully considered to maximise the efficiency of the project team and minimise on-site inventory. The focus has remained on the business benefit to GSK, and not some intermediate stage such as mechanical completion.

Figure 1

The concept, development, definition, design and procurement together form a supply chain that precedes construction, just as it precedes production. Constructability processes are intended to ensure that the construction process is designed at the same time as the asset, which is fundamental to lean production, but is rarely used to its full intent.

Construction often does not flow smoothly and at maximum efficiency because of shortages of information, materials, equipment, and resources – just as in a production environment. When delays do occur to critical path work, resources get diverted to lower priority work, or short-term fixes or 'work-arounds' are carried out. This reduces efficiency and results in re-work, both of which are basic problems in the production process.

Figure 2



Many project plans build in a 'float', which often gets used (wasting time), just as exists in many production plans. Poor workflow of equipment and materials required for construction can often result in inefficient use of the site area. This is equivalent to factory floor space being wasted with excessive buffer stocks required in the production process.

Many individual companies involved in projects tend to seek to optimise the duration and

cost of their own service, which then results in sub-optimisation of the project as a whole – because fundamental interdependencies are not taken into account. Lean thinking revealed these interdependencies in the production process.

LEAN PROJECT DELIVERY EMPLOYING ACTIVE PRINCIPLES

Adopting the ACTIVE Principles and Value Enhancing Practices has enabled PROjEN to improve significantly the speed and effectiveness of project delivery. Characteristics of the approach include an effective project selection and prioritisation process to ensure strategic alignment and maximisation of business benefits from the project portfolio. From the outset of a project, it is vital that plans are well-defined and value streams are identified: 'do the right project, before you do the project right'. We are actively engaged in assisting a number of clients to improve their project portfolio management processes through the application of ACTIVE Principles. These are described below.

'Stage and Gate' Framework

The principles incorporate a flexible 'stage and gate' framework that is set in place for all projects, no matter what their size or complexity. Gates are seen as entry points to the next stage, rather than exit points from the preceding stage. In this way, the next stage can be started (provided the relevant criteria and checks have been performed) as soon as the organisation is ready, regardless of whether or not the full work-scope of the previous stage has been completed. Consequently, stages can overlap – thereby reducing timescales without increasing the risks associated with the project.

This principle also ensures that the work packages overlap to shorten the schedule, and that objectives are shared throughout the supply chain by the creation of integrated teams. This is most easily achieved where there are partnerships, alliances, term contracts or supply agreements in place.

Control During Execution

All Lean Thinking projects are highly controlled during execution rather than retrospectively monitored; this involves driving project delivery according to the plan and implementing corrective actions to get the project back on track whenever deviations occur. Core project management techniques and controls (planning, risk management, issue management, scope changes, scheduling, cost control and review) are also combined to create maximum effectiveness.

Effective risk-management techniques are employed from the earliest stages onwards and form an essential element

Figure 3

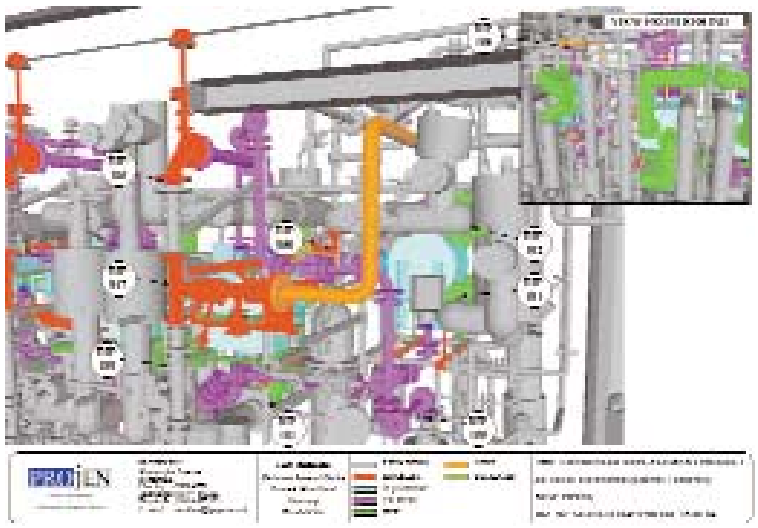
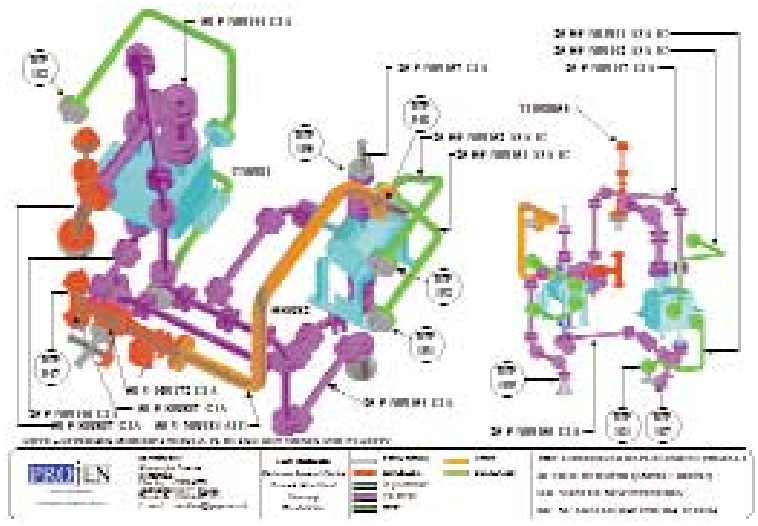


Figure 4



of the principles with the identified risk being managed by those best able to deal with them. Value Analysis also occurs throughout a project to identify ways to reduce cost, improve quality and shorten the schedule, Post Implementation Reviews are held to assess the effectiveness of the project with regard to meeting the business objectives.

Project Teamwork

In conjunction with the planning of the project according to the principles, effective and flexible project teamwork with dedicated full-time resources are used wherever possible. This results in an open "no blame" culture where team members are empowered and decision-making is delegated to the lowest competent level.

Any required operator training is commenced in advance of start-up whereupon job boundaries are purposely ignored and individual project team members are encouraged to have a high level of technical competence coupled with an enthusiastic, flexible, 'can-do' attitude.

Each project is relayed with a strong sense of ownership through the appointment of a single Project Sponsor who is sufficiently senior to enable rapid decision-making and ensure that the focus remains on achieving the business benefits throughout the life-cycle of the project. Commitment to project objectives is ensured by the identification and involvement of key stakeholders at the earliest possible time to enable the opportunity to 'buy-in' as necessary.

Elimination of Waste

A peripheral but equally vital element of the principles is the elimination of waste wherever possible. This encompasses, for example, elimination of unnecessary processing steps, unnecessary inventory and unnecessary movement of people (for example, siting amenities close to people and stores close to the building site). Avoidance of double-handling of materials on site is always encouraged. The effective selection of suppliers – that is, on the basis of being capable of manufacturing to meet the assembly schedule – is also an essential requirement.

CONCLUSION

Clearly, there are sufficient similarities between production and construction projects to adopt appropriate 'Lean Thinking' concepts for project management in various industry sectors, including pharmaceuticals.

ECI ACTIVE Principles and Lean Thinking overlap in a number of areas. Both place a high emphasis on improving the overall efficiency of the supply chain and minimising non-value adding activities, and PROjEN and its clients have gained significant advantage in using ACTIVE Principles to reduce both project time-scales and costs.

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