

Rethinking Highway Management

**Case study integrating:
Highway Management
via
Visualising Transformation™**



Support Services Direct

Summary

The traditional approach to highways management tends to separate strategy from maintenance from design and build, this paper seeks to show a more integrated flow bringing together all influences for design and use, in a way that the majority of parties will be comfortable with.

The accent of this is not on the transformation to a new way of working, but on how work should continue once the new way of working has been agreed.

Visualising Transformation here is an on-going way to work, enabling the most efficient and effective delivery of services possible to be routine.

The book Visualising Transformation™ contains over 100 diagrams, charts and tables to help provide insight for services to save money by improving services re-investing into the released capacity to add even more value to customers, enabling massive cost savings, typically with no loss of employment.

Introduction

There are many factors to consider when setting the Council Tax for next year, just trying to maintain services within an ever-reducing budget, with ever increasing demands can be enough of a problem on its own.

Highways will, by definition, be a challenging service to address, in that budgets are being slashed; environmental impacts are becoming more extreme, with flash-flooding, storm force winds, very hot summers and bitter winters more likely, while economic pressures from increased material and energy costs just make the situation seem impossible.

There is an increase in the overall population; there are more cars on the road, travelling further each year, with frequent changes of jobs, leading to more commuting. There is a general diminishing size of house-holds which again creates houses, then more journeys, and an even greater length of carriageways to maintain in the future.

Behind all of this, the public sector has become less business-like over the last decade, reducing the general capability to achieve innovative improvements to service delivery, relying far too often on cloning ideas from a minority of more forward thinking authorities.

The last major influencer for service design is the national media. While most people accept the changing pressures on the world eco-system, with fast diminishing raw materials, and global warming leading to ever more dramatic weather related extremes, some members of the press find it amusing to cause sensationalism to sell papers, rather than consider the wider issues of stewardship for our children's children.

Operational Management

The management of highways across an area depends on a myriad of inter-dependant issues to be: known, integrated, weighed and evaluated. These are traditionally run as a series of budgets, with a service professional in charge of each area, with an occasional balancing act being performed from the centre. Thus Street Lighting, Urban Traffic Control, Car Parking, Highways Repairs, Highways Management (including what was NRSWA (New Roads and Streetworks Act)), Development Control, Trips and Falls, Drainage, Highways Agency (Trunk Roads), Major Works, Accident Prevention and Transportation all work mainly as self-sufficient units.

Sometimes the central team controls all these functions, while others may have a central strategic function with developed local working. Either way, management silos tend to emerge to run specialist functions, almost in blissful ignorance of the whole picture.

The 'glue' to all this tends to be the Local Transport Plan (LTP), which is designed as a 'checks and balances' approach, seeing all the things that need to be done, against those that we wish to be done, trying to juggle over a hundred balls in the air, with one hand tied behind the back. Needless to say, the LTP takes considerable design, is discussed endlessly while being reviewed and is never right.

The LTP provides a core structure, evaluates development area and growth pressures, oversees consultations, and addresses the condition of the existing highway infrastructure. All these aspects taken together then enable the future budget allocations to be determined, sometimes via very logical approaches, sometimes heavily influenced by political pressures, and sometimes a mixture of momentum and random decisions, but rarely entirely scientific.

What is clear is that no one method of management or data presentation will be appropriate for all aspects of work. Some aspects, such as, street lighting is predominantly repetitive, with frequent night-time observations of all lights, to address the occasional light not working, dealing with accidental and deliberate damage, monitoring costs and effecting bulk changes of lanterns. Where-as major highway design and construction is entirely project driven, with every project having unique, but similar issues to contend with.

It's this wicked mess of conflicting demands that makes Visualising Transformation (VT) the best integrated approach to managing these diverse pressures in such economically difficult times.

Highways management is based on civil engineering, which is based on scientific principles: material properties, project management, statistical analysis and design, etc. Civil Engineering is also very visual, using maps, then creating plans and cross sections of designs, elevations, 3D images and models, Gantt charts, critical path analysis.

Displaying all of this in GIS would enable the rapid identification of urgent through to no issues, but would also be able to add in other layers, such as areas with high pedestrian activity close to schools, hospitals or sheltered

housing, or traffic demands and when peak issues would occur. In addition, photographs of the latest condition or actual condition reports could be filed against each transect.

So the VT approach enables better diagnosis of issues and a stunning presentation capability to the decision makers, such that the worst areas can be scientifically presented without the need for a lengthy committee report.

If the evaluation for this year's LTP budget is the core focus, each transect could carry the budget cost of repair, so as roads are selected for inclusion or exclusion, the running projected budget could be constantly in view, enabling all the less scientific juggling to occur, perhaps with the non-selected blue categories remaining highlighted as not included.

Strategic development

In any form of service delivery, who is to say what is the *best solution*? Highways touch virtually every person in a community, therefore there will be a considerable variety of concepts as to what are the prime needs, the two extremes may be; enable great pedestrian, cycle and public transport, to the car is king, let it get everywhere.

In order to achieve a perfectly balanced, but acceptable highways infrastructure which is efficient and effective, the design needs to address issues which are wider than just environmental and customer facing.

The strategic decisions should give consideration to Customers, Environment and Costs. Whatever your motivators within the highways industry, these three aspects will enable a balanced design with optimised outcomes.

If that simple triangle is the basis for the initial discussions, the next steps would be to flesh out what is important for the customers and the environmental needs, comparing possible next steps against the current starting point.

CORE HIGHWAYS STRATEGY



What are the issues to be addressed regarding the environment?
Which are more important, local, regional or national issues?
What options are there for journeys in your area? What is being developed or could be developed alone or in partnership?

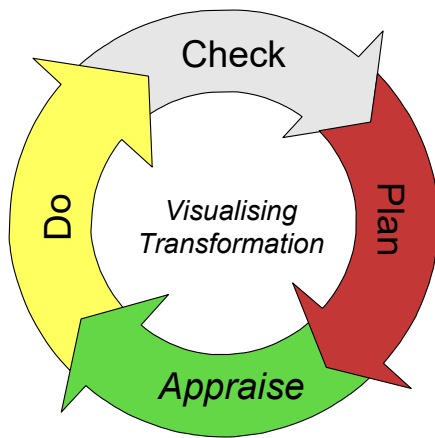
Who is to say what the customer actually wants? There will be many demands, wants and wishes for a highways strategy. The best way to find out what the opinions are, is to ask the public, enabling not only quantitate responses, but also qualitative replies. Effectively you need to map what is wanted with the boundaries of acceptability defined.

Elemental Management

Each of the professional elements discussed earlier lends its-self to review by 'Lean Systems Thinking' methodologies, there are case studies relating to these within Vanguard and Support Services Direct, for pot-holes, and highways trips and falls for instance. It will not be uncommon for costs to reduce by a factor of four, while the effectiveness of service improves far more than that. (Highways trips and falls, costs down from £300K to £67K, time to create investigation report from 90 days to 2.65 days, with 100% accurate reports achieved)

Experience has shown that a systemic based approach, addressing strategic and operational aspects in combination, viewing the service as end to end work, from both customer and technical points of view, will enable the most value to be achieved. It is likely that elements of service delivery could be initially reviewed using LST to improve the efficiency of the service.

A new methodology has been developed from Lean Systems Thinking, called Visualising Transformation™, for just such a demand. Visualising Transformation has a core methodology based on the Check Plan *Appraise* Do cycle, which is usually depicted as a continuous circle of events:



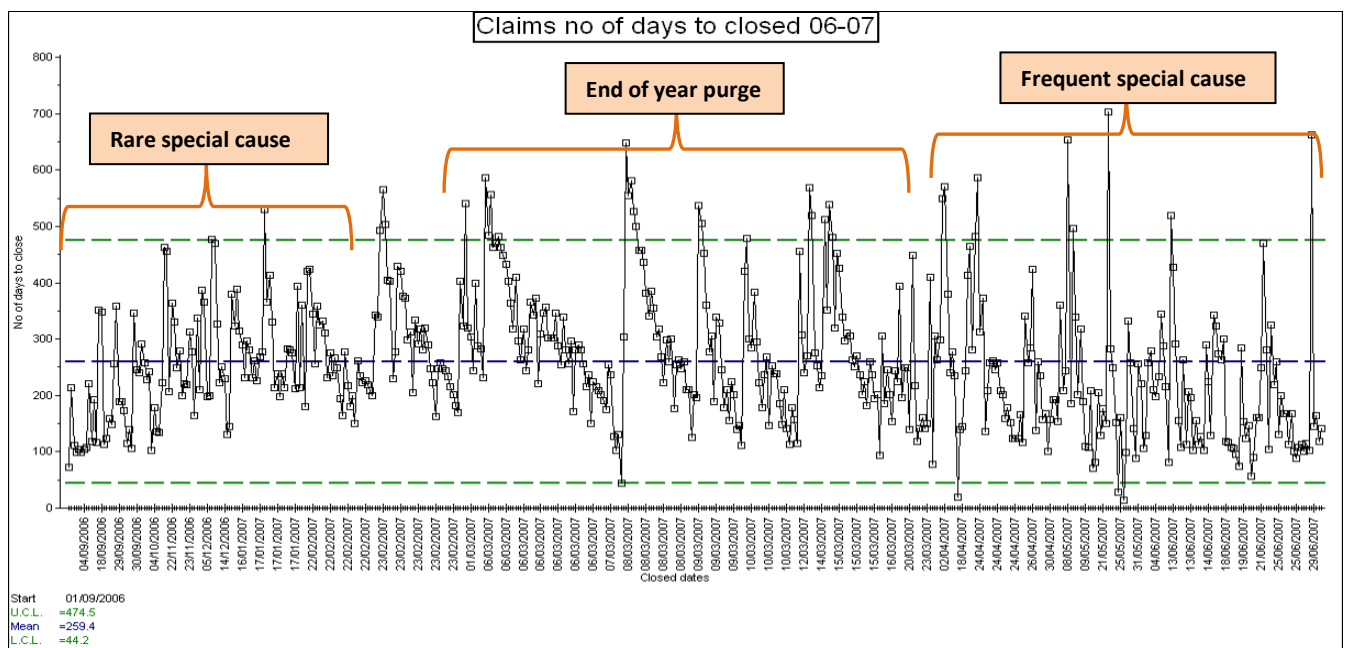
Check starts from the initial discussions with a project sponsor, to understand the needs and constraints of the project. What is needed to be achieved, when is it needed by, how will success be defined?

An intervention team will be created using change and highway management experts supported by all colleagues involved in the operations. This team will be trained in change techniques to help create far better awareness of how work is carried out now, what the outcomes are, and what the potentials may be.

Data will be collected and displayed in a number of ways in order to enable new insight for the hosts, so they understand the principles of cause and effect. Work is analysed, mapped with achievements fully understood, and special needs and causes agreed.

Data will be cleaned and transformed into meaningful information. Some previous beliefs will be challenged. Run charts will be produced with comments added to show a change of system, or exception to normal working. The control chart below is quite typical of administrative style operations in the public sector.

The concept for a control chart is that any work that performs between the upper and lower control limits, is a result of normal cause, while those above or below these are special cause. This is based on industrial applications of the method where uniform items can be constantly made. The public sector has a wide array of special cause issues which may sit inside the upper and lower control levels. While the data below is for a nine month period, over 40% of the records were completed in March, a typical end of year purge!



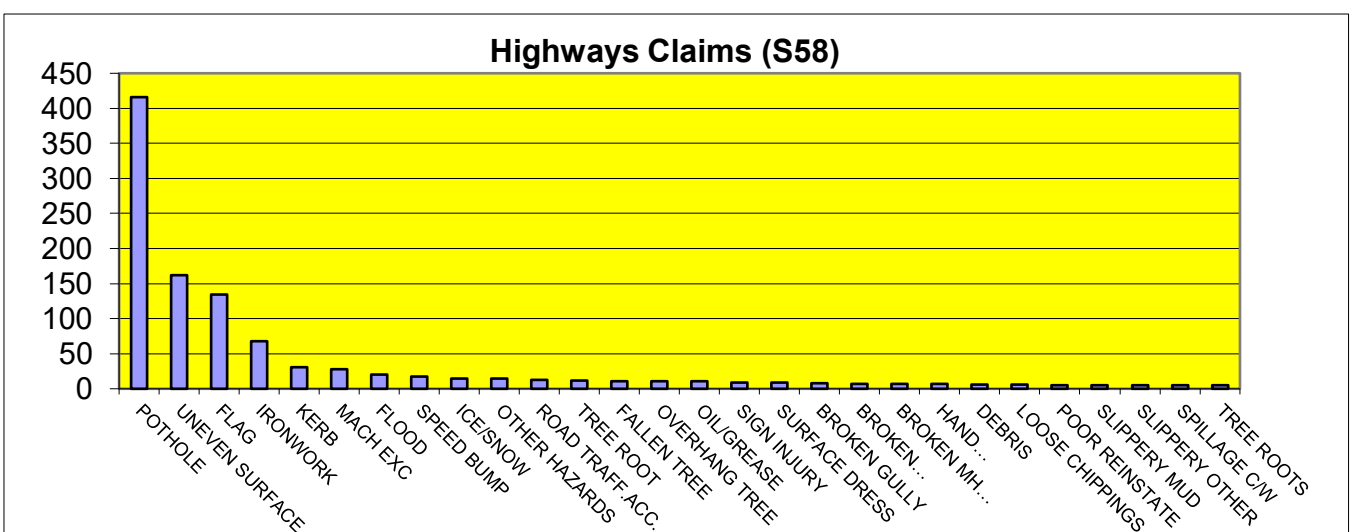
This shows an amazing scatter of performances, there were six operational areas, and all sorts of changes in the background. Are there six area backlogs in March, cleared from oldest to most recent one area at a time? Note the range as well, from around 2 years down to a few days.

That's one area where 'special cause' built into the system would apply, the repudiations in a few days will be where the claim is outside of the County or due to works by a statutory undertaker, where the SU will be deemed liable, thus 'complete' for the council. The fact that the March purge can occur also shows that the time to do the work is relatively quick compared to the relative importance of processing these.

The CPAD approach to this function realised a reduction in costs by over a factor of four, and a reduction in time to do the work by more than a factor of thirty. An interesting observation before we trialed the new solution was that having one technician driving around the whole county would be so inefficient! The cause and effect chart below shows the breadth of issues that we addressed, we also created a mind-map to see what opportunities to integrate ideas for service delivery could be presented.



Breaking the headings down as above enables clarity of what issues there are, and where they are. Some issues will be repeated in different branches of the diagram, others show how this piece of work links into the bigger picture, addressing processes, systems and events both prior to this work and after. The overall concept was to 'Reduce Costs', thus in 'Linkages' we broke that down into four sub-headings of Management Strands, Enablement, Systems and Reduce causes.



The idea is to be able to understand an holistic relationship between divergent issues, while targeting specific areas to improve. Some of that targeting was achieved using a Pareto analysis chart as above, which also showed that the call centre allowed too many 'free-type' descriptions of cause, many adding nothing to intelligence.

Parallel pieces of work were carried out on establishing a call centre which used GIS as the initial call handling and service action point, dealing with customer issues in an holistic / joined up manner, improving the pot-hole react and repair service, increasing control on openings and repairs by statutory undertakers (ex NRSWA works).

Elements of the 'Trips and Falls' work above showed that well over 50% of all surface defects were initially due to a previous trench, in most cases well after a year had expired, often due to a low specification of repair or poor workmanship. The council had intended to reduce inspections and control of these works, prior to realising that the savings were a small fraction of the latter cost burden. In another authority, an additional NRSWA inspector became self-financing simply via increased fines, at the council involved I was able to show £6,000 worth of fine income possible from a single five mile walk. The new strategy and revised structure determined to increase 'NRSWA' management rather than to reduce it.

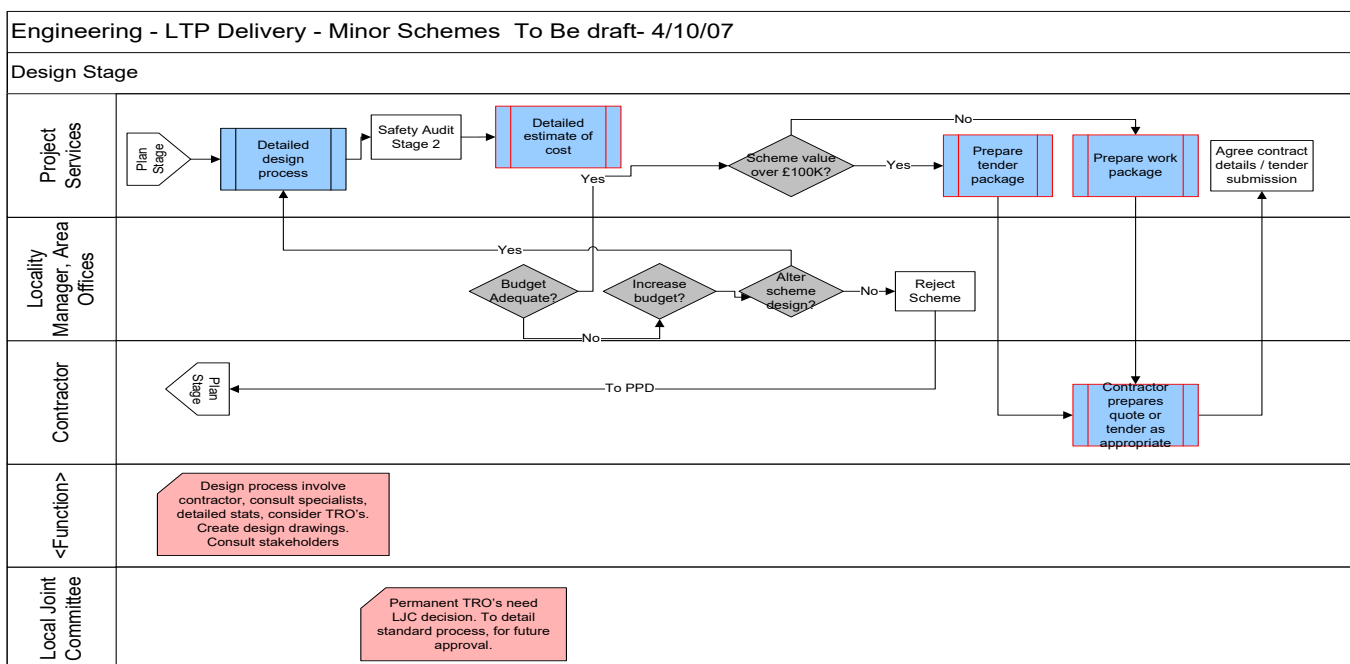
The methods of dealing with pot-holes was also reviewed, linking a two man team using a flat back lorry, to a man plus van, with a supervisor controlling both teams in real time, i.e. not going out and covering a street in spray paint boxes, detailing them, then sending them to the contractor to deal with in the coming weeks. Two men dealt with larger holes, using conventional techniques to break out, painting edges with bitumen and compact asphalt into place, while the other dealt with smaller holes, using a broom and spade to prepare a clean base, and then using proprietary bagged asphalt to spade in and compact with the rear of a spade, or simply painting emerging cracks.

The four men achieved about eight times the amount of work that an inspector and a three man team would carry out, at around one quarter the unit costs. Repairs were to a quality and specification which would be far better lasting than originally.

When the Pareto analysis as above, was considered and refined by highways experts rather than call centre operatives, the second most common cause of trips was tree root paving lift, while the third was failing pot-hole repairs. Thus the one intervention start for 'trips and falls' led to a better resourcing of NRSWA which would be more than self-funding in the short term, with a four-fold reduction in pot-hole repairs. Both NRSWA and pot-hole improvements would lead to a safer highway network, which would then reduce the amount of trips, and ultimately lead to less claims, less costs and lower insurance payments / premiums.

VT is also very powerful for the design of major schemes where consulting with the public and interest groups can virtually halt work. The Government is now seeking to place even more power to the local people, where perhaps 15% of the interested parties could stop work from happening, so how can consultation be managed to be efficient and effective.

Within a 'Plan Do Check Act' environment, workflows were designed with the whole team for major and minor works to be '**Plan Design Construct Assess**'. The workflows for this was designed in flowcharts with swim lanes, so that all parties were involved as early as was possible, enabling monitoring and sign off at each stage.

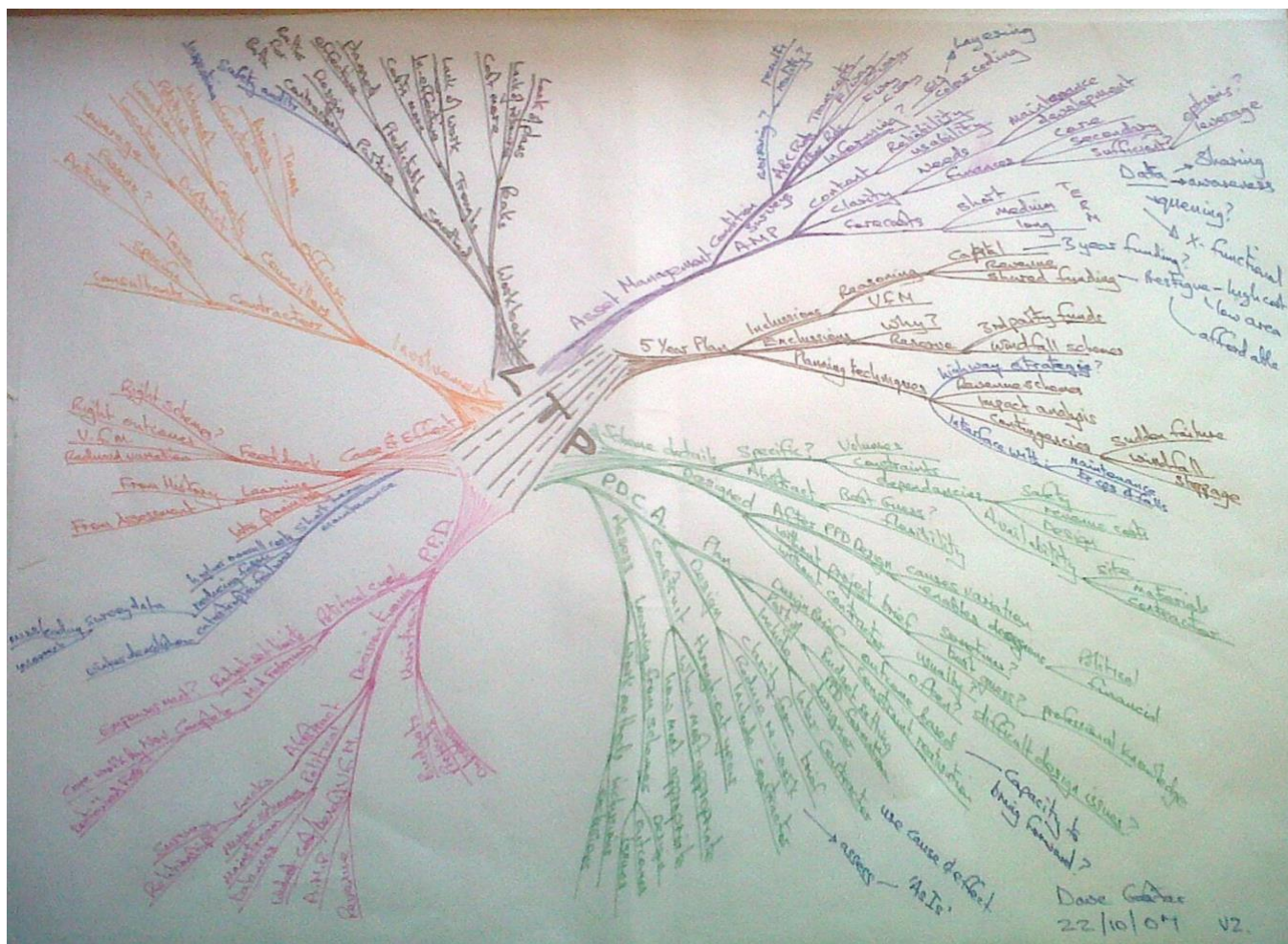


The flow above is the second page at design. The benefits of this standard approach were considerable, as the process to design these enabled dialogue and the freedom to comment from previous minority influencers, in such a way that the LTP gained scheme clarity and the contractor was able to design in an ease of build before too many constrictions were added.

The last element of Assess, was aimed at gathering learning points from the work, did it come in on budget and time, were there any health and safety issues, was there difficulty with traffic management or the ease to build that style of design. The concept was to consider all these points and reflect for future schemes, creating a learning organisation.

Prior to these reviews, virtually every type of design work had its own unique way of progressing, our 'As Is' mapping showing just how under-designed or evolved these all were. We took this new **PDCA** approach as above and aligned that into all the LTP design work-streams, including safe routes to schools, street-lighting, footpaths and bridleways and many more. From an LTP monitoring point of view, the work position would be at one of the PDC or A levels, current financial estimates were known, and constraints reportable, suddenly the whole process came into vision.

The mind-map below shows how a very wide series of issues can all be considered together, so that specific thoughts about one area can be reflected into other areas. This is a typical second draft, the first is usually in pencil with far less structure, starting from a 'brain-dump' simply to bring structure to next steps, or informal discussions. The later added blue comments reflect secondary thoughts or latter discussions.



The black area shows some of the outcomes arising from a lack of planning, bottle-necks, too much consultation, or seasonal variation of work flow. Cause and effect charts could be created to analyse how to reduce costs, or how to smooth work flow, then work back via the five whys to establish root cause and perhaps a Pareto analysis to see where the maximum influences are.