Stakeholder perspectives of street works management in England

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Abstract

It is widely recognised that street works are disruptive, have high social costs and are deleterious to highway structures. Notwithstanding this, utility works are critical so that society can enjoy the amenities of a modern world. In striking this balance, this study investigates the policy landscape of street works management in England to gain an insight into stakeholder perspectives of the industry. Semi-structured interviews with industry stakeholders have helped to identify the complexity of the industry and revealed that a number of issues compromise effective street works management. Principal problems include Street Authorities failing to take enough ownership of the coordination process, highway legislation not encouraging joint working due to inherent challenges arising from reinstatement guarantees, and entrenched attitudes and adversarial practices in the construction industry encouraging silo working. Key recommendations include amending highway legislation to support and recognise multi-agency working and Street Authorities undertaking reinstatements on behalf of undertakers to help reduce fragmentation and discharge undertakers of onerous guarantees which contribute to silo working.
Keywords: construction, highways, local government, management, NRSWA street works, policy, utilities.

1 Introduction

An estimated 1.5 million utility excavation works (street works) with a direct construction cost of around £1.5 billion occur in the UK annually [1]. The volume of highway excavations in urban areas has a negative impact on the road

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network causing disruption, premature deterioration [2], increased social and economic costs [1], increased environmental impact [3], as well as compromising the street scene [2, 4]. The cost of road user delays has been calculated at around £5.1 billion, whilst social costs amount to £5.5 billion annually [1]. Yearly increases in activity [5] warrant better highway management to reduce highway excavations and their associated impacts. This paper aims to provide the sector's views about road works and street works performance in order to identify where improvements can be made. To achieve this, 28 semi-structured interviews were held with stakeholders involved in, or affected by road works and street works activity. Under the New Roads and Street Works Act (NRSWA) 'road works' are undertaken by Highway Authorities (HAs) to maintain, rehabilitate and reconstruct highways. 'Street works' are undertaken to install, inspect, maintain, repair or replace utility apparatus in the highway by utility companies [9]. However, for the purpose of this paper, street works will be used to describe both terms given that the public are affected in the same way.

This paper will commence with a literature review providing state-of-the-art of street works management, then outline the methods used to perform the study, followed by presenting the findings and discussion. Finally, the study will conclude with policy recommendations and associated guidance to help improve the management of street works.

2 Literature review

Conventionally, utility apparatus are housed underground in modern densely populated urban cities in the United Kingdom (UK), United States (US), China and Japan [4]. In order to manage street works activity, there appear to be two approaches, technological and policy based approaches [7].

2.1 Technological based approaches

Open cut excavations, also known as trenching have been in operation for around 200 years. Trenching entails cutting and excavating the ground to place utility apparatus underground [8]. Trenching is considered disruptive, expensive and as having high social costs [9]. An alternative to trenching is the use of trenchless technologies, necessitating little or no use of open cut trenching. Trenchless methods include, amongst others, horizontal directional drilling, micro tunnelling, pipe jacking, auger boring, pipe bursting and robotic spot repairs which are being used extensively in operations in Canada, China and the United States [9, 10]. Trenchless technologies can require greater capital outlay than open-cut methods thus discouraging wider take-up [8]. Utility assets are also stored in tunnel systems around the world known interchangeably as Multi-Utility Tunnels, Utility Corridors and Pipe Subways. These tunnels can house multiple utilities within purpose built enclosures constructed for human entry; examples can be found in London, Barcelona, Paris, Athens and Tokyo [11]. Tunnels negate the need to trench the highway but are associated with relatively

high initial capital investment and long-term maintenance costs, making them unattractive propositions for extensive use [8].

2.2 Policy based approaches

Whilst street works policy has received limited attention in literature [9], in practice, several schemes exist around the world. For example, permit schemes in the UK, Singapore and New York enable HAs to issue permits to undertake works on the highway [12]. Further, Lane Rental schemes in London and Sydney enable HAs to rent out highway lanes for specified periods [13, 14]. Examples of localised street works restrictions include:

- One-for-one lane replacement – work promoters in Singapore are required to provide a temporary lane for any lane lost to street works [12];
- Works embargo – any works involving a road closure are generally restricted to a Sunday in Sydney, Singapore prohibits peak hour working and Hong Kong prohibits works between 7am – 7pm daily [12, 14, 15].

The literature review has established techniques used to manage street works, however a knowledge gap exists about stakeholder views of street works policy.

3 Method

This study was undertaken through conducting 28 semi structured interviews; this gave interviewees the flexibility to guide and expand discussions within set parameters [16]. Interviews were conducted in two stages. Stage one comprised exploratory interviews focused around the following discussion themes:

1. Performance of street works management system;
2. Factors affecting street works management;
3. The future of the street works industry.

Participant selection was initially targeted by using snowball sampling initiated by Derby City Council as the sponsoring organisation. From thereon, purposive sampling was used to identify experts. Stage 1 involved 18 traffic management experts from various government agencies and utility companies as well as general managers. 'Experts' were considered as those with interpretative and technical process orientated knowledge [17].

Stage one interviews provided a developed understanding which meant more defined questions could be asked in stage 2 (as detailed in Table 1). Ten interviews were undertaken comprising government, regulatory and business/ public representatives. Purposive sampling was adopted to target appropriate expertise from local authorities and the regulator [18]. Expert knowledge was not sought from business/public interviewees as this was not considered necessary. Table 2 provides a breakdown of the interviewees. Interview findings were analysed using a Thematic Analysis approach involving an iterative process of reading, annotating, and coding of data. This was followed by labelling commonly occurring themes in the data. Themes were analysed, compared and contrasted [19]. Interview findings were blended with literature to provide a comprehensive study.

Table 1: Design of stage 2 interviews.

Theme	Question
Design of overall process	What is your understanding of the process of managing street works? Who are your stakeholders and what challenges does their management present? Do you work with others and how does this influence what you do?
Performance	How do you see the street works process performing generally? What is the current method for measuring street works performance? Does any incentives/penalties framework exist in your sector?
Context	What are the main issues, constraints and difficulties facing your stakeholders when faced with street works? What are the issues, constraints and difficulties of your organisation on the utility sector? What do you consider is working well in street works management?
Future	What current trends are likely to influence the future of street works, and what will their impacts be? What are the future challenges and opportunities for the road works and street works sector? What recommendations would you make to improve the sector?

4 Findings and discussion

This section details the interview findings along with providing some discussion. It begins with describing the key players of the industry to provide context. Subsequently, the interview findings are split into the following themes: performance of street works management processes, factors affecting street works management and future challenges and opportunities.

4.1 Key actors

Before proceeding further it is important to understand who the main players in the street works industry are. The key actors are as follows:

- Street Authority – usually part of a local government authority, with a statutory duty to manage and co-ordinate street works on its road network.
- Highway Authority – usually part of a local government authority, with a statutory duty to repair and maintain the fabric and structure of its highways.
- Undertakers – usually those involved with the execution of works related to utility apparatus; they have a statutory duty to make efforts "to co-operate with the street authority and other undertakers" to assist with street works [6].
- Regulators – with the exception of the telecoms industry, the water, electric and gas sectors are subject to substantial financial regulation. Other industry regulators also monitor different aspects of their activity.
- Construction industry – the utility industry relies on a chain of contractors and subcontractors from the construction industry to undertake works on its behalf.

Table 2: Breakdown of interviewees and codes.

Group	Subgroup	Interviewee codes	Interview stage 1	Interview stage 2
Government	Central	NG1-2	✓	
	Local	LA2	✓	
		LA1, LA3-5		✓
Regulator		R1-2		✓
Utility	Electric	UE1-3	✓	
	Water	UW1-4	✓	
	Gas	UG1-3	✓	
	Telecoms	UT1-2	✓	
	Miscellaneous	UM1-2	✓	
	Industry representative	UR 1	✓	
Business and Public	Business	B1-2		✓
	Public	P1-2		✓

4.2 Performance of street works management

This section discusses the performance of street works management as identified by interviews. Findings have been categorised into two main areas of performance: process performance, which examines the administrative and office based elements of street works management; and construction performance which covers the on-site operational aspects of street works management. In order to rationalise the findings, discussions have been split into a number of construction performance indicators and adapted [20] as follows:

- quality – the degree to which a street works process satisfies user's needs;
- functionality – the degree to which a street works process fulfills its intended function;
- efficiency – the minimal degree to which a process expends time and effort;
- cost – the degree to which street works activity provides value for money.

4.2.1 Process performance

Process performance is concerned with the operational elements of street works and focuses mainly around the interactions of SAs and undertakers.

4.2.1.1 Quality – Undertakers felt that SAs compromised the quality and effective management of street works due to lacking ownership and determination (UG1, UW2). Interviewee UG1 stated "collaboration doesn't happen unless local authorities make it happen." Interviewee NG2, a government agency asserted; "it is incumbent on local authorities to coordinate and not utilities." Undertakers (UE3, UE2, UW2) expressed a desire to work with others but found it hard to initiate multi-utility working because of the logistics of seeking and contacting other undertakers. Indeed inter-organisational collaboration is considered innately difficult due to the involvement of multiple

actors [21]. SAs should therefore seek to provide effective management of multiagency working through taking ownership of street works and providing genuine leadership, vision, strategy and engaging organisational buy in [22, 23].

4.2.1.2 Functionality – Interviewees alluded to prescribed Coordination meetings tending to be poorly planned, inefficient, and superficial (UM1, UM2). Literature corroborates that coordinated working in the construction industry tended to be scripted with little genuine collaborative effort [24]. To help address this, SAs should plan and manage co-ordination meetings diligently to maximise potential multiagency working opportunities.

Further, undertakers felt that SAs were not interested in long term coordination plans (UM1, UM2, UW2, UW3). UW4 stated "Local Authorities don't have very long term plan in comparison with utilities who may plan for 30 years." Reasons behind limited long term plans amongst SAs could be:

- HA budgets – local government funds are awarded annually and are not ring-fenced; this discourages long term planning and spending. Further, austerity cuts have meant reduced budgets and uncertainty over future allocations [25].
- Elections process – frequent elections can cause changing political structures, thus also promoting short term objectives [26].

4.2.2 Construction performance

This section will consider views on construction performance around on-site operational issues and factors including silo working and financial penalties.

4.2.2.1 Efficiency – Interviewees generally agreed that undertakers sought to work individually, as this was more convenient for the undertaker and the construction supply chain. LA5 explained "utilities are tied into contractors who then sub-contract. Two contractors agreeing to work together does not happen as companies want to maximise their profits." The construction industry is well documented as an industry symptomatic of fragmentation through its processes, procurement and working practices, [27] and driven by entrenched adversarial relationships where there is not a natural desire to work collectively for the common purpose [21]. Further, the construction industry was considered a key party in enabling/restraining advancement of street works (LA1, UG1, R1, R2). To address this, construction firms should seek to manage contractors through performance measurement and management frameworks to evaluate, control and improve performance [28]. Carefully planned communication and contractor management strategies could help change behaviour.

4.2.2.2 Costs – Undertakers felt that SAs were using the NRSWA legislation to unnecessarily financially penalise undertakers through section 74 charges and FPNs (UW1, UG1, UW2, UW3, UW4, UR1). Interviewee UW2 felt that the utility sector was being used to substitute local authority austerity cuts with UW4 remarking that "street works are seen as a cash cow." The regulator supported undertaker concerns; "utilities feel that they can get penalties easily. They (SA) see it as an opportunity for raising money" (R2). In contrast, LA1 and LA3

expressed unapologetic views suggesting that financial penalties were avoidable and often calculated: "it may be cheaper for undertakers to receive a fine from us than the logistics of stopping and starting works again on another date" (LA3). Trust is an important component for inter-organisational working; however, an environment where parties feel suspicion and mistrust is unlikely to support a conducive environment for collaborative working [22, 23, 29].

4.3 Factors affecting street works

This section will look at those factors that interviewees considered had an indirect impact on street works management namely, regulatory structure and industry standard.

4.3.1 Regulatory structure

Undertakers reported conflicts between highway legislation and industry regulation, as well as competitiveness in the telecoms sector effecting street works management. These discussions will be elaborated on further.

4.3.1.1 Conflict in industry and highway regulation – Some interviewees reported significant 'clashes' between the obligations of NRSWA legislation and respective monopoly industry regulations (UE2, UM1, UG1, UW1, UW2, UW3, UW4, LA1, LA4). Interviewee UE2 summarised: "neither regulation has any regard for the other." Interviewee UW1 revealed that sometimes these conflicts compelled them to work against NRSWA which meant that they risked receiving small fines by SAs, as opposed to being 'fined millions' by their regulator. Working in conflict with street works legislative requirements shows an unnecessary compulsion faced by undertakers, demonstrating a lack of honesty between the parties. The regulator expressed surprise about perceived conflicts and assured that any such conflicts would be taken seriously and investigated.

4.3.1.2 Commercial sensitivity in the telecoms industry – The telecoms industry operates in a free market which is a highly competitive and secretive industry. Unlike the monopoly industry, there was a distinct hesitation about discussing works in the presence of competitors to protect commercial dealings and prevent theft of clients (UT1, UT2, UR1). Like the construction industry, the telecoms industry is profit driven where a culture of secrecy is common practice [24]. Joint working with competitors is regarded as 'adversarial collaboration' which can make developing trust difficult [29]. These issues appear to be significant and are difficult barriers for SAs to overcome to facilitate joint working.

4.3.2 Industry standards

Interviewees felt that with highway reinstatement standards and HAs being lead work promoters had a significant impact on street works management. These issues will be looked at further below.

4.3.2.1 Highway reinstatement standards – Statutory street works reinstatement standards require work executors to reinstate and subsequently guarantee reinstatements for at least two years [30]; this guarantee period was typically referred to as a 'liability' (UE2, UW1, UG1, UT1, UW2, UW3, UW4). Issues around the guarantee period center around the responsibilities of the 'last noticer'. UG1 explained; "only one of the two or more utilities can be the lead Notice provider – the lead organisation has to take the most liability and there is reluctance as the company doesn't want to take liability for another utility's carelessness or mistakes." Undertakers were more willing to work together subject to legal contracts clarifying responsibilities (UT1, UW1). Respondent UE2 stated "there is no incentive and even a reluctance to collaborate….it is far too risky." Indeed section 70 of NRSWA places the entire reinstatement onus on the executor which inadvertently discourages joint working. Different working cultures and practices make inter-organisational working difficult, thus parties are motivated to work together by incentives as opposed to risks [21, 31]. Therefore it would be beneficial if NRSWA legislation is amended to use terminology that is supportive of and recognises multi-agency working.

4.3.2.2 HA as guarantor – Undertakers proudly cited examples of participation in multiagency working led by HAs as part of their highway maintenance works (UE1, UG4, UW2, UW7, UW8). In such instances it is highly likely that the HA would be the executor, reinstator and thus guarantor of works. Undertakers showed a distinct difference in attitude and enthusiasm to multiagency working once the onus of the reinstatement guarantee (or liability) had been taken away by the HA in the capacity of works executers. Tapping into undertakers' willingness to work with HAs, the HA could potentially carry out reinstatements at a cost on behalf of undertakers, and discharge them of guarantor obligations. This would encourage increased multiagency working and ensure consistency in materials and standards across areas.

4.3.3 Practical coordination barriers

Interviewees discussed the working practicalities of joint working. Their views cover two issues namely, scheduling and physical constraints.

4.3.3.1 Scheduling constraints – Undertakers considered joint working to be resource intensive (UE1, UG1, UW2). Respondent UE1 stated, "coordination takes a lot of time, effort and planning". The profit driven nature of utility industries can mean that they are less inclined to spend time on limited-value adding activities. Further, rooted attitudes towards maximising individual gains and profiteering prevalent in the construction industry can make coordinated working 'economically irrational' [24] and thus reinforce silo working.

In addition, disparate timing of works was considered a barrier to multi-agency working, "…expectations are unrealistic; coordination involves logistics, gangs and materials all to tie in" (UW3). Similarly UE2 felt; "… it would only work with seamless or consecutive working – it doesn't work with differing utilities having different regulator timescales". An available forum to plan and

co-ordinate works exists through Co-ordination meetings; but this has been described as ineffective (see 4.1.1.2.2 – functionality).

4.3.3.2 Physical constraints – Interviewee UW1 identified that "trench sharing is not easy" referring to guidelines set by the National Joint Utilities Group (NJUG) which specify the sequence and depths of underground apparatus. NG1 and NG2 referred to health and safety risks with UG1 explaining: "it's not usually practically possible for two utilities to work simultaneously…… logistics and safety of the job come first; this can make collaboration very difficult". Whilst trench sharing simultaneously may not always be appropriate due to potential dangers, utilities may be able to reduce risk by working sequentially. This area requires further research to fully understand the risks and likelihood of incident, as well as the impacts of different utilities working together.

4.4 Future challenges and opportunities

In looking to the future, interviewees identified asset management and silo working as key issues likely to affect street works management.

4.4.1 Asset management

Key challenges were considered around utilities requiring greater knowledge of the location of their assets (R1, R2). This issue is prolific and is currently being addressed through the Mapping the Underworld project [31]. Concerns were also expressed about ageing assets; R1 stated "buried assets are deteriorating, how do you deal with infrastructure that is over 100 years old?" Despite this concern, interviewees were optimistic about the rapid development of technologies to help prolong highway and utility asset life (LA1, LA3, LA4, R1, R2). LA4 and LA5 expressed concerns that repeatedly cutting the highway compromised the life of highway infrastructure and questioned whether a 2 year guarantee period was enough or if utilities should be subject to whole life charges? Indeed a charge structure has been developed for trenching in the highway [2], which Street Authorities could adopt.

4.4.2 Silo working

Fragmented working amongst the construction industry was damaging as it undermined coordinated working (LA1, LA4). Non-local authority interviewees (P1, P2, B1, R1, R2) also desired increased multiagency working to minimise the impact of street works. A way of addressing this could be by amending NRSWA legislation to encourage multiagency working by removing the reinstatement onus off the executioner. Indeed interviewees commented that NRSWA was complex legislation open to interpretation (LA3, LA4, UM1, UE1); "if legislation was clear and free from ambiguity then it would drive greater collaborative working" (LA4).

5 Conclusion and recommendations

This research set out to provide the sector's views about road works and street works performance in order to identify where improvements can be made. Principal findings from the research under the umbrella themes reveal:

Performance – non-local authority interviewees expressed firm expectations that SAs should take greater ownership of the management of the coordination of street works. Prescribed co-ordination meetings were considered ineffective and superficial. It is recommended that SAs take more ownership and lead by providing strategic vision and direction to enhance street works management.

Interviewees also felt that the construction supply chain hindered the effective management and advancement of the street works industry because of its entrenched attitudes, adversarial practices and profiteering culture. It is recommended that undertakers take ownership of managing contractors through a performance measurement and management framework to evaluate, control and improve performance.

Factors affecting street works management – there was a perceived conflict between timescales prescribed by NRSWA legislation and industry regulations. In the circumstances undertakers tended to give greater priority to utility industry timescales as they were driven by financial rewards. It is recommended that any perceived conflicts should be brought to the attention of HAUC UK to own, investigate and provide remedial.

Further, NRSWA was not considered to encourage undertakers to participate in joint working due to the inherent challenges associated with reinstatement guarantees placed on the primary executor of works. It is recommended – that NRSWA legislation is amended to use terminology that is supportive of and recognises multi-agency working as opposed to placing the single onus on the executioner of works. Indeed undertakers showed a greater willingness to participate in multiagency working where the HA was the executor and guarantor of works. Therefore it is recommended that HAs undertake reinstatement works on behalf of undertakers at a cost, and thus discharge the undertaker of the guarantee period by becoming the guarantor.

Future – key future concerns were particularly expressed around prolonging the life of highway and utility infrastructure, with technological innovations and adoption of trench charging structures seen as potential opportunities in mitigation. The contemporary prevalent nature of silo working was also seen as an area which would benefit if NRSWA legislation was amended.

Overall, street works are expensive for industry and society and need to be managed effectively. This study is significant as it has identified some of the current problems facing the industry which are impeding the optimal management and efficiency of street works practices. Failure to consider and address these issues is an unsustainable scenario, particularly in the current climate of rising street works and decreasing local authority budgets. This study contributes to a limited body of literature in street works policy, and is novel in that it is the first time a comprehensive study of stakeholder attitudes to street works management has been undertaken.

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