

Analysis of a public sector organizational unit using strategic and operational analysis tools

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The author hereby asserts his moral right to be known as the Author of this Article.

Abstract

This paper reports on a project which analyzed the processes carried out by a unit within a public sector organization. The method used a combination of strategic and operational analysis tools. This combination proved to be complementary and effective in practice. This outcome of the study suggests that where a process analysis project has strategic considerations, as many do, then the use of strategic as well as operational analysis tools should be considered.

1. Introduction

This paper is a case study analysis of the machinery yard unit within a public sector organization. A combination of strategic and operational tools was used to carry out the analysis. The paper follows in a line of process analysis case studies of public sector activity (Hughes et al, 2006). It also follows in a line of research that advocates combining strategic and operational analyses (Kiraka and Manning, 2005) and the use of multimethodologies when undertaking operational and strategic analysis (Mingers, 2001). Broadly speaking the project is a process reengineering study (Davenport and Short, 1990; Hammer, 1990; Hammer and Champy, 1993) although information technology does not play its typical enabling role.

The public sector organization in question is a local authority charged with providing road, housing, cultural and other services to a community of approximately 150,000 people in a county of approximately 2500 square kilometers in area. The machinery yard (hereafter referred to as the yard) was originally set up four decades ago to manage the vehicles and equipment belonging to the local authority. Most local authorities in the country set up, and still operate, a machinery yard.

The yard comprises a premises, vehicles and equipment and employs 34 permanent staff. The premises consists of a hard standing area for vehicles, an indoor and outdoor store, a vehicle workshop and a fitter workshop. Vehicles comprise ten 10t tipper trucks, two articulated tractor rigs, two tanker trailers, two low-loaders, two rubber-wheeled rollers, two chipping spreaders, one bitumen spreader, one tractor with steel brush, three integrated pothole patching trucks and miscellaneous other vans and pickups; other equipment stored in the yard includes eight salt gritters that fit onto 10t trucks and nine snow plough attachments. Of the 34 staff the majority (23) are truck or machinery drivers, five are fitters and one is a general operative; administering and supervising the yard are five staff members: the yard engineer, the yard foreman, one accounts clerk, one store man and one quality assurance technician. During the peak summer season six additional temporary workers are employed – one driver and five general operatives. The age profile of yard employees is high with twenty two employees over fifty years of age and six over sixty.

The yard undertakes a variety of activities ranging from road maintenance to water and wastewater facility maintenance. From these activities the yard generates annual revenues of €5.8 million. The annual cost of running the unit is €5.7 million and so the unit makes a modest profit margin of just under 2%. However full head office overheads are not applied to the unit; if these were to be applied then it is likely that the costs would exceed revenues. Surface dressing of primary and secondary roads within the county is the most significant activity carried out by the yard accounting for 60% of revenues.

A strong overtime culture permeates the yard. Historically work practice agreements between the union and the organization have resulted in agreed overtime hours for additional duties. Over the past twenty five years a succession of these agreements were made. This has led to the current situation where most of the yard workers (drivers and fitters) receive regular rostered overtime i.e. overtime that is automatically received each week. The most financially significant agreement is that for travel time: drivers and fitters receive overtime for traveling from their home to the yard in the morning and from the yard to their home in the evening; for many employees this amounts to 17.5 hours of standard pay each week for every week of the year including annual leave.

Regular rostered and other overtime has led to several yard drivers and fitters being among the most highly rewarded employees in the local authority. It has also led to a fixed labor cost of €17,000 for regular rostered overtime that must be applied to yard activities. These high labor costs have also led to yard employees not being replaced by the local authority when they retire as was the case for two recently retired drivers.

The motivation for this study stems from the fact that the yard is currently renting its premises and the lease is shortly due to terminate. The yard has obtained from the local authority a site a short distance from the existing premises and has invited tenders for the construction of new premises on this site; tender quotations indicate that cost of a new premises will be of the order of €4 million. Before committing to this investment the local authority wished to analyze the activities of the yard with a view to improving their

efficiency and effectiveness. The alternative to relocating activities in the new premises is to close down the yard and outsource the activities to the private sector.

This paper is organized as follows: the method used to carry out the study is discussed in section 2. The operational level analysis is discussed in section 3. In section 4 the strategic analysis is developed. The redesign of yard activity is addressed in section 5. Section 6 concludes.

2. Method

The literature recommends that a modeling project should have input from two sources: domain experts and knowledge engineers (Roberts et al., 1983:7; Ljung and Glad, 1994:16) or process analysts (Klein and Petti, 2006). Domain expertise was provided by the yard engineer and by the director of infrastructural services of the local authority who has overall budget responsibility for the yard. Process analysis skills were provided by the author.

The approach taken was to use a mix of techniques from the fields of strategic analysis and operational analysis. This was because initial discussions with the domain experts indicated that the problems facing the yard were not simply to do with operational efficiency: a major strategic question-mark hung over the future of the yard. Also, as discussed earlier use of multimethodologies is useful in its own right.

The primary strategic techniques used were environmental analysis using the PEST technique (Wheelen and Hunger, 2006:73) and Porter's Five Force analysis to determine the attractiveness of the industry (Porter 1980 and 1985). PEST analysis provided the author with a thorough understanding of the political, economic, social-cultural, and technological context in which the industry is set and of the forces driving change in the industry. The Five Force analysis allowed the author determine the level of competition taking place in the industry. It also allowed the author formally consider alternatives such as the possibility of new entrants and substitute services; this forced thinking beyond the supplier-firm-customer process chain.

The primary operational analysis techniques used were process decomposition (Martin, 1986:565) and soft system methodology: SSM (Checkland, 1985 and 2006). SSM is a formal methodology for structuring messy problem situations and taking action; this allowed the author untangle the knot of activities initially presented and consider the yard's situation from the viewpoint of a number of different actors. For a state of the art discussion of problem structuring methods refer to the special edition of the Journal of the Operational Research Society (2006. **57**: 757-883).

The approach taken was three-pronged and consisted of qualitative interviews with key actors, participant observation of activities as they actually took place, and an archival study of yard documentation (see Bryman and Bell, 2003 for an explanation of these methods). Semi-structured interviews lasting between one and three hours were held with the director of infrastructure, the finance officer for the local authority, the yard

engineer, the yard supervisor, the clerical officer, the storeman, two customers (area engineers) and two bitumen suppliers. One full day was spent observing the surface dressing process. One full day was spent observing the water facility maintenance activity. One half-day was spent observing the pothole patching process. One half-day was spent observing the stores operation.

The project was carried out over a six-week elapsed period during the height of the summer surface dressing season. As winter gritting of roads does not take place during the summer season it was not possible to directly observe that activity.

3. Process analysis

The initial process level analysis carried out was to prepare a high level decomposition of the activities carried out by the yard. These were identified as:

- Road maintenance
 - Surface dressing
 - Winter salt gritting
 - Drawing chippings
 - Pothole patching
- Facility maintenance
 - Water facility maintenance
 - Waste water facility maintenance
 - Roadside water pump maintenance
- Stores management
 - Materials stores management
 - Diesel fuel management
- Vehicle hire-out
 - All year hire out of vehicle and driver
 - Off-season hire out of vehicles.

Each activity was then analyzed in turn and in detail. Activity decomposition diagrams were prepared for each of the high level activities listed above. Process maps were not prepared as it was felt that these would add little value to the analysis and so were deemed unnecessary. Activity decomposition diagrams were determined from information gained from interviewing participants and from observing the processes in action. This twin approach provided a degree of triangulation of results.

Each high level process (second level in the above activity decomposition diagram) was analyzed using the CATWOE technique. This is a technique from soft systems methodology that is similar to process mapping but takes into account that the various agents involved in the process may hold different worldviews. CATWOE is a mnemonic for customers (victims or beneficiaries of the process), actors involved in the process, transformation (of inputs into outputs), world-view, owner (who has authority to stop the process), and environmental constraints (that impact on the process). The transformation is linked to the world-view of a particular agent and is formalized as a written-down 'root

definition' statement. Several world-views, and hence different views of the transformation taking place, may exist.

While in the project all the high level processes were analyzed, for space reasons in this section I will concentrate the analysis on the surface dressing process which is by far the most significant of the processes carried out by the yard. The owner of this process (and indeed of all yard processes) is the director of infrastructural services who has authority to increase or decrease the level of yard services or indeed terminate the service. The director is also the penultimate customer as it is from one of the director's budget headings that all yard services are paid. As discussed in the previous section area engineers are also customers as they are authorized to requisition the surface dressing service. Ultimate customers are the road users and taxpayers.

It is useful to consider the various transformations that take place. At the primary level chippings, bitumen and operator skills are inputs that are transformed by the surface dressing process into a finished road surface. A formal root definition for this is: 'a system to transform bitumen and chippings into a finished skid resistant road surface'. The world view here is a technical one in which inputs are transformed into outputs in a manner that is technically efficient and effective and represents that of the yard engineer.

The actual surface dressing is carried out by a train of vehicles much like a moving assembly line. Preparatory work is firstly carried out: safety and diversion signage is placed in position, the road or carriageway is closed off and traffic diverted or managed via a stop/go system; an agricultural tractor equipped with a wire brush sweeps all debris from the road surface. A tractor and tanker trailer with attached bitumen spreader distributes a thin layer of bitumen across the surface of the road. A chipping spreader, hitched to a reversed tipper truck supplying chippings, distributes a layer of chippings over the bitumen layer. Next follow two rubber wheeled rollers that embed the chippings into the bitumen layer. Finally follow a number of general operatives who clean out any debris left after the process, fill any gaps in the dressing, and remove any excess chippings. When the tipper truck is empty of chippings it unhitches and travels to the nearest chipping dump to refill. A fleet of eight to ten tipper trucks, depending on the distance to the dump, keeps the spreader supplied with chippings. The second tractor and tanker trailer rig collects bitumen from the supplier ensuring a constant supply of bitumen. Once the new surface has been sufficiently rolled the road is reopened to traffic although a safety vehicle leads traffic for a period of time to ensure that a slow speed is maintained. Twenty permanent and four temporary yard employees carry out the surface dressing process. Area offices provide an additional four to ten employees making it a considerable operation in terms of personnel and equipment.

The surface dressing process has been well honed over the years and is carried out in a technically efficient manner. Set up costs for each job are high as the slow moving vehicles take some time to travel to the site or else must be transported by low loader; ideally jobs should be substantial enough to take up a full working day. Average daily output is 25,000m² of dressed road; output for the season is approximately 2 million m² of dressed road.

Monitoring and controlling of the activity is carried out by the yard engineer who directly supervises the surface dressing activity. Monitoring and controlling of bitumen, chippings and finished surface dressing is carried out by the yard technician who takes samples on site and later tests them in the yard laboratory; performance measures exist against which to rate each sample.

A number of constraints on the process exist. Surface dressing can be carried out only during the warmer months of the year: bitumen will not bind to chippings in low ambient temperatures. In recent years yard employees who retired were not replaced; many of the current employees are due to retire in the next few years and might not be replaced. Many of the yard vehicles are old; the local authority has been slow to invest in new vehicles for the yard.

At a more strategic level the transformation is as follows: the inputs are the county's roads and these are transformed over the course of a planning period into safer roads. A formal root definition is: 'a system that maintains the road network of the county at a satisfactory level of skid resistance in an effective and efficient manner'. The viewpoint here is managerial and the issues relate as much to prioritizing, scheduling and budgeting as to technical efficiency. Constraints are the available budget and the number of kilometers of road that it is possible to treat in a season with one surface dressing train. A greater number of options for providing skid resistant road surfaces exist under this view. For example, roads could be surfaced using a more expensive but longer lasting surface such as hot-rolled asphalt. Alternatively the entire surface dressing activity could be outsourced to private contractors. Both of these alternatives are entirely consistent with this world-view. These efficiency versus strategic worldviews have parallels with Margherita et al's (2007) efficiency and strategic evaluations of a process where the former takes into account cost and dimension metrics and the latter considers cost and value metrics.

While not formally declared, a third worldview can be deemed to exist: that the yard is a vehicle for generating overtime. The transformation taking place here is to turn inputs - available activity - into outputs - overtime; the beneficiaries of this transformation are the yard employees, in particular supervisors, drivers and fitters. The current high labor cost structure is consistent with this worldview.

3. Strategic analysis

It was realized early on in the project that the issues in the yard were not just process related but also strategic: the high labor costs, the lack of synergy between processes, the hire-out pricing structure, and the gaps in the organizational structure and monitoring and control system. This extension to the project scope required the use of strategic analysis techniques. I used two techniques: I reviewed the environmental analysis using the PEST technique and I reviewed the industry analysis using the Five Force analysis technique. In this section I again concentrate on the surface dressing process as this is the most

significant of the processes carried out by the yard and the under most scrutiny within the local authority. .

Firstly I carry out a PEST - political, economic, sociocultural, technological – analysis. Political change in recent years has led to several high profile new management initiatives within local authorities resulting in a stronger emphasis on strategic planning, customer service and value for money. One outcome of these initiatives is that local authorities have begun to outsource operational activities; for example refuse collection has been outsourced to private contractors by many local authorities.

The primary outside influence on the yard has been the external economic environment. Over the past twenty five years the economy of the country has moved from being characterized by low labor costs and high unemployment to one of high labor costs and low unemployment. The increase in labor costs has had enormous impact on the yard as agreements denominated in overtime hours were inflation proof. As labor rates dramatically increased nationally in recent years so too did the cost of paying for work practice agreements by means of regular rostered overtime. Yard activity became particularly costly when compared with other local authority activity.

The increase in employment and general economic growth has resulted in significant social change. A net influx of people into the country has led to significant increased demand for housing and infrastructure at local and national levels. It has also led to a significant increase in levels of private and commercial traffic on regional and national roads. The increase in population, traffic, and demand for housing is particularly keen for this county as its towns act as dormitories for a nearby major city. For the yard this has required that increased attention be paid to traffic management and public and employee safety when carrying out surface dressing activity.

The technology used in yard activities has undergone little change over the past several decades.

I will now examine the attractiveness of the industry using Porter's Five Force technique. I will firstly consider 'rivalry among incumbent firms'. Surface dressing is largely a monopoly activity carried out by local authorities within their county boundaries. It is not usually carried out by a local authority outside its county boundary although there is no reason why it could not do so if such an agreement was made between neighboring counties. In the county in question the local authority carries out all surface dressing on public roads within the county and does not carry out surface dressing outside the county boundary. Within the county rivalry among incumbents is therefore non-existent. Within the country surface dressing is a collective monopoly with each local authority looking after the needs of its own county. At national level rivalry among incumbents is therefore also non-existent.

Next I consider 'supplier power'. Bitumen binder is a largely undifferentiated product supplied by four large suppliers of which three have depots within range of the county in question. The cost of switching between suppliers is low. While on the face of it one

would expect that supplier power over the industry would be low, traditionally suppliers have held a deal of power in the surface dressing industry and have largely dictated the price for bitumen binder. There is some evidence that this is now changing with incumbents taking a tougher stance when negotiating price.

Some suppliers are forward integrated and carry out road laying work but rarely surface dressing. However there exists a credible risk of forward integration as bitumen suppliers have indicated to the author that, while their primary interest is to sell bitumen, they are prepared to carry out surface dressing if that becomes necessary in order to sell bitumen.

While many local quarries supply stone good quality chippings are difficult to get. The incumbent uses two suppliers both external to the county. During the winter off-season the incumbent typically transports chippings from the supplier to a series of chipping dumps dotted around the county. Chippings are drawn from these dumps during the course of the surface dressing operation. Chipping suppliers are unlikely to move into the surface dressing operation as it requires a different skill set and specialized equipment; they therefore do not present a credible risk of forward integration.

As discussed earlier, labor has also held a great deal of power over the incumbent with unions traditionally negotiating firmly with local authority management and achieving agreements favorable to themselves. High labor costs have effectively eliminated the incumbent's profit.

I now consider 'buyer power'. Area engineers, responsible for roads within the county and budget-holders for road maintenance works, are the buyers in this industry. The county is divided into five areas and the five area engineers compete for the surface dressing service by placing their requirements with the yard engineer at the beginning of the calendar year. The yard engineer then decides the surface dressing schedule for the season and the schedule of hire-out rates for each vehicle. Area engineers are price-takers: they have little purchasing power as they have only one source of supply and can be mandated by their head office to use the internal supplier. Area engineers view the yard's surface dressing service as technically good but overpriced. This is partly due to the pricing mechanism used which results in some jobs carrying a higher per meter squared cost than others depending on whether or not the job was carried out at overtime rates. Also, the first and last jobs of the day bear the entire travel time burden. Jobs are billed by allocating timesheet hours to a job code. A rate for each hour is allocated to include labor, equipment and yard overhead cost: in effect an hourly hire-out charge for vehicle and driver. Area engineers are acutely aware of the high labor costs of the yard.

In recent years area engineers have reacted against high yard hire-out charges by sourcing vehicles for winter road maintenance from private hire-out firms rather than from the yard. Water facilities have also on occasion outsourced maintenance fitters from private contractors rather than use yard fitters. Area engineers have not to date outsourced surface dressing work to private contractors.

The fourth of the five forces is ‘threat of new entrants’. There exists little threat from new entrants to the industry. Due to the current economic boom private contractors have plenty of work and show little interest in surface dressing. However there is no reason why contractors could not enter the industry if they wished as they have the equipment, vehicles, labor and skills required. Recent change in the political climate means that local authorities are receptive to the possibility of outsourcing operational activities such as surface dressing to the private sector.

The last of the five forces is ‘threat of substitute products’. Substitutes for surface dressing exist but these are either many times more expensive or provide insufficient skid resistance. Hot rolled asphalt provides a skid resistant surface that lasts several times longer than surface dressing but is many times the price. Asphalt is laid as the final surface on many national primary roads but its price prohibits its widespread use on secondary roads, of which there are many in this county. Other forms of macadam are used as final surfaces in urban areas where traffic speeds are lower but these do not provide sufficient skid resistance for the open road.

5. Organizational and Process Redesign

While the ‘going-in’ position with respect to this project was to carry out a process analysis and then to recommend a process redesign it was realized early on into the project that the processes were in reasonably good shape but what was needed was a strategic overhaul of the structure of the yard and the activities carried out by the yard. For this reason process analysis focused on decomposition of activities as this was felt to provide sufficient detail for a strategic reorganization; processes were not mapped in diagram form as either the processes were relatively simple and did not require mapping or were in sufficiently good shape that the ‘as is’ process was largely going to remain into the future and mapping would provide little added value. Decomposition was found to be sufficient to identify synergies between activities and inefficiencies within activities.

The major recommendations were strategic and referred to the lack of synergy, the structure of the unit, the command and control systems in place, the cost base of the unit, the pricing mechanism used. Only minor recommendations were made with respect to the processes themselves.

Lack of synergy

Detailed process analysis showed that little synergy exists between processes. The only overlap between the water based, road based and hire-out processes is that the yard supervisor supervises all yard workers: drivers, fitters and general operatives. There exists some synergy within the road based processes in that the same fleet of trucks is used for surface dressing, winter gritting and drawing chippings. However, while the fleet of 10t trucks is acceptable for surface dressing and winter gritting it is inefficient for drawing chippings over long distances as the trucks are too small. The stores provides safety equipment and road signage for use in surface dressing but the level of this activity

is low. The diesel fuel service is used by all yard vehicles and also by other local authority vehicles.

Some synergy exists at managerial level in that the yard engineer is nominally in charge of all yard activity. However, in practice even this work is split between the yard engineer and supervisor with little overlap: the yard engineer is largely responsible for road maintenance activity while the yard supervisor looks after facility maintenance, stores management and vehicle hire-out activity. This situation is even more complex in another respect: the yard supervisor signs off timesheets of the road maintenance crews.

Organizational Structure

The set of activities carried out by the yard had been grouped together under one organizational unit largely for historical reasons. Much of the rationale for grouping them together no longer applied. For example, the new centralized wastewater unit removed the rationale for having a wastewater maintenance facility in the yard and in practice the yard facility had been downgraded to maintain mostly older wastewater facilities. Also, the local authority's need to operate its own stores had diminished over time. Arguably the local authority's need to operate its own machinery had diminished over time as the private sector now has the capability of hiring out all required machinery. Indeed all the work carried out by the yard could be outsourced to the private sector and outsourcing of activity is now an acceptable alternative and actively considered by local authorities.

The study recommended that the activities carried out by the yard be rationalized and the yard focus on road maintenance activity only. It was recommended that the stores operation be discontinued as it was no longer required or viable at the current usage rates. The study recommended that wastewater facility maintenance activity be relocated to the new centralized wastewater unit allowing the local authority gain economies of scale. A similar recommendation was made with respect to the water facility maintenance function. The study recommended that the pothole repair activity be decentralized to the area offices. The study recommended that the surface dressing and winter gritting activity remain, provided the issue of regular rostered overtime was addressed (see recommendation below).

Command and Control Systems

The yard engineer holds budget responsibility for all yard activity but directly supervises only surface dressing, winter gritting and chipping drawing activity. The yard supervisor directly supervises the facility maintenance, pothole patching and hire-out activities. However, the yard supervisor signs off timesheets for all drivers, fitters and general operatives. This situation is potentially problematic as the yard engineer who supervises the surface dressing work on a day to day basis does not sign off timesheets for the staff carrying out the work. Also, the yard engineer, although having budget responsibility for the facility maintenance work, has little day to day involvement in that work. Increased control needs to be placed over the signing off of timesheets and the authorization of overtime.

Pricing of services

The yard in essence operates as a hire-out company: it charges for vehicles on the basis of hours worked (applying different charge out rates for different periods e.g. winter hire-out, standard and overtime with rates increasing in that order). No incentive to increase the efficiency of yard activity exists as all time and costs are simply passed on to the customer. A pricing arrangement based on outputs would force the yard to become more efficient in its cost structure. For example, if area engineers insisted on paying a price per m² for finished surface dressing this would force the yard to monitor its costs as it could no longer simply pass these on to the customer. It would also allow area engineers directly benchmark yard rates against those of private contractor rates forcing the yard to be more competitive.

Other Processes

Stores

Activity in the stores is so low that it is not possible to justify its continued existence. However a considerable amount of procurement of goods and services, especially hire-out of vehicles, is carried out within the local authority as a whole. This activity is largely ad-hoc with the local authority losing out on potential economies of scale. A new unit to monitor and control the procurement of goods and services across the entire organization could be set up, providing a new and expanded role for stores personnel.

Pothole patching

Pothole patching is an area level activity and benefits little from its current location in a centralized yard as pothole patching vehicles must be driven on a daily basis to area offices before moving on to the work location for the day. It is logical for responsibility for the integrated pothole patching vehicles to be decentralized to area offices.

Facility maintenance

Facility maintenance also benefits little from its location in the yard as it has no synergy with any other yard activity. There exists another centralized wastewater maintenance facility within the local authority that is charged with maintaining the more modern wastewater treatment facilities (the yard maintains the older treatment works); the local authority would gain economies of scale if yard fitters were to be relocated to that centralized facility.

Winter gritting

The budget for winter gritting is at area level but areas have no involvement in calling out or organizing the winter gritting process. It is logical for budget responsibility for winter gritting to be centralized. Indeed there is a case to be made for winter gritting activity to be organized on a multi-county level as currently regional roads may be gritted by one county and not by the neighboring county leading to the potentially hazardous situation of gritting suddenly ending at a county boundary.

6. Discussion

The situation described in this paper represents a collection of processes that have developed in an incremental and ad hoc fashion over the past forty years. The path dependent nature of process development was highlighted two decades ago by Hammer (1990). The complexity of the process mix was augmented by an ill-fitting organizational structure and an ad-hoc approach to reward. Environmental, especially economic, changes over time combined with the particular index-linked reward structure in place led to high labor costs. The price setting mechanism whereby all costs are effectively transferred onto customers led to the services provided by the unit becoming very costly. As is commonly cited in the change management literature a crisis led to an examination of the future viability of the unit. The crisis in this particular case was the expiry after forty years of the lease on the premises. This required new premises to be set up and a consequent demand for substantial capital investment. This capital requirement provoked a review of the unit's operations.

While the original 'going-in' position for this project was a review of operations it became quickly apparent that a strategic review was also necessary. This changed the nature of the project early on and required extending the analysis from process mapping and analysis to a strategic analysis of the environment, of the structure of the organization, of the market, and of the pricing mechanism in use. Hence the use of strategic analysis, as well as process analysis, tools became necessary.

Several conclusions can be drawn with respect to the yard itself. Firstly, the yard appears unclear as to whether or not it is carrying out identifiable processes or simply trading as a hire-out firm. Mixed messages are sent to customers: on the one hand the yard appears to take responsibility for carrying out a particular job eg. surface dressing but on the other hand it bills for its services by simply charging out for vehicles and drivers. This has the knock-on effect of making it difficult to determine the profitability of a job: there is no easy way to determine costs and revenues for a particular job. For example, to determine the cost of surface dressing a length of road requires carrying out a cross-referenced search of the accounting database for each vehicle in the yard and the code for that particular stretch of road.

The lack of synergy between the various processes carried out by the yard is also striking. There is no overlap at all between the facility maintenance process and the surface dressing process and no reason other than historical to keep them within the one organizational unit. While synergies exist in theory between the stores operation and surface dressing, stores activity is so low that this synergy is relatively meaningless.

A crucial action for the local authority is to eliminate regular rostered overtime. This imposes a huge cost burden on the yard at all times but especially during the cold season when surface dressing, the primary revenue earner for the unit, is not carried out and revenues are consequently low. This will not be easy to achieve as employees have been earning high wages for many years and will be reluctant to cut back on earnings. Also, anecdotal evidence suggests that similar overtime arrangements exist also in other units

of the organization increasing the scale of the issue and making it even more intractable. However, unless this action is taken it is difficult to see a future for a yard in which senior management has lost confidence. In essence this requires comparing and reconciling the three yard world views: the technical efficiency view, the value for money view, and the overtime vehicle view. The nub about which implementation of change in the yard will centre is this reconciliation of three world views.

The organization must force the yard to act as a contractor rather than as a hire-out firm. Under the current hire-out arrangement the yard has no incentive to become cost efficient as it simply passes on all costs to the customer. The surface dressing process is technically efficient and if it were to also become cost efficient could provide much future useful service to the local authority. The recommendation to charge on the basis of output (area surface dressed) rather than input (vehicle hours) would allow direct benchmarking against outside contractors and go some way towards forcing cost efficiency. The resulting higher profit margin could be used towards funding new machinery and vehicles. Hand in hand with this goes the recommendation to improve the monitoring and control of work done. It is vital that inputs (timesheets) be signed off by the engineer responsible for the yard and that outputs (area satisfactorily surface dressed) be signed off by both the service provider (engineer responsible for the yard) and the customer (area engineer).

Several conclusions may be drawn with respect to the analytical approach taken. The combination of strategic and operational analysis tools was found to be useful in practice. The two sets of tools were complementary: the strategic analysis sets the context for the operational analysis and the operational analysis puts structure on a 'messy' situation making it more tractable for strategic analysis. Both sets of tools are 'soft': the Five Force analysis is a form of economic analysis softer than traditional microeconomic analysis; SSM is a 'soft' operational analysis technique suitable for 'messy' unclear situations that involve people related and technology related issues. Use of this methodology is becoming more common in the business process literature. For example, Skok and Vikiniyadhane (2005) use an SSM technique - rich picture - when analyzing a taxi management system. Skok and Legge (2002) use SSM techniques and take into account multi-perspectives when analyzing the implementation of ERP systems. However in neither of these papers is the CATWOE approach used nor are formal root definitions developed to make explicit the worldviews of the different actors involved in the situation being examined. Other authors have combined the use of strategic and operational methods: Kiraka and Manning (2005) advocate the combined use of strategic and operational level analysis; Nurcan et al (2005) found that detailed process mapping (the 'what') can enable an improved understanding of strategic issues (the 'why'). However, neither of these sets of authors combined PEST and Five Force analysis with process modeling, the former concentrating on stakeholder analysis and the latter on strategic goals.

In practice in this project both sets of analyses were carried out in tandem with no distinction made to interviewees or domain experts. Nor did the analyst use any specific technique-related terminology when carrying out interviews. This was found to be

effective as the interview process was relatively free of jargon and less threatening to interviewees.

The formal decomposition of activities made the situation tractable from a strategic point of view allowing issues to be raised against each distinct activity and also against the yard as a whole. Applying the concept of business processes was a useful one in itself as previously the yard had been viewed more as a collection of vehicles and staff than as a collection of processes. The process view also starkly demonstrated the lack of synergy between the various yard activities. The results of the study support the view put forward by Kirika and Manning (2005) that strategy determines processes and processes in turn determine structure.

The PEST technique, apart from setting the context for the entire study, also provided a number of categories under which the environmental constraints (the E in CATWOE) could be analyzed. The Five Force approach enhanced the CATWOE analysis: concepts of buyer and supplier power, switching costs, availability of substitutes, and threat of backward and forward integration deepened the understanding of customer (the C in CATWOE) and supplier (treated under A, other actors, in CATWOE). The concept of power with respect to setting price, from the Five Force model, added an additional dimension to the process level analysis.

One outcome of this research is to suggest that strategy texts include a review of operational analysis techniques and methodologies and in particular process decomposition. While the importance of processes (Ghoshal and Bartlett, 1998:ch.7) and the process of strategy making itself (Burgelman, 1996) have been accepted into the strategy literature, strategy texts traditionally do not discuss process analysis techniques per se (other than the value chain (Porter, 1985) which is a generic high level process decomposition tool; note however that Porter (1996) has continued to emphasize the importance of activity analysis in his writings). Writers from the operations field have applied their techniques and approaches to strategic level analysis (Warren, 2002; Coyle 2004; Ackermann et al, 2005).

An issue in case study analysis is that it is by definition an observation based on a single situation or on a small number of situations and this poses difficulty when attempting to generalize from one's analysis and conclusions. This issue is well recognized by authors using the case study approach (Barnes et al, 2004). Certainly the specific recommendations relate only to the organization described in this paper. However, business processes are by nature path dependent and it is commonly observed that inefficient working practices build up in an organization's business processes over time as was the case here. This case study describes in detail an instance of such path dependency with consequent build up of inefficiencies: the in-depth discussion in this paper may provide insight to a general audience into the path dependent nature of processes within a socially complex situation and the difficulties that arise therefrom. The case study also illustrates the complex way in which business processes combine social and technical elements. Imposing a technical solution on a socio-technical system without considering the social elements yields sub-optimal results, a finding also of

Barnes et al's (2004) from their analysis of e-commerce implementation case studies. Also the particular combination of tools used in the analysis – strategic and operational – is still relatively novel; illustration of the effective use of such a combination of techniques may also be useful to a general audience.

The major challenge faced in carrying out this project was to avoid getting sucked into analyzing activity in too much detail: the paralysis by analysis problem. This is an ever-present danger in process analysis work (Rosemann, 2006). Use of strategic tools forced the level of analysis upwards and so mitigated falling into this trap. A second major challenge was to ensure that responses from interviewees were accurate. Two levels of triangulation increased the accuracy of the analysis. Firstly responses from one interviewee were cross-checked against those of other interviewees. Secondly the data gained from interviews was cross-checked against the data gained from archival analysis of documents and against data gained from direct observation of activity. Newell et al (2006) used a similar triangulation approach in carrying out their case study analysis of the implementation of ERP systems.

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