Effecting Policy Change within UK Construction Logistics - Capturing Current and Future Industrial and Institutional Obligations

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Abstract

The challenges facing the UK construction industry reflect many inefficiencies in current practice: 60% of planned vehicle deliveries do not arrive on time; 20% of all UK waste comes from construction. This research aims to inform how best to inform government policy on contracting models for construction logistics and create incentives to influence UK-wide consolidation center adoption by both private sector (e.g. consumers, suppliers, logistics service providers) and public sector (e.g. local, regional policy makers) stakeholders. A process mapping methodology was developed and is presented to capture current and future industrial and institutional obligations. It identifies (a) the key stakeholders in the public sector procurement process of construction projects, (b) processes required for construction approval and (c) the mapping of each key process. The research method involved fieldwork interviews and site visits involving both public and private sector stakeholders involved in local authority-led construction project provision. The hard/soft factors that influence public sector approval were examined in the context of an urban construction consolidation center (UCCC) to aid development of a collaboration model between private companies and public resources. The key processes and requirements of these key stakeholders may then be linked, informing development of a new industry standard for the UK construction industry.

Introduction

The challenges facing the UK construction industry reflect many inefficiencies in current practice: 60% of planned vehicle deliveries do not arrive on time, 20% of all UK waste comes from construction (Environment Agency Website, Nov 2009), 15% over-ordering of materials (Transport for London - London CCC Interim Report May 2007) and nearly one hour lost productivity per person per day on every construction project due to materials delay (BSRIA report, Feb 2008). In London/Heathrow the lack of space, operational necessity and mandated need to reduce local site congestion have been the key drivers for change. However, for projects outside London,

inefficiencies in supply to sites are masked (lower urban densities, use of local roads as overspill) but continue to contribute to significant road congestion.

This research (sponsored by the UK Technology Strategy Board as part of an 'Informed Logistics' programme) pilots and examines the 'Urban Construction Consolidation Centre (UCCC) concept. The Construction Consolidation Centre (CCC) solution aims to promote the efficient flow of construction materials through the supply chain to the work face on-site, providing 'just-in-sequence' consolidated supplies to multiple construction sites, reducing vehicle deliveries and reducing the impact of congestion, pollution, and waste. Construction material, less bulk items such as aggregates, would be delivered to the UCCC, where they are formed into work packs, defined by the various contractors, and delivered to the work face, using 'just-in-time' criteria. In the scheduling of multiple part loads, unnecessary packaging is removed for re-use or re-cycling. Site based material distribution teams extract all unused material, manage and reduce waste, and maximise re-use. In the UK, construction consolidation has only been used in London due to the operational necessity (space, vehicle movement reduction and control), and which are largely project specific and temporary in nature. Where construction has not had those imperatives, contractors have chosen to revert to traditional, less efficient supply chain models. The UCCC is innovative in the application of existing consolidation technologies to multiple projects within the wider context of Local Authority construction, providing community and commercial benefits, promoting greater customer choice in selection of construction processes that reduce negative impacts on the environment and communities and informing government policy on contracting models for construction services in a more environmentally aware way with potential application across the UK.

The overall research programme specifically examines the following key areas:

- Customer choice: Allows customers of major construction projects to propose use of a Urban Construction Consolidation Centre (UCCC), both to improve the efficency of deliveries (currently, inefficiencies are simply passed on to the customer) and reduce environmental impact, across a range of projects in a geographical area.
- Effective use of transport network: The consortium involved in the project links consolidation to the broader construction supply chain utilising inter-modal links via 4PL solutions. The UCCC concept will also look to involve synchronisation with other modal termini (railway station, airport, docks) in the long term.
- Customer focused technology development: The pilot also looks to define technological applications in tracking systems and the identification of optimum solutions. Principal construction companies, and their sub-contractors in the supply chain are all potential users benefiting from the efficiencies of the system. The use of consolidation in the context of

regeneration may also pioneer a new approach to construction logistics with potential benefits throughout the public sector.

- Enable effective working in the logistics industry: The UCCC aims to set a new standard throughout the construction logistics industry on 'just-in-time' material consolidation processes and control.

This paper specifically focuses on how best to inform government policy on contracting models for construction logistics and create incentives to influence UK-wide UCCC adoption by both private sector (e.g. consumers, suppliers, logistics service providers) and public sector (e.g. local, regional policy makers) stakeholders. A process mapping methodology was developed to capture current and future industrial and institutional obligations. It identifies the key stakeholders in public sector procurement process of construction projects processes required for construction approval and mapping of each key process.

Literature/Selected case studies review

The successful adoption of consolidation-based last mile solutions has in the past relied on regional or local authority mandation – classic exemplars in the UK includes the Heathrow terminal 5 construction project. Successful demonstration of a financial viable and indepedent entity will be required for regional authorities to adopt the correct fiscal and regulatory policies to accelerate adoption, in particular in those urban areas which have had historical problems with congestion. Hence, the greatest barrier to the consolidation centre growth and dissemination lies in the initial stage – following this the necessary ecosystem of secondary stakeholders should, through the appropriate exchange of information by, e.g. key technology networks (KTNs), and facilitated by entities such as regional development agencies (RDAs) in the UK, allow a natural propagation of the concept.

Additionally, as a result of heightened societal environmental awareness, an understanding of appropriate ways to provide the opportunity to give the consumers the ability to choose "greener" methods of delivery is gaining traction with legislative and political bodies. Solutions proposed include collection on foot by the consumer themselves, or through the provision of low carbon vehicle solutions as a delivery option.

The following sections provide a synopsis of case studies/publications and practitioner knowledge in last mile/informed logistics and industrial reports on consolidation practices. These two separate but inter-related concepts are key to current policy thinking on minimizing the impact on urban areas of an increasing level of goods delivery, whether B2B (or indeed B2C), and as such constitutes the primary pull factor for the creation of an urban construction consolidation center (UCCC). From an overview of the understanding of logistical capabilities and supply network management, this work looks to develop the definitions required to understand informed logistics, and defines the operational space from the perspective of all public, private and end-user/client stakeholders with consolidation practices.

Future work will look to utilize this information to inform initial definition of elements required for a B2B/B2I 'Concept of Operations' to address configuration; process (capability); strategy; metrics elements for the proposed consolidation solution.

DfT – Best Practice Case Study

The freight industry faces a number of challenges in its attempt to increase operational efficiency, while reducing the costs and environmental impact of deliveries. Consolidation centers aim to reduce the number of vehicles travelling into urban areas and provide an efficient way for freight operators to service such environments. The fundamental objective of a consolidation center is to offer an effective supply chain management solution to facilitate the safe and efficient flow of goods from the supplier through to the end user.

There are many terms used to describe consolidation centers, including 'transhipment centers', 'public logistics centers' and 'urban platforms', yet it is 'consolidation' which is probably the key characteristic of such sites. Goods from different suppliers are combined into single shipments. This results in many potential benefits of which the greatest is the reduced number of vehicles in urban areas.

The economic advantages that can be achieved from the use of a consolidation center are substantial. An increase in the quantity of goods carried on vehicles entering a specific area proves more cost-effective due to the reduction in the unit costs of transportation. In turn, a reduction in the number of deliveries required to transport a given volume of goods leads to less disruption (particularly in urban areas), reduced labor requirements and additional cost savings. The amount of time spent by the driver in travelling to and accessing points of delivery will also decrease, leading to fuel savings and reduced stress. Value-added services may also be offered by consolidation centers, including various pre-retail activities such as breaking bulk deliveries into more manageable consignments.

The benefits of such centers are not solely economic. From an environmental standpoint, consolidation centers can help in reducing the unwanted effects of freight transport, providing benefits to a far wider spectrum of people. These include reduced traffic congestion, reduced pollution and fewer accidents.

These benefits have been identified under recent EU initiatives, such as the CIVITAS-VIVALDI transport project. These policies establish innovative and sustainable strategies, which are targeted at the freight transport sector. Essentially, consolidation centers can play a major role in modern day logistics operations, delivering both economic and environmental benefits to individual companies and society as a whole.

As planning and environmental obligations increase, such centers will become more important in order to deliver both efficiency and financial savings in the future. Consolidation centers can be utilized to create efficient and forward-thinking logistics operations.

While the main objective of consolidation centers is to reduce vehicle trips, they are often planned to have many secondary objectives (and indeed they may achieve some unplanned objectives as well). The London Construction Consolidation Centre saved operators money due to fewer vehicles travelling within the boundary of the congestion charge zone. There was also a reduction in the number of journeys, which in turn saved money and reduced CO_2 emissions due to less fuel being used. Fewer vehicle journeys also meant less congestion on London's already congested roads. The consolidation center also allowed for materials and goods to be stored off site until actually required, freeing up much needed space on the site, and also reducing the likelihood of damage to goods while being stored on site. The Heathrow Airport Retail Consolidation Centre achieved its core objectives, but also improved security at the airport on account of fewer deliveries being made. Due to all the airport deliveries being made by one logistics company, it allowed the airport security staff to understand when the delivery was arriving and who the driver was.
Consolidation centers require substantial initial investment in order to be implemented. However, the operational, economic and environmental benefits that can be gained, together with the value added services such as waste collection, recycling, provision of a hub for a pallet network, and driver rest area, to name but a few, comfortably outweigh the costs.

Finally, when designing a consolidation center and agreeing the process of its operation, the needs of a number of stakeholders must be considered. In particular the construction companies, the logistics operator running the consolidation center and the local authority must all be involved in the scheme/process from the outset.

Strategic Forum for Construction – Improving Construction Logistics

The report 'Accelerating Change' (Strategic Forum for Construction, September 2002,) highlighted that 'a considerable amount of waste is incurred in the industry as a result of poor logistics'. The Forum subsequently identified addressing logistics as one of its priorities and set up a Task Group set out to build on work already undertaken by the Construction Best Practice Programme in its '*Factsheets on Logistics'*, the research '*Construction Logistics: Consolidation Centre'*, and the Constructing Excellence publication *'Construction Logistics: Models for Consolidation'*. Against this background the Group agreed that its terms of reference should be to;

- *Identify the key issues that need to be addressed to improve logistics in the construction industry*
- *Develop an Action Plan that highlights the steps that need to be undertaken by the different parts of the industry in order to address these issues*
- *Establish means by which the impact of the proposals in the Action Plan can be measured and a resulting improvement in logistics demonstrated*

Arising from this, four key issues on which it chose to focus its attention were identified:

- Design
- Transport
- Stockholding
- More efficient use of on-site labor

A summary of the action items is summarized in table 1.

Table 1. Strategic Forum for Construction – Improving Construction Logistics: Action Items

Action Directed to	Action Required	Lead Organisation (s)
Clients	• *Client's Charter to refer to the expectation that a Logistics Plan is prepared at an early stage in every project*	Construction Client's Group
	• *Best Practice Guide to be prepared to help clients understand what they can expect from the supply side on logistics*	Construction Client's Group in co-operation with other umbrella bodies on Strategic Form
Design Professionals	• *Design professionals to prepare a Process Map for each project as part of the Scheme Design* • *Professional institutions representing the design professions to develop advice and offer briefing to members on the role they have to play in project logistics* • *Professional institutions to consider ways in which the role of their profession in project logistics can be incorporated in initial education and training.* • *Professional team prepare a Bill of Materials as part of the logistics plan.*	CIC in Partnership with RIBA, ICE, IStructE, and CIBSE
Main Contractors and Specialist Contractors	• *Main contractors to prepare a Logistics Plan in consultation with the rest of the Supply Chain, at the outset of each project.*	Construction Confederation in co-operation with Construction Products Association, National Specialist Contractors Council and Specialist Engineering Contractors Group
	• *CITB ConstructionSkills to review the need for logistics skills in the industry and recommend what needs to be done to address this.*	CITB ConstructionSkills in co-operation with Summit Skills and with support of Construction Confederation, NSCC and SEC Group

WRAP Material Logistics Plan – Good practice Guidance

Typically 10-15% (but up to 45% for some materials) of the total materials ordered for construction projects are either unused or end-up as waste. A 35% reduction in material wastage could be achieved by adopting more efficient logistic practices and the key to achieving this is the development and implementation of a robust Material Logistic Plan (MLP). These plans are an important tool for the construction sector to help ensure the right materials are in the right place at the right time in the right quantity. This is achieved through rigorous attention to design, materials specification, estimating and ordering as well as preventing the generation of waste from damaged, lost or surplus materials e.g. from poor storage or resulting from multiple handling of materials.

This document provides guidance on the format of MLPs and their application within the construction industry. A useful MLP template and checklist are also provided which have been designed to ensure MLPs are practical, easy to use and

develop on-site, and to enable them to deliver economic and environmental benefits. A template MLP was developed with technical input from the Project Advisory Group members and piloted at a number of construction projects.

This template has been developed to enable firms to prepare, implement and continuously update a Material Logistics Plan (MLP). The template was designed for use 'through-life', from project conception through to project close. The main purpose of the plan is to achieve savings in materials use and reduce the production of wastes. The template provides tasks to complete seven key steps of the MLP. The template provides space to record progress against each task in note form. Each step is supported by the 'Questions to Consider and Further Information' document. Table 2 displays the contents of the MLP and the corresponding section(s) in the 'Questions to Consider and Further Information' document. Good site waste management practices will reduce the amount of materials that will end up as waste.

Therefore, the project's SWMP should link into the MLP to prevent duplication of effort. Guidance on SWMPs has been issued by WRAP, DTI, Envirowise and the Environment Agency and is available from the respective websites.

Table 2. Contents of an MLP and corresponding section(s) in a 'Questions to Consider and Further Information' document

Step	Title	Supporting Section in the 'Questions to Consider and Further Information' document
1	Responsible Persons, Training and Communication	1 Project Conception 2 Project Location Selection Pre-Defined Sites 5 Tender Process 7 Construction
2	Training and Communication Plan	1 Project Conception 6 Site Mobilisation
3	Material Requirements	1 Project Conception 2 Project Location Selection Pre-Defined Sites 3 Planning Permission 4 Outline Design
4	Materials Receipt and Storage	2 Project Location Selection Pre-Defined Sites 3 Planning Permission 6 Site Mobilisation 8 Site Waste Management
5	Management of Sub-contractors	5 Tender Process 7 Construction
6	Site Mobilisation and Construction	6 Site Mobilisation 7 Construction 8 Site Waste Management
7	Project Demobilisation and Completion	9 Demobilisation, Commissioning and Completion
8	Review	10 Review and Auditing

SEStran – Freight Consolidation Centre Study

In order to identify lessons learned from current or recently operating consolidation centers elsewhere, a case study review of information that Scott Wilson has collected

from other similar work. This includes the Best Urban Freight Solutions (BESTUFS) Good Practice Guide2 and a number of case studies, both in Britain and in Europe. This review aims to consider the volumes, changes in flows, costs and benefits for various types of consolidation center, and the potential synergies a consolidation center can share in terms of benefits and operations.

The principles in the operation of a consolidation center are very similar irrespective of the sector they serve e.g. retailers and contractors place orders for their goods and materials with their suppliers, but instruct that the delivery is made to the consolidation center and not to the retail business or construction site as is normally the case.

Retailers and contractors can then place a delivery order with the consolidation center for the goods and materials they ordered. This is assembled at the consolidation center and delivered to the sites. The delivery from the consolidation center to the retail or construction sites consolidates numerous businesses' orders onto each vehicle. The goods and materials are normally decanted from lorries and other heavy goods vehicles onto smaller vans in order that the deliveries are able to negotiate traffic and loading/unloading conditions with greater speed and flexibility in an urban environment.

Value added services can also be offered at the consolidation center allowing retailers and other users of the facility to pick and choose the services that suit their needs. The underlying principle is to charge normal commercial rates for these activities. The cost for the added value activities is borne by the retailer requesting the service. Costs for each value added service are calculated on an individual basis and are subject to negotiation between the operator and the customer. Table 3 details the typical services offered by a consolidation center, together with the benefits to retailers.

Table 3. Typical Services on offer by a Consolidation Centre

Activity	Benefits
Consolidation	Multiple daily deliveries can be consolidated to a reduced number of deliveries, which enables staff to concentrate on core activities, thereby increasing productivity.
Cross docking	Deliveries can be made to a consolidation centre at a time to suit the supplier, with onward delivery at times to suit the store, therefore reducing staff and transport costs.
Storage	This can be short, medium or long term, depending on requirements. Storage can be at carton, case, cage or pallet level.
Replenishment	Regular deliveries of a product that is needed by the user throughout the day, rather than one unmanageable delivery. Staff are able to react quickly to customers needs, therefore eliminating lost sales.
Pre-retailing	For retailers, pre-merchandising activities can be carried out at the consolidation centre before the stock arrives at the retail outlet. This includes unpacking, hanging, security tagging, re-labelling, size cubing and sale markdowns. This activity enables store staff to concentrate on customer facing activity rather than being at the back of the store. Ultimately, this lowers staff turnover and increases motivation and job satisfaction.

Six examples of freight consolidation centers have been reviewed, focusing on their efficiency, sustainability, and their effects in terms of freight transport impacts on the supply chain. The six examples reviewed which provide the range and depth of information required is as follows:

- Bristol Consolidation Centre;
- Meadowhall Consolidation Centre;
- London Construction Consolidation Centre;
- Heathrow Airport Consolidation Centre;
- Monaco Consolidation Centre; and
- Stockholm Hammarby Consolidation Centre.

The schemes noted above provide a good range of different types of consolidation center. Table 4 summarizes the basic characteristics of the six schemes that are considered in detail. As can be seen, the sample provides both UK and non-UK schemes, a mix of retail and construction sectors (since these are most common), and examples of optional and compulsory scheme participation.

Table 4. Range of different types of consolidation center

Centre	Location	Sector	Status	Terms of use
Bristol (Broadmead)	UK	Retail	Active	Optional
Sheffield (Meadowhall)	UK	Retail	Active	Optional
London	UK	Construction	Closed *	Optional
Heathrow Airport	UK	Retail	Active	Optional
Monaco	Overseas	All	Active	Compulsory **
Stockholm (Hammarby)	Overseas	Construction	Closed	Compulsory **

This review of six consolidation center case studies has revealed that the concept has been shown to work operationally in a number of different scenarios. In general, consolidation center customers appear to have positive experiences of the service that they receive, and there is evidence that consolidation centers can enhance supply chain performance, e.g. financial benefits to retailers at Meadowhall and the ability to meet tight timescales for the construction project in Stockholm.
Table 5 summarizes the key characteristics and performance of the six consolidation centers reviewed.

Table 5. Key characteristics and performance of the six consolidation centers reviewed

Case Study	Bristol (Broadmead)	Sheffield (Meadowhall)	London	Heathrow Airport	Monaco	Stockholm (Hammarby)
Location	UK	UK	UK	UK	Overseas	Overseas
Sector	Retail	Retail	Construction	Retail	All	Construction
Status	Active	Active	Closed	Active	Active	Closed
Terms of use	Optional	Optional	Optional	Optional	Compulsory	Compulsory
Distance from location served	10 miles	400 metres	3 miles	10 miles	Adjacent to area served	Adjacent to construction site
Size	500 sq. m	2,500 sq. m.	5,000 sq. m.	2,300 sq. m.	1,300 sq. m.	3,500 sq. m inside and 4,000 sq. m. outside
Main Objectives	Reduce congestion and related emissions	Reduce operating costs, improve sales and reduce loss/theft	Reduce traffic congestion and vehicle emissions	Reduce traffic congestion and disruption	Reduce traffic congestion and disruption	Reduce traffic congestion & emissions
Services offered	Consolidation, delivery when required plus value added services	Consolidation, delivery when required plus value added services	Consolidation, delivery when required plus short term storage	Consolidation, delivery when required plus value added services	Consolidation, delivery when required plus value added services	Consolidation, delivery when required plus short term storage
Consolidation Centre operator	Private company	Private company	Private company	Private company	Private company	Private company
Staff level	Staffing information unavailable	6 staff plus extra staff at peaks as needed	16 staff	20 staff	8 staff	10 staff
Traffic benefits	• 75% reduction in delivery vehicle movements for participating retailers • 6,945 fewer vehicle trips • Saving of 178,000 vehicle kilometres	• Reduced the number of vehicles delivering to shopping centre but not quantified	• 68% reduction in construction vehicles for deliveries to sites served by consolidation centre • Better control over sizes of vehicles entering City of London	• 66% reduction in the number of vehicle movements to airport terminals	• 38% reduction in traffic congestion • 42% reduction in space used by vehicles for deliveries	• Vehicle load factor improved from approx. 50% to 85% • Vehicle kilometres per day reduced from 64 km to 26 km • Vehicle delivery time reduced from approx. 60 minutes to 6 minutes • The 80% reduction in small volume, direct deliveries was achieved only at peak times
Environmental benefits	Savings of: • 20.3 tonnes of CO2 • 660 kg of NOx	Reported that consolidation centre reduces vehicle movements to store	Approx. 75% reduction of CO2 emissions for deliveries from consolidation centre to	Reported savings consist of: • 22 tonnes of CO2 per year	Reductions for deliveries from consolidation centre to site of: • 26% in fuel	Reductions for deliveries from consolidation centre to site of: • 90% in energy use

There are a variety of different types of consolidation center and the factors affecting those centers differ depending on the individual aims. The following key factors appear to influence the success of a consolidation center:

- Objectives – consolidation centers can have single or multiple objectives, from meeting environmental targets to modal shift in the type of transport used;
- Financial viability – in spite of efforts to encourage financial self-sufficiency, in most cases consolidation centers require operating subsidy. However introducing value added services can reduce a scheme's dependence on public support;
- Location – consolidation centers vary in terms of their proximity to the area served, type of location and proximity to the transport network;
- Spatial coverage – some consolidation centers are purposely developed to serve a single site whereas others may be regional hubs serving a much larger hinterland;
- Range of goods handled – examples of the types of goods handled at consolidation centers range from high street retail goods to construction materials;
- Transport modes – many consolidation centers utilize road transport, but increasing importance is being attached to initiatives introducing intermodal facilities between road and rail, where the location permits;

- Flexibility of operations – while some consolidation centers operate on fixed schedules, others may be geared towards on-demand operations;
- Ownership – consolidation centers may be privately or publicly owned and involve either a single operator or a joint venture, such as a Freight Quality Partnership; and compulsory/voluntary – some schemes can be operated on a voluntary basis or through

Research Methodology

The research method involved fieldwork interviews and site visits involving both public and private sector stakeholders involved in local authority-led construction project provision. The hard/soft factors that influence public sector approval were examined in the context of a UCCC, using an *Industrial Systems Mapping Approach*, previously developed (Srai, 2011)**,** to aid the future development of a collaboration model between private companies and public resources. The key processes and requirements of these key stakeholders may be identified and linked, informing development of a new industry standard for the UK construction industry.

Industrial Systems Mapping Approach

The Industrial Systems Mapping Approach provides an initial overview of industrial system structure: identifying the key players including institutional, sector specialists and the principal supply chain actors. The approach can also be used to capture key linkages between industrial players and to identify firms involved in supporting major product categories, where applicable.
A review of the literature on international industrial networks specifically on historical approaches to industrial network/value chain mapping and analysis was conducted, summarized in table 6, and was used to construct the final industrial system mapping process.

The following industrial systems have been examined using this approach to-date:

- New routes to market within Last Mile Logistics
- Emergence of product-service models within Defense Aerospace
- The transition of a Maritime cluster into a niche high-specification product supply
- The early evolution of firms supporting sustainable Built-Environments
- Technology Platform development in the UK Industrial Biotechnology industry (IB)
- Product generation changes in global Photovoltaics (PV)

These cases include a mix of industrial systems that demonstrate new markets, technology platforms, new routes to market, and new product/service delivery

models. These mapping activities inform the creation of industrial ecosystem maps that can be used in subsequent analysis. Relevant focal Firm, Government and country specific advantages, where applicable, can also be captured in a variety of different contexts.

Table 6. Summary of key industrial network/value chain mapping and analysis literature by type, objective and emphasis

Type	Objective	Emphasis	Reference
Functional Map	Process Mapping	Product & Information flows	SCOR '06
Tier 1& 2 Players	Network Structure	Relationships, Complexity	Lambert *et al* '98
Tier 1/2 Suppliers	Supplier Process Map	Supplier role, relationships (hard/soft)	Choi & Hong '02
Process Flows	Activities, Mechanics	Firm roles, leaders, push-pull point(s)	OR fields
Product Shape	Network Shape	Classification	Slack *et al* '95
Service	Thru-Life Management	Life cycle, design authority, services	Slack '05
Value Stream Maps	Value added/lost	Relative cost, quality, waste...	Hines & Rich '97
Full-S-Chain	Descriptive	Academic, conceptual	New '95, Jagdev '01
Lean Mfg Map	Component Flow	Lean/inventory reduction	Rother & Shook '99
Reverse Log's/Service	Directional Flows	Reverse Logistics & repair	Blumberg '99
Geometry	Network flow/logic	Alternative routes/options	Fine '98
Organisational	Organisation Network	Co-ordination	Bartlett & Ghoshal '89
Geographic	Geographical Spread	Co-ordination	Porter '86
Changing Ind. Structure	Industry Dynamics	Changing actor-scope profile	Jacobides *et al* '07
S-Network Configuration	Supply Network Design	Structure, dynamics, relationships	Srai & Gregory '08
GVC Governance Models	Governance, Value capture	Governance	Sturgeon '08
Multi-Organisational VCs	Mapping/Analysis	VC visualisation, nodes/links	Meis '09 (M.Phil)
Value Sets	Value perception	Value in a Network Context	Stephenson '09 (M.Phil)
VC emergence paths	Future VC Configurations	Alternative Therapy models in Health Sector	Alinaghian '10 (ISMM)

In summary, the final methodology involved the:

- **Identification of sector institutional players and secondary stakeholders** e.g. *research, industry development, specialist firms*, *policy decision makers etc.*
- **Development of a Value Chain Process Map** e.g. *production processes and unit operations etc.*
- **Identification of the industry actors** e.g. *supply chain actors, organisational types, linkages between organizations, material, potential information and value flows etc.*
- **Technology process and product types** e.g. *Identification of substrates, process technologies etc. (where applicable)*

Generic Process Map

The process mapping approach was applied in the context of local authority, e.g. Essex County Council (ECC) decision/approval processes, specifically the identification of the key stakeholders in public sector procurement process of construction projects.

The process in this context involved:

(1) Public Sector Stakeholders in Construction projects and approvals
e.g. Identification of ECC internal stakeholders e.g. planning office, procurement office, environmental sign-offs, etc.

(2) Process identification
e.g. Processes required for Construction approval e.g. planning, procurement, environment, etc.

(3) Process Mapping - for each key process
e.g. Definition of Process stages and stage requirements in terms of regulatory, legal, contractual etc.

Future work will look to link stakeholder process maps - identifying public and private sector drivers, key interdependencies and requirements and support overall UCCC concept definition and development. Process mapping in this context refers to the key activities involved in defining exactly what a business entity does, roles and responsibilities, to what standard a process should be completed and, ultimately, how the processes of key stakeholders can be linked.

The first step in understanding stakeholder 'touch points' is to determine and understand the basic high-level processes. The generic process-mapping template, used in this particular study, is presented in Fig. 1.

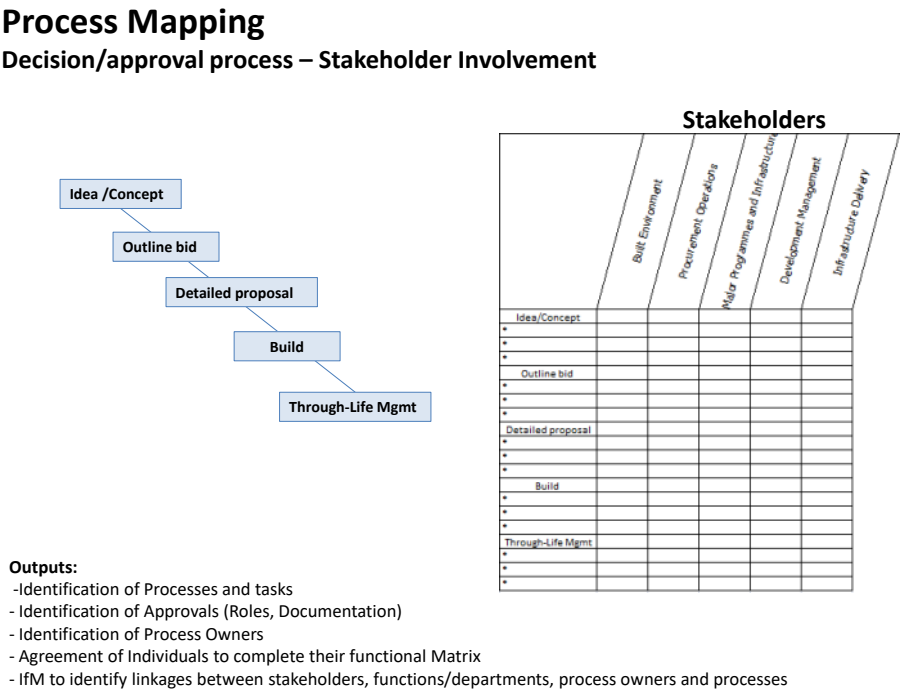

Figure 1. Generic Process map template, adaptable to public, private and end-user/customer processes

Process Mapping I – Essex County Council (ECC) Local Authority

Essex County Council (ECC) is the local authority responsible for the geographical area in which the UCCC operates. The mission of the ECC states a dedication 'to improving the lives of our residents' and an ambition 'to deliver the best quality of life in Britain' by 'providing high-quality, targeted services that deliver real value for money'. ECC is an active supporter of the UCCC pilot study and represents the 'institution' within the scope of this research.

An ECC-specific process map was co-developed with correspondents and the relevant functional stakeholders, process owners and 'roles' (Hard/Soft) in public projects, respectively, by stakeholder, process owner and function. 'Hard', in this context, refers to *Responsible (R), Accountable (A), Consulted (C), Informed (I)*, whilst 'soft' refers to an influencing Role only, e.g. best practice, processes, procedures e.g. figures 2 and 3 summarize data captured to-date for technical standards and asset management functions respectively.

ECC PROJECTS - PUBLIC

Function	Functional Stakeholder	Process Owner	Capital Program	Outline Business Case			Scheme & Estimate	Final Business Case (Award)	Build	Inspect
				Sub Board	Direct (£0.25M threshold)	Corporate Contracts Board (£3.9M threshold)				
Technical Standards	Peter Geall	Peter Geall	C	C	C	C	C	C	C	I

Responsible (R), Accountable (A), Consulted (C), Informed(I)

Function	Technical Standards
Functional Stakeholder	Peter Geall
Process Owner	Peter Geall

ECC PROJECTS - PUBLIC

	Capital Program	Outline Business Case			Scheme & Estimate	Final Business Case (Award)	Build	Inspect
		Sub Board	Direct (£0.25M threshold)	Corporate Contracts Board (£3.9M threshold)				
KEY ACTIVITIES	Budget Modelling aligned with Design & Construction Quality Standards	Budget target allocated aligning project brief with design policy and budget model. Route to market advocated.	Budget target allocated aligning project brief with design policy and budget model. Route to market advocated.	Budget target allocated aligning project brief with design policy and budget model. Route to market advocated.	Compliance check aligning project proposal with target budget model & benchmarking studies	Compliance check aligning project proposal with target budget model & benchmarking studies	Performance relative to selected route to market budget model & benchmarking studies	Lessons learned

Figure 2. Process Responsibilities and key activities for ECC – Technical Standards

ECC PROJECTS - PUBLIC

Function	Functional Stakeholder	Process Owner	Capital Program	Outline Business Case			Scheme & Estimate	Final Business Case (Award)	Build	Inspect
				Sub Board	Direct (£0.25M threshold)	Corporate Contracts Board (£3.9M threshold)				
Essex Property & Facilities (Asset Mgmt)	Roger Moore	Roger Moore	C	C	C	C	n/a	C	I	I

Function	Essex Property & Facilities (Asset Mgmt)
Functional Stakeholder	Roger Moore
Process Owner	Roger Moore

ECC PROJECTS - PUBLIC

Capital Program	Outline Business Case			Scheme & Estimate	Final Business Case (Award)	Build	Inspect
	Sub Board	Direct (£0.25M threshold)	Corporate Contracts Board (£3.9M threshold)				
Ensure Capital programme aligns with Property Strategy	Ensure proposals accords with Property Strategy	Ensure proposals accords with Property Strategy	Ensure proposals accords with Property Strategy	n/a	Ensure proposals accords with Property Strategy and appropriate Member Authority for property transaction in place if appropriate	For records	To review final product against original proposed Strategic outcomes

Figure 3. Process Responsibilities and key activities for ECC – Asset Management

Process Mapping II - Current and Future Industrial and Institutional Obligations

As the previous mapping examines only high-level processes, further understanding was required to enable identification of how a UCCC facility could add value.
A review of process maps was completed and follow-up interviews with all ECC functional stakeholders (see figure 4) were arranged to examine how current ECC process & performance/compliance requirements were met in the context of:

- **'Audit':** At present (without UCCC)
- **'Explore':** Future (with & without UCCC)

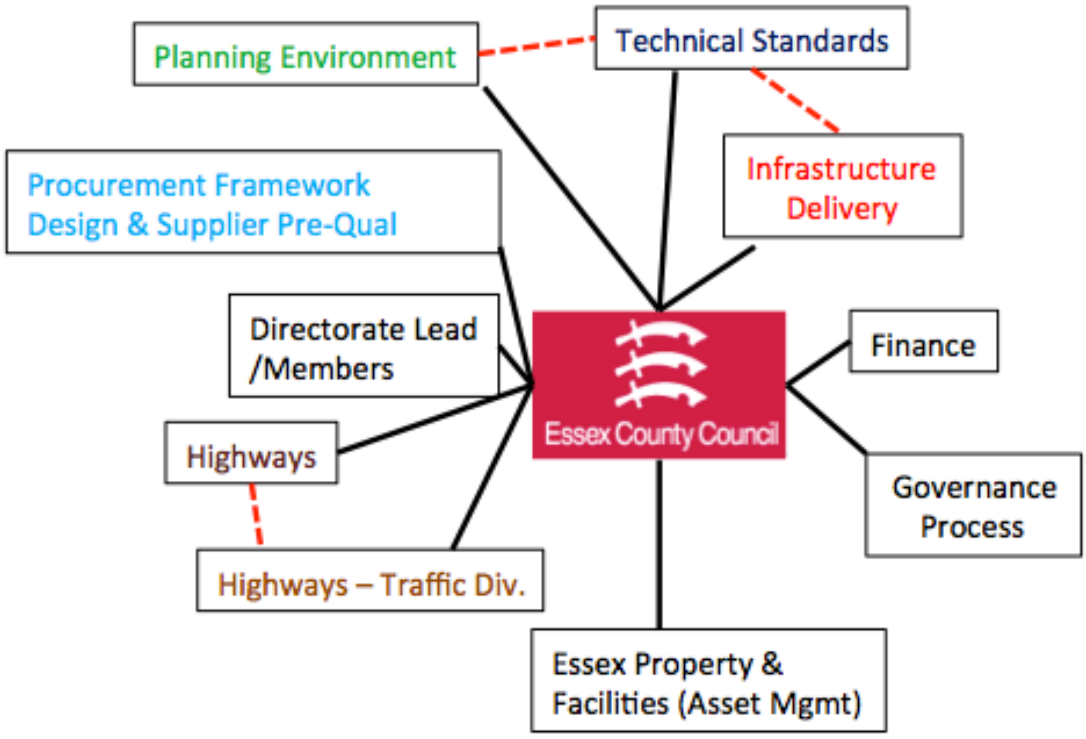

Figure 4. Functional stakeholders interviewed

Figure 5 summarizes the output from these interviews in terms of planning environment, technical standards, Infrastructure delivery, Highways, Highways – traffic division and Procurement Framework Design and Supplier Pre-qual.

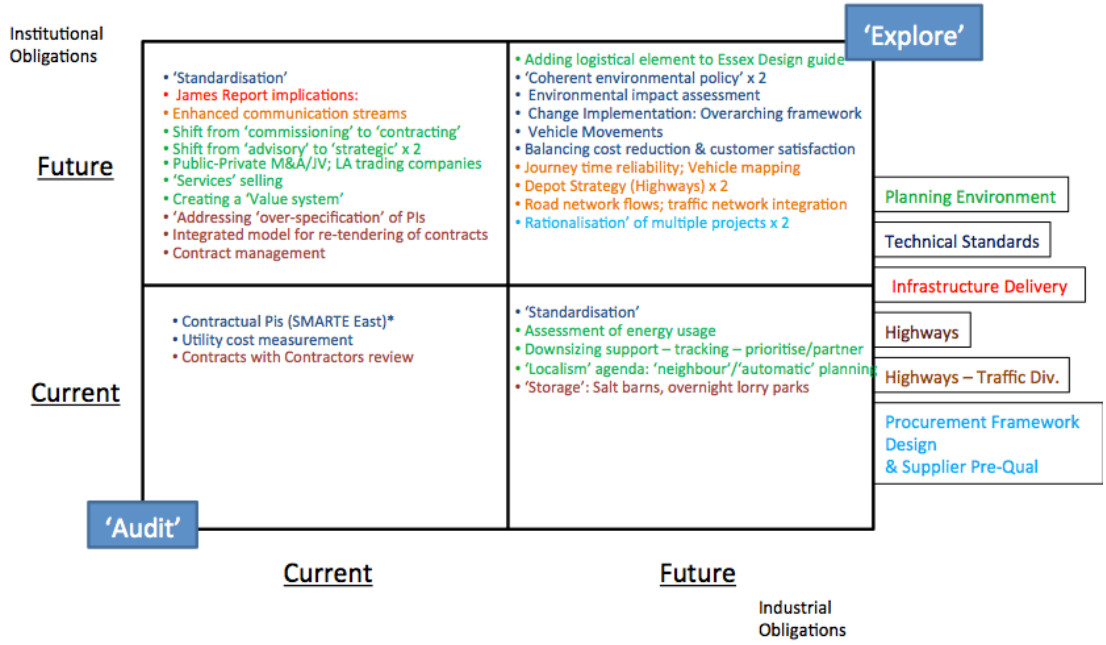

Figure. 5. Summary of ECC process & performance/compliance obligations

Discussion/Conclusions/Future Work

A process mapping methodology was developed and is presented to capture current and future industrial and institutional obligations. It identifies (a) the key stakeholders in the public sector procurement process of construction projects, (b) processes required for construction approval and (c) the mapping of each key process. The hard/soft factors that influence public sector approval were examined in the context of an urban construction consolidation center (UCCC) to aid development of a collaboration model between private companies and public resources. The key processes and requirements of these key stakeholders were then linked, informing development of a new industry standard for the UK construction industry.

Outputs from this work have culminated in the drafting of a *Planning Guidance Note* for the Essex Planning Officers Association (currently in the approval loop). This guidance note is intended to provide the policy context for the promotion of the UCCC concept, and suggests how it can be incorporated into Local Development Documents and how such policies could be operated through the Development Management process. This provides a critical output for the UCCC project and has the potential of effecting major planning policy change (e.g. opportunities to encourage the UCCC concept through the planning process by introducing requirements for the use of construction plans, construction statements and transport assessments for construction and operational phases to minimize trips, contract deviation and waste).

Future work will look to examine partnering models capturing the different cultures, linkages & drivers for the stakeholders involved in construction logistics e.g.

"Triple Helix" concept of engagement between Local Authorities (focus of this paper), Industry, and Customers.

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