



ASSOCIATION OF RESEARCHERS IN **CONSTRUCTION MANAGEMENT**

**Proceedings of working papers from the  
ARCOM and BEAM Centre Early Career  
Researcher and Doctoral Workshop on  
Building Asset Management**

**20<sup>th</sup> January 2017**

**Glasgow Caledonian University**

**WORKSHOP CONVENOR AND PROCEEDINGS EDITOR:**

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**BEAM Research Centre**

*The Research Centre for the Built Environment Asset Management*  
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## **Introduction**

On Friday 20<sup>th</sup> January the Built Environment and Asset Management (BEAM) Centre ([www.gcu.ac.uk/assetmanagement/](http://www.gcu.ac.uk/assetmanagement/)) at Glasgow Caledonian University (GCU) jointly hosted a full day workshop with the Association of Researchers in Construction Management (ARCOM) ([www.arcom.ac.uk](http://www.arcom.ac.uk)) in the field of Building Asset Management. Aimed at doctoral students and early career researchers the workshop sought to provide an environment where they can present a paper, exchange ideas and engage in critical discussions surrounding contemporary research within the context of Building Asset Management.

The workshop was convened by *Dr Craig Thomson* (GCU) with 26 participants attending from as far field as Sweden, with attendees from Universities of Loughborough, Bolton, Salford, Manchester, Abertay Dundee, Strathclyde, West of Scotland, GCU and a number of experienced practitioners.

Following a welcome from *Professor Rohinton Emmanuel* (Director of the BEAM Research Centre) and *Dr Paul Chan* (ARCOM Committee Chair), 7 papers were presented by researchers reflecting research at different stages of maturity and from presenters at different career stages. Each of the papers were peer reviewed and authors invited to modify them based on the feedback with the final papers being presented in this Working Papers Proceedings which will be available through the ARCOM Website.

We are delighted to welcome some guests to the workshop shared their experience as guest speakers, discussants and members of the audience. *Dr Paul Chan* (University of Manchester) led a discussion at the end of the morning session drawing out key research questions emerging. *Professor Milan Radosavljevic* (Assistant Dean of Research and Enterprise at University of West of Scotland) provided a key note lecture sharing his innovative thinking in the areas of BIM and digital construction which including an overview of his recent Innovate UK funded project Bali. This provided the platform for him to be joined by two other guests *Dr Alex Reid* (Apsis Solutions) and *Dr Roger Talbot* (formerly University of Edinburgh and now practicing consultant) to explore the key opportunities for academic research to better inform and respond to the challenges faced in Asset Management. Both Dr's Reid and Talbot are members of the BEAM Centre's steering committee.

A short summary is provided for the 7 presentations of research at the workshop.

*Dr Zhen Chen* (University of Strathclyde) presented his work in establishing the principles of facilities management around which he is seeking to establish a framework around which a Facilities Management Body of Knowledge can be developed.

*Ingrid Svensson* (Chalmers University, Sweden) presented a paper which explored sustainable property management through the lens of multiple changes, and this was considered from the perspective of a public construction client in Sweden.

*Mary Lundberg* (Lulea University of Technology, Sweden) presented her research through a systematic literature review of the methods which are used for knowledge management and organisational learning in the practice of construction projects. Both these papers provided a strong international dimension to the workshop but through discussions with the audience it was clear that a common recognition of the same issues could be found equally in the UK.

*Saikat Maiti* (University of Strathclyde) presented the very early stages of his PhD research where he was seeking to explore evidence-based safety management in the context of building refurbishment. His work sparked an engaging discussion amongst the participants and he was able to take away good advice from researchers engaged in safety but also others involved in refurbishment research.

*Eloise Grove* (Amey and Loughborough University) was engaged in the final stages of her EngD and presented her work focused on building relationships in the face of adversity. She drew on her experiences whilst embedded within Amey and considered this in the context of collaboration within complex term-maintenance contracts. The discussion which followed explored the implications of her position within the organisation and the influence this has on her research, raising some really interesting methodological questions.

The final two presentations were from *Laura Rodriguez-Labajos* and *Sharma Samriti* who are both PhD research students with the BEAM Research Centre at GCU both working in collaboration with Health Facilities Scotland (HFS). Laura is working as a Research Assistant based at HFS and presented her current research which looks at the perspectives of senior stakeholders on the role of strategy performance measurement for health care estates. Sharma presented the final presentation, which explored the challenge which exists in effectively utilising clinical and estates data to help inform strategic decision making in the healthcare arena. Her presentation represented early stage of her work without a supporting paper. The final three papers helped the audience reflect on the challenges facing researchers when responding to clear practice based problems, and the need to help provide solutions whilst retaining a theoretical lens.

Overall, the workshop provided an excellent platform for the presenters to share their latest work and in keeping with the spirit of ARCOM they were supported by an audience who were actively engaged in discussion, a bit of fun and importantly created a positive environment to support the development of the research.

**Dr Craig Thomson (Workshop Convenor)**

**Glasgow Caledonian University**

**20<sup>th</sup> January 2017**

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\*The papers presented as part of these proceedings are working papers and as a result they will not be included in the Scopus index, and therefore will not impact on the H-index of the authors. As this is an unpublished working paper, this allows authors to submit this to a peer-reviewed journal for consideration in future but they will need to acknowledge that this was first presented at the ARCOM workshop.

<b>Session plan for ARCOM/ BEAM Centre Workshop</b>			
<b>Name</b>	<b>Affiliation</b>	<b>Topic</b>	<b>Time</b>
Dr Craig Thomson	Glasgow Caledonian University	Registration /Tea & Coffee	<b>9:30</b>
Prof. Rohinton Emmanuel	Director of BEAM Centre	Welcome to GCU and outline of BEAM Centre	<b>10:00</b>
Dr Paul Chan	University of Manchester and Chair of ARCOM	Introduction to ARCOM and aims of the workshop series	<b>10.10</b>
<b>Presentation Session 1 (10 minutes presentation, 10 minutes for questions)</b>			
Dr Zhen Chen	University of Strathclyde	The principles of facilities management and case studies	<b>10.15</b>
Ingrid Svensson	Charmers University, Sweden	Exploring sustainable property management through the lens of multiple changes: the case of public construction client in Sweden	<b>10:35</b>
Mary Lundberg	Luleå University of Technology, Sweden	Methods used for knowledge management and organizational learning in the practice of construction projects: a systematic literature review	<b>10.55</b>
<b>Tea &amp; Coffee refill and 15 min break (11.15)</b>			
Saikat Maiti	University of Strathclyde	Evidence-based safety management in building refurbishment	<b>11.30</b>
<b>Discussions Session: Chaired by Dr. Paul Chan (University of Manchester)</b>			<b>11.50</b>
<b>LUNCH BREAK &amp; NETWORKING A523</b>			<b>12:20</b>
Guest Speaker: Professor Milan Radosavljevic (University of West of Scotland) “Overview of the Bali Project and the future for research in asset management”			<b>13.20</b>
<b>Guest Speakers Discussion: Chaired by Dr Craig Thomson (Glasgow Caledonian University)</b>			
What are the key opportunities for academic research to better inform and respond to the challenges faced in asset management? Discussants: Dr Alex Reid (Apsis Solutions), Dr Roger Talbot (Consultant), Professor Milan Radosavljevic (University of West of Scotland)			<b>13:40</b>
<b>Presentation Session 2 (10 minutes and 10 minutes questions)</b>			
Eloise Grove	Amey/ Loughborough University	Building relationships in the face of adversity: collaboration in complex term-maintenance contracts	<b>14.30</b>
Laura Rodriguez Labajos	Health Facilities Scotland/ Glasgow Caledonian University	Perspectives of senior stakeholders on the role of strategy performance measurement for healthcare estates	<b>14:50</b>
Sharma Samriti	Glasgow Caledonian University	To Utilise Clinical and Estates Data to Help Inform Strategic Decision Making in the Healthcare Arena.	<b>15.10</b>
<b>Discussion Session: Chaired by Dr Craig Thomson (Glasgow Caledonian University)</b>			<b>15.30</b>
<b>CLOSING REMARKS – Dr Craig Thomson/ Dr Paul Chan</b>			<b>15:55</b>
<b>Closing at 16.00</b>			

# THE PRINCIPLES OF FACILITIES MANAGEMENT AND CASE STUDIES

Zhen Chen

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**Abstract:** This paper presents a set of six principles of facilities management (FM) with supporting discussion through selected case studies to justify these principles, which were put forward through a rigorous quantitative analysis through a TRIZ process underpinned by extensive literature review into industry standards, professional guidance and best practice relating to FM. The six principles covers three essential technical domains including Clients and Professionals, Service Products, and Service Processes to reflect six important aspects that forms the entire contemporary FM practice. For the domain on Clients and Professionals, this paper highlights technical focuses on providing competitive advantage for clients and developing professional competence through lean practice. For the domain on Service Products, this paper emphasises key issues on the dependability driven quality services and sustainability oriented resources efficiency. For the domain on Service Processes, this paper enhances technical needs for effective services procurement and provision and lifecycle oriented rapid dynamic responses. The nine-square approach as a TRIZ process was adopted to conduct a holistic review into literatures and practice relating to FM, and this also provides a novel practical approach to inform further research into construction management. In order to further justify the relevance and value of the six FM principles, this paper also provides a series of case studies which address how these principle can be applied to advance FM practice with regard to improving professional leadership and technical capability in the provision of FM services across industry sectors towards dependable and sustainable built environment.

**Keywords:** buildings, case studies, facilities management, principles, TRIZ.

## INTRODUCTION

This paper is a summary of the author's recent research into the principles of facilities management (FM). With regard to the background that there was a lack of summary of FM principles despite of some initiatives led by professional bodies including RICS (2012) and ICE, 2013), this research was set up at philosophy level to derive a reliable set of FM principles based on the framework of FM body of knowledge (FMBOK) accumulated through professional practice and research in the subject field over the past three decades.

This research was conducted through the use of an extensive literature review underpinned by TRIZ (Gadd, 2011) in order to identify the principles of FM through an inventive process towards a reliable and innovative summary to inform further practice and research. In addition, case studies were further conducted and presented in this paper to justify those FM principles with regard to their relevance and applicability in practice.

This paper describes the research in three parts, including the use of TRIZ, principles of FM, and case studies. It demonstrates how TRIZ has facilitated an inventive

problem solving process to derive the principles of FM in this research, and this, as a new example, can also inform the learned society with regard to the value of using TRIZ in innovative research. The author expects that this paper with regard to the theoretical progress in the subject field could be useful for both practice and further research in FM.

## THE USE OF TRIZ

TRIZ is the Russian acronym for "Teoriya Resheniya Izobretatelskikh Zadatch", which means the 'Theory of Inventive Problem Solving' and was developed in 1946 by soviet inventor Genrich Altshuller and his colleagues (Gadd, 2011), and it has been widely received and applied in the creative sector and some other sectors. The author of this paper has applied the theory of TRIZ in his research into the sustainable built environment in the past decade, and one example is to integrate TRIZ with an analytic network process (ANP) for multicriteria assessment of façade systems with regard to the whole life value of the design (Chen, et al., 2007).

In the subject field of FM, it has been not only of academic interest in but also professional need for a set of principles to support best practice research and development after a fast profession growth in this new sector in the past three decades. In order to derive a reliable set of principles of FM through an extensive review on literature and practice, as well as to verify the suitability of those principles with regard to their applicability in specific practice and further research, the TRIZ was chosen to effectively facilitate an expected inventive process. For such a dedicated research, the author of this paper adopted the nine-square approach, which is one practical TRIZ tool, to qualitatively identify and justify the framework of FMBOK and the set of FM principles.

Figure 1 illustrates the nine-squares that were named and used to derive the FMBOK framework and FM principles described in this paper. In principle, the nine-square approach looks on the horizontal direction into the history, the present, and the future of the problem to be solved through a review into related information at both microcosmic and macroscopic level across the vertical direction. Based on the theory of the nine-square approach, Figure 1 presents an evolutionary process to derive the terminal goal through a middle square which collects all feedback from the rest of seven squares. As illustrated in Figure 1, the square of FM Principles was set up as the goal of this nine-square analytic process and achieved through the establishment of FMBOK in the middle square to collect feedback from the following seven squares for review on:

The principles of management in academia domain with regard to theoretical achievement of management principles that can underpin and inform the summary of principles of FM.

FM definition and practice in practice domain with regard to evolving FM practice that can inform the summary of FM principles by providing a comprehensive connection between theory and practice.

International practice in FM in practice domain with regard to the best practice in FM that can inform the summary of FM principles by incorporating the best practice at international level to inform future FM practice in a wide scope across the whole FM sector.

FM core principles defined by RICS with regard to professionally recognised FM principles to inform the summary of FM principles towards a better expression underpinned by further considerations on theory and practice in related areas.

The principles of project management such as standards developed by BSI with regard to accumulated knowledge on project management relating to FM at macro-system level.

FM standards being developed by BSI with regard to contemporary professional standards on quality FM services at macro-system level.

ISO FM standards being led by BSI with regard to international professional standards on quality FM services at macro-system level.

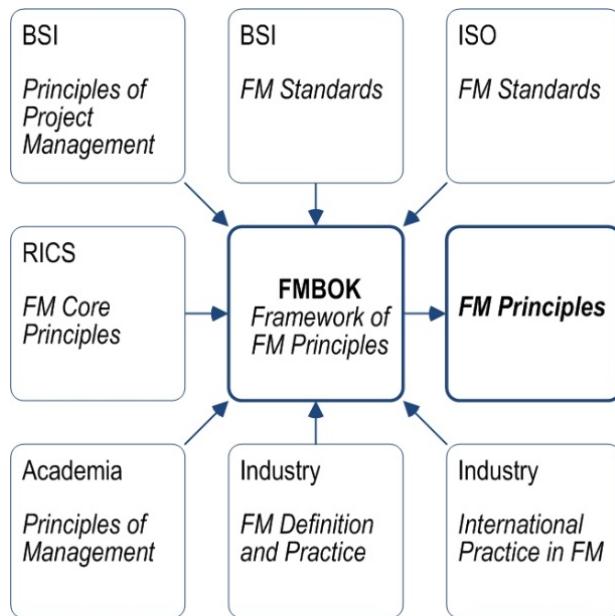


Figure 1: A TRIZ approach to deriving FMBOk framework and FM principles

The review through these seven squares can ensure a systematic study on FMBOk from the past through present to the future at three main levels on micro-system, system, and macro-system in the scope of FM related practice and research. In this research, the nine-square approach illustrated in Figure 1 was used to derive the framework of FMBOk first and then a set of principles of FM.

*Table 1: FMBOK framework and representative technical contents*

Knowledge Domains	Representative Technical Contents	
	Atkin and Brooks (2009)	British Standards Institution (BSI) (1986-)
FM Philosophy	Background to FM; and Innovation, research and development.	BS EN 15221-1 Facility management. Terms and definitions; and BS EN 13306. Maintenance. Maintenance terminology.
FM Profession (Clients and Professionals)	FM service providers; Managing service provider & supplier relationships; Managing specialist services; and Education, training and professional development.	PD CEN TR 15628 Maintenance. Qualification of maintenance personnel.
FM Products (Service Products)	Retaining services in-house vs. outsourcing; Service specifications, service level agreement and performance; Information systems management; and Contract management and financial control.	BS EN 15221-2 FM. Guidance on how to prepare FM agreements; BS EN 15221-4. Taxonomy of FM. Classification and Structures; BS EN 15221-6. FM. Area and Space Measure; BS 8210 Guide to building maintenance management; BS EN 13460. Maintenance. Documents for maintenance; and BS EN 1504-9 Products and systems for the protection & repair of concrete structures.
FM Processes (Service Processes)	Developing a strategy for FM; Facilities planning; Change management; Human resource management; Policy & procedure for outsourcing; and Policy and procedures for in-house provision.	BS EN 15221-3. FM. Guidance how to achieve/ensure quality in FM; BS EN 15221-5. FM. Guidance on the development & improvement of processes; BS 8536 FM briefing. Code of practice; BS 8572 Procurement of facility-related services; BS ISO 15686. Buildings & constructed assets. Service life planning; and PAS 55-1 Asset management. Specification for the optimized management of physical assets.
FM Practice	Health, safety and environment; Workplace productivity; Building intelligence and smart systems; Benchmarking best practice; and Public-private partnerships.	BS EN 15221-7. FM. Performance benchmarking; BS EN 15331. Criteria for design, management and control of maintenance services for buildings; BS 8207 Code of practice for energy efficiency in buildings; BS EN 15603 Energy performance of buildings - Overall energy use and definition of energy ratings; and BS EN 15459 Energy performance of buildings - Economic evaluation procedure for energy systems in buildings.

## PRINCIPLES OF FM

The book on the Principles of Scientific Management (Taylor, 1911) has profound influence to the evolving theory of management science over the past ten decades. According to Jones and George (2012), the management theory has evolved from the scientific management theory in the 1880s and 1890s through the development of administrative management theory, behavioural management theory, management science theory and organizational environmental theory towards the theoretical system of contemporary management.

In the past several decades, the revolution of integrated lifecycle management of built assets has made the FM one of the most fast-growing profession in the global construction industry with regard to clients' diverse needs and demands, and the formation of FM principles has been eventually in need for theory development for both research and practice for this profession.

The concept of total FM (Atkin and Brooks, 2009 and 2015) has not only been adopted in practice, at Mitie for example, but also inspired management thought on three essential elements, including people, products and processes, to structure the FMBOK so as to derive a set of principles of FM. From the FM profession point of view, people are clients and FM professionals and their organisations, products are various FM services, and processes are various management actions to provide FM services. A further review focused on people, products and processes was therefore conducted into the evolution of management theory to set up a generic framework of management principles for FM. After looking into five major management theories summarised by Jones and George (2012), it has been found that the three essential elements as a whole set of essential elements of FM are well connected with key aspects inside the five management theories (Refer to Figure 2) in terms of their coverage to all general management issues. This review process was conducted in the first square on the principles of management in academia domain (Refer to Figure 1) and formed the essential structure of the FMBOK framework and eventually the technical domains for FM principles.

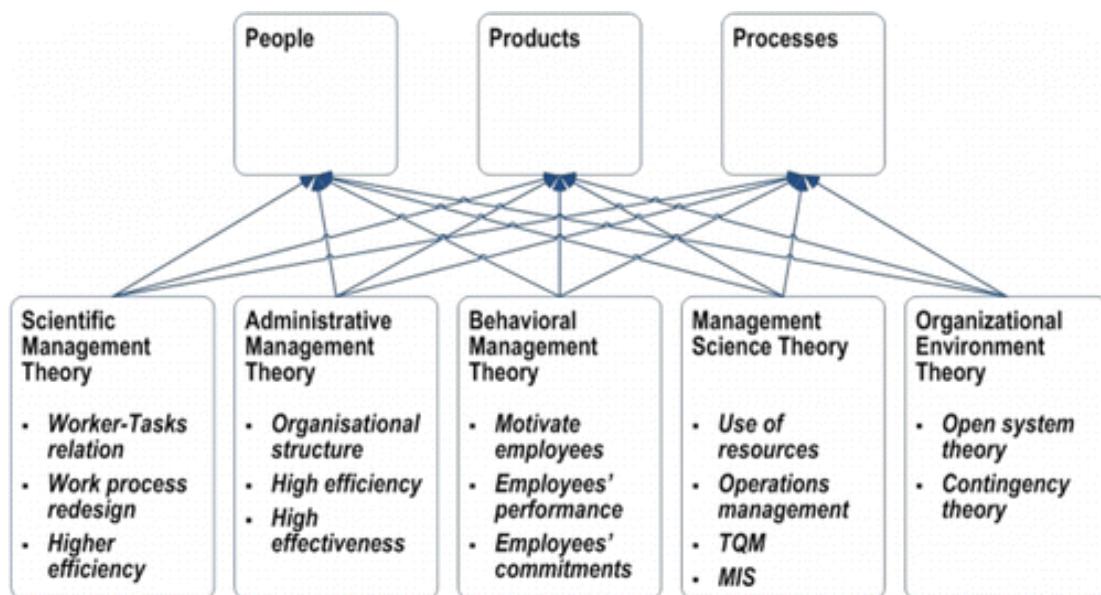


Figure 2: Interconnections between management theories and FMBOK knowledge domains

With regard to the relevance of these essential elements to structure, the FMBOK, a further review into the following three related documents and other publications, including A Practical Guide to Facilities Management (Barker, 2013), has provided strong justification:

BS 6079-1:2010 Project management – Principles and guidelines for the management of projects (BSI, 2010), RICS facilities management standards – core principles (RICS, 2012), and ICE's Guiding Principles of Asset Management (ICE, 2013).

Generally speaking, the best practice in FM can satisfy two essential needs on dependability and sustainability. Dependability consists of issues about conditions of built assets and related FM services in terms of reliability, maintainability, supportability and adaptability. Sustainability includes all aspects of FM in relation to social, technical, economic, ecological and political issues. Based on needs for both dependability and sustainability in FM, and a comprehensive review and technical analysis into related literatures and practice through the nine-square approach (Refer to Figure 1), a set of six general principles of FM were summarised within the FMBOK framework structure. For the knowledge domain on people (Clients and FM professionals), it emphasises professional competence and lean organisation. For the knowledge domain on products (FM service products), it emphasises quality services and resources efficiency. For the knowledge domain on processes (FM service processes), it emphasises effective actions and dynamic responses. Table 2 provides a summary of the six FM principles that have been derived from the research.

*Table 2: Six principles of FM*

Knowledge Domains	Principles of FM
Clients and Professionals	1. Competitive advantage for clients 2. Professional competence through lean practice
Service Products	3. Dependability driven quality services 4. Sustainability oriented resources efficiency
Service Processes	5. Effective services procurement and provision 6. Lifecycle oriented rapid dynamic responses

In comparison with RICS draft FM standards about core principles for FM Surveyors (RICS, 2012), which consists of ten pre-contract principles, twelve principles for contract operation and two principles for contract completion, the six principles (Refer to Table 2) derived through the TRIZ process are within a new FMBOK framework which is structured on all three essential elements of management theory in a holistic connection with the nature of FM. It is therefore anticipated that the six principles of FM can demonstrate a good applicability in practice.

## CASE STUDIES

This section aims to discuss lessons learnt through case studies in response to the six FM principles summarised in Table 2 in terms of their applicability in practice. Cases for study in this section were collected from UK over the author's observation on FM practice over the past decade, and these include:

- The great natural light, Edinburgh, 2012;
- Replacement of brand-new windows, Edinburgh, 2016;
- Reliability of thermal insulation, London, 2006;
- Display Energy Certificates, London, 2016;
- Cash is spent, 2008; and
- Six windows, Edinburgh, 2016.

## **Competitive advantage for clients**

It is essential for FM to effectively support the core business of clients no matter what the mode of services provision could be in either short or longer term. From this point of view, clients need to choose dependable FM services providers who can demonstrate technical advantages that they can bring to clients through professional teamwork with regard to a better value for money in the competitive FM market. This principle therefore aims to reflect clients' needs for FM and the value added FM services to support their core businesses.



*Photo 1: The great natural light. Image courtesy of the owner of the office building in Edinburgh.*

Photo 1 was taken from an office building in Edinburgh while all lights in the communal area were unnecessarily left on at the lunch time in the sunny day on 9 October 2012. It has been always a priority to maximise the use of natural light at workplaces not only in building design but also throughout the use of the building. While timers are widely adopted to minimise the intervention because of human factors, there are still problems on the optimised use of lighting in office buildings. With regard to all specifications and regulations of the building, a service level agreement (SLA) can be specifically designed and effectively used to reduce wastes in resources use at workplaces with regard to the advantage for clients through the use of FM services; and from the clients' point of view, the provision of either in-house or outsourced FM services through the implementation of SLAs needs to show such advantages at a competitive level in comparison with other services providers on the local market. In this particular case, the waste on electricity usage indicated a lack of demonstration on the competitive advantage of resource use and the principle on competitive advantage for clients therefore make it relevant in FM practice.

## **Professional competence through lean practice**

The fast growth of the FM profession in the past three decades has been underpinned by the competence of FM professionals working on various positions within companies driven by lean principles for improved efficiency on resources usage at clients' organisations. This principle reflects the requirements on FM professionals in terms of their competencies and organisations in services provision, and it aims to ensure FM services provision in a competitive professional way from design through construction/refurbishment to operation.



*Photo 2: Replacement of brand-new windows. Image courtesy of the owner of the office building in Edinburgh.*

Photo 2 was taken on site at the new office building in Edinburgh on 20 January 2016. More than 90 brand-new opening windows were taken away from the building under construction and to be replaced by new ones with different colour of the glass. The changing need/requirement on the client side has added extra cost of the building at not only construction stage due to the rework on those windows but also probably operation stage due to the impacts on construction quality due to this rework. It's an example regarding the role of FM professionals to effectively coordinate building design, construction and use for the benefits of clients in short and longer term. Although it is not unusual for clients to change minds during either design or construction, FM professionals working for clients can actually provide sufficient support to decision making in time among foreseen options.

### **Dependability driven quality services**

This principle aims to ensure clients to have and professionals to provide quality services with regard to the dependability of FM in terms of the built environment and the services. Dependability is the ability of an item to perform as and when required (BSI, 2014), and it is used as a collective term for the time-related quality characteristics of an item in terms of its adaptability, availability, buildability, constructability, durability, integrity, maintainability, recoverability, reliability, safety, security, and supportability. For the built environment, the dependability is essential for clients' business in longer term, and FM services providers therefore need to embed it in services provision with regard to quality standards on physical built assets through whole life.



*Photo 3: Reliability of thermal insulation. Image courtesy of the owner of the office building in London.*

Photo 3 was taken outside the construction site of one new office building in London on 14 March 2006. Construction quality has direct impacts to the performance of buildings in long term. An example of poor construction in thermal insulation has left problems which is different from the design scenario. The principle on the dependability driven quality services made an alert on the high-impact contribution of FM at both design and construction/refurbishment stage regarding the relevance of construction quality to FM in longer term.

### Sustainability oriented resources efficiency

This principle aims to ensure clients to have and professionals to provide FM services that make the efficiency of resources usage as a goal within the scope of sustainable built environment. In order to achieve such an ambitious gold on long-term resources efficiency towards sustainability, plans on resources usage and implementation have demonstrated their effectiveness in numerous cases, and proved the applicability of this principle in FM practice.



*Photo 4: Display Energy Certificates. Image courtesy of the British Library.*

As one essential FM service through longer term, the measurement on energy efficiency has been widely adopted in buildings across the world. For example, large public sector buildings have been

required to display the display energy certificate (DEC) in UK since 2008, and the HM Government first published the Guidance about the regulations for DEC of public buildings in 2012, and provided update versions in 2013 and 2015 in order to improve the energy efficiency of public buildings.

Photo 4 was taken at the British Library on 22 July 2016. At the main entrance of British Library, a DEC issued by the HM Government, and an energy label issued by the International Association of Museum Facility Administrators (IAMFA) were put together into a steel frame. This display not only tells people the result from implementing the Energy Action Plan led by the Estates Department but also may have well informed and inspired many library users coming from all over the world regarding the reduction on energy use inside not only the British Library building but also numerous other buildings. On the two displayed certificates (See Photo 4), it can be learned that the British Library had greatly improved its Operational Rating, moving from a score of 152 (G Rating) to a score of 116 (E Rating); and that has been achieved through the implementation of Energy Action Plan including the replacement of the heating and hot water systems with new, highly efficient gas boilers and the introduction of new, very low energy LED lighting in public areas. The best practice on the continuous improvement of energy efficiency at British Library over the past decade has demonstrated the applicability of the principle on sustainability oriented resources efficiency.

### **Effective services procurement and provision**

This principle aims to ensure clients to have and professionals to provide FM services that can be effectively procured and provided in a symmetrical manner with regard to essential FM functions relating to people and products.



*Photo 5: Cash is spent. Image courtesy of Network Rail.*

There are numerous cases in which resources unnecessarily used at workplaces including open spaces such as car parks, squares and roads within an organisation's local built environment. For example, a lack of informed control on effective energy used for lighting at daytime. The environmentally considerate procurement (Ferro, 2011) of FM services under either in-house or outsourcing mode takes an important role to identify the most appropriate FM contractor upon the adoption of a well-designed SLA and the implementation of a portfolio-based facilities management (NAS, 2011) towards long-term efficiency in resources usage at workplaces. Photo 5 was taken at one railway station in England on 9 June 2008. Like many other railway stations, it looks that timer might be adjusted properly to maximise the use of daylight on platforms in the summer season. Under the circumstance in which outsourcing has been on an increasing trend in FM, the principle on

effective services procurement and provision can be useful for clients to find appropriate services providers and for FM professionals to fulfil their duties.

### Lifecycle oriented rapid dynamic responses

The need for and value of professional FM services are to support clients to provide quality workplaces to their employees who may have diverse and dynamic perceptions and needs for everyday working towards productive contributions in teamwork inside the environment where all aspects of health, safety and welfare are sufficiently considered. This principle aims to ensure clients to have and professionals to provide FM services that can effectively and efficiently respond to dynamic needs for facilities and their users inside the local built environment through whole life with regard to essential FM functions relating to people and products.



*Photo 6: Six windows. Image courtesy of the owner of the office building in Edinburgh.*

Photo 6 was taken on campus at one university in Edinburgh at a bright midday on 20 January 2016, and it was a reflection as an example of the quality of light in relation to the provision of lighting and users' preferences at workplaces, in addition to the care of indoor air quality behind the six windows. While it may not be necessarily on demand for a routine check on lighting and indoor air quality at specific time intervals in this office building, Photo 6 shows different lighting degrees in six rooms in which natural and artificial lighting were chosen differently by six academics working in their individual offices. In addition to the lighting, one window on the ground floor was kept open for fresh air while all other five windows were closed in this building which has no artificial ventilation and air conditioning system for offices. It can be learned from Photo 6 that under the circumstances that building occupiers may have different perceptions and/or cautiousness on the conditions of workplaces with regard to essential requirements on health, safety, and wellbeing, etc., it is required that FM can provide thorough care of people and workplaces on these issues through rapid dynamic responses informed by data, information, and knowledge accumulated from specific workplaces under FM, and the applicability of this principle is inevitable.

## CONCLUSIONS

The purpose of this paper is to summarise the methodology of and findings from a recent research into FM principles. It consists of three main sections including the use of TRIZ, principles of FM, and case studies. The section on TRIZ summarised a nine-square approach to conducting TRIZ-led literature review, which has been used to derive the framework of FMBOK and principles of FM, and can be further widely used as a generic method for extensive literature review in a systematic way in order to justify research aims and objectives. The section on FM principles summarised six

generic principles under three knowledge domains on people, products, and processes respectively within the framework of FMBOK. The six FM principles were derived from and justified by the TRIZ-led literature review. The section on case studies provided six exemplary studies on issues related to individual FM principles, and were used to further justify the applicability of the six FM principles. It is expected that research methodology and findings described in this paper could be useful for both practice and research in FM.

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# **ADOPTING A MULTIPLE CHANGE PERSPECTIVE TO EXPLORE ORGANIZATIONAL IMPLICATIONS FROM IMPLEMENTING ENERGY EFFICIENCY TARGETS**

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Swedish public construction client organisations are forced to find sustainable and new ways to manage their building stock. This is due to several challenges, such as rapidly growing cities, resulting in a lack of premises, ambitiously set governmental sustainability targets and a run-down building stock in need of measures. In this paper, current challenges and their related change processes are viewed from a ‘multiple change’- perspective and it is suggested that several change processes, both past and present ought to be acknowledged when incorporating sustainable targets, such as energy efficiency, in public construction client organizations.

Keywords: Change management, Organizational analysis, Facilities management

## **INTRODUCTION**

Closely linked to the many important challenges that society faces today, including climate change and urbanization, is the issue of how the existing building stock is managed. Many public buildings in Sweden were built during the millennium program, a public housing programme implemented between the years 1965-1974. At the same time as Swedish cities are growing rapidly, resulting in a shortage of premises for public service functions such as schools and nurseries, the premises built during the millennium programme need to be renovated or even replaced, as they have now reached their technical lifespan. In addition to growing cities, new sustainable targets, such as energy efficiency goals, are entering public construction organizations. As an example, the building sector in Sweden (like the EU) is, compared to 1995 levels, aiming at a 20% reduction in energy use by 2020 (Thollander et al. 2013).

Responsible for supplying and maintaining public premises are public construction clients (PCCs). With 50% of the construction output being commissioned by PCCs, together with the fact that PCCs often serve as role models for private clients and that they are expected to act as change agents in the construction industry (Eisma and Volker 2014), PCCs are of great importance for the industry. Despite this importance, findings from a literature review (Eisma and Volker 2014) showed that the number of scientific papers on PCCs is limited and the ones that are out there have a limited scope, having for example missed out on the organizational level of analysis. In this paper, I seek to address the organization level of analysis, together with the micro/project and the national/industry level. By adopting a ‘multiple change perspective’ (Schwarz and Stensaker 2014), the aim of this paper is both to create further understanding for the implementation of energy efficiency targets in PCC organizations and also to expand the understandings of change in PCCs.

A study of the development of a new strategy within a municipal Premises Management Office (PMO) is given as an illustrative example of how PCC organizations, when complying with national and local regulations, such as energy reduction, are at the same time involved in several other (change) processes, past and present, that have possible impacts on each other and consequently ought to be recognized and sufficiently managed.

## **FRAME OF REFERENCES**

### **Change in public organizations**

Being faced with new challenges, such as to meet new sustainability targets, public client organizations are forced to rethink the way in which they operate. To rethink, means to change. For the public sector, processes of change are challenging due to the public sector's risk aversion, its bureaucratic structures, conflict regarding budgets and the sector's monopolistic structure(s) (for a more comprehensive overview see Meyer et al. 2013). Research on change in the specific context of public client organizations has shown that change can be difficult due to public construction clients' bureaucratic structures (Hartmann et al. 2006). Further, implementing sustainability in an organization can be compared to the implementation of a so called radical innovation (Lozano 2006), meaning implementing a new idea which brings with it new products and processes. This in turn means that resistance will be inevitable (Lozano 2006). In addition, public clients operate under political influence, where they are confronted with requirements that represent targets and ambitions of political bodies (Hartmann et al. 2008), and in such organizations, radical change is often more difficult to execute than in other types of organizations (Brunson 1982).

### **Implementing sustainable targets in public construction client organizations**

Research has shown that while implementing sustainable measures several processes are occurring at the same time within client organizations and that the implementation of sustainable measures can be affected by these other processes. In a study of a Swedish public housing company's energy efficient renovation process, Palm and Reindl (2016) found, by applying a practice theory framework, that existing technical infrastructure largely determined what issues came up for discussion at meetings. Thus, rather than discussing newer technology and solutions most meetings were spent discussing technical details of previously used technology. In the same vein, Thoresson (2015) found, by using Actor Network Theory (ANT) (Law 1992), that how energy issues were enacted in practice in a large public refurbishment project, was not solely determined by the (public) housing company involved but also included several intertwined actors and processes such as urban planning and national housing policies. In the later stages of this refurbishment project, climate arguments were largely excluded from the agenda at the advantage of financial ditto.

### **The framework of multiple changes**

Recent examples of research on strategic change in construction has investigated the meaning of change for organizational members, how it is acted upon and interpreted in the construction industry (Löwstedt and Räisänen 2012). In Löwstedt and Räisänen's (2012), case it was found that there was a difference between how strategic change was experienced by the people involved in the process (as complex, as consistent of contradictions and tensions and as evident in various levels throughout the organization) and the formal strategic plans. As such, their research indicates that strategic change is a complex matter, consistent of various parallel processes. In this paper, I seek to build on and contribute to research that acknowledge the complexity and contradictions embedded in organizational change in order to create an understanding for the implementation of energy efficiency targets and consequently changing facilities management practices in PCCs. In other words; research that sees the organization as an emergent state of continuous organizational change (Tsoukas and Chia 2002). From this view the organization itself is not given ontological priority, hence change is not seen as an exceptional effect, produced only under specific circumstances by certain people (change agents) (Tsoukas and Chia 2002, p.569). Rather, change is seen as indivisible and inescapable. This view effects the foundations for the understanding of the organization; a deeper understanding can only be possible by looking at ongoing processes of change. Specifically, in order to increase the understanding for PCC organizations that are

implementing energy efficiency targets I will use the frame work of ‘multiple changes’ as presented by Schwarz and Stensaker (2014).

The theoretical perspective of ‘multiple changes’ is an empirical- and phenomenon driven approach that takes a processual rather than structural approach to change.

Seen from a multiple change view, the organization is always in motion (Schwartz and Stensaker 2014) which indicates a shifting emphasis, from the organization to processes of organizing “The organization....is not the same today as it was yesterday or will be tomorrow (Scott and Davis 2007, p.385)”. Change is viewed neither as continuous nor episodic, rather, large scale changes is proposed to happen in parallel with more incremental change. More, change is not seen as the exception but the normal state, thus change is seen as ‘a series of multiple events’ rather than ‘grand’ events that happens at rare occasions in otherwise stable organisations. In addition, different sorts of change may be occurring at the same time; “The notion of multiple change suggests that at any one point in time there will be multiple and related processes of change underway at different levels within the organization (Schwarz and Stensaker 2014, p.495)”. Further, “These processes are intertwined, yet they tend to have their own momentum, pace, and trajectory (Schwarz and Stensaker 2014, p. 494).” As such, organizations are encouraged to recognize the multitude of processes at a given point in time as stated; “Rather than focusing on how to mobilize for a particular change project, a key question in a multiple change context has to do with how to develop a capacity for many overlapping change processes (Schwarz and Stensaker 2014 p. 495)”.

With a multiple change perspective, history is seen as a narrative of the past and therefore highly subjective (Suddaby et al. 2010), hence, past processes within organizations are alive and effect the present processes (Schwarz and Stensaker 2014). Processes do not have a clear stop, they are ongoing, which contrast previous “linear” views on change. Further, according to Schwarz and Stensaker (2014) the previous dominant change perspectives have treated change in a quite isolated manner, leaving out the broader context and parallel processes. As such, little is known about how different (change) processes affect and impact each other.

Through the lens of a multiple view on change, the sustainability change related processes within PCC’s needs to be set in relation to other processes within the organizations, each process having their own momentum, pace and trajectory, yet being intertwined. Figure 1 illustrates the main arguments of the multiple change perspective in relation to previous dominant perspectives, as presented by Schwarz and Stensaker (2014), and set in relation to the issues brought up in this paper.

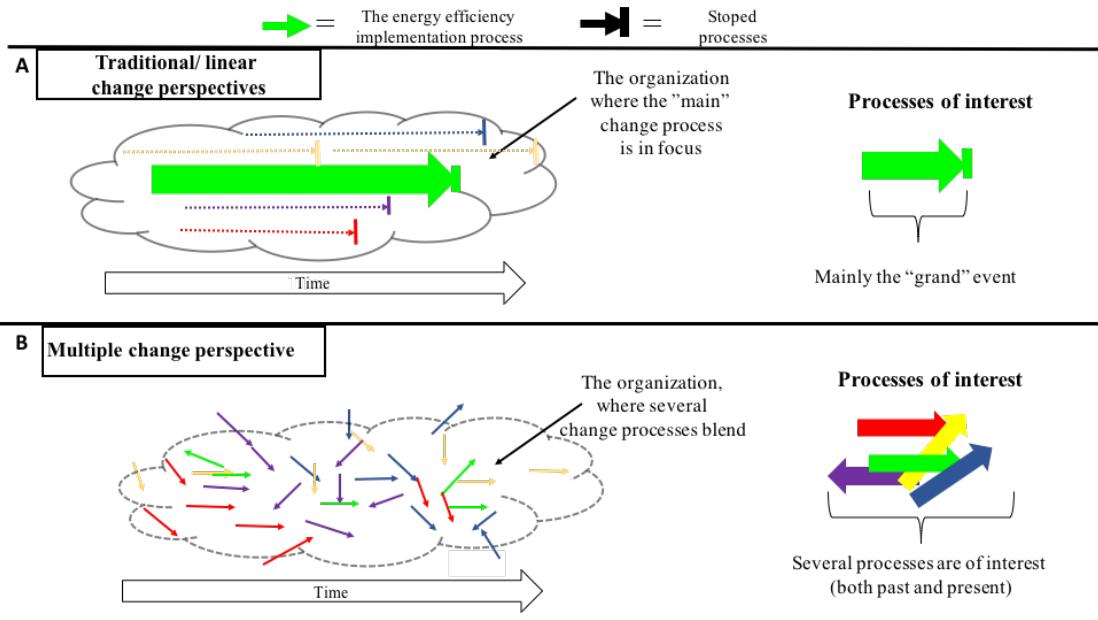


Figure 1: An illustration of the multiple change perspective in relation to previous perspectives

## METHOD

Data was collected between February 2016 and September 2016 and consist of findings from a case study focusing on a Swedish PCC's work with implementing energy efficiency measures; the PMO in the City of Gothenburg, Sweden. In this organization, a strategy for managing premises from the 60's and 70's was developed in 2016. For the purpose of data collection, the author participated in meetings and presentations, at which the strategy was developed and conducted extensive field-notes. In total six meeting and three presentations were attended. Also, the author was given access to organizational documents regarding the strategy. Furthermore, fifteen one-hour semi-structured interviews with twelve stakeholders within and outside of the PMO, all in some way connected to the strategy, were conducted. These interviews consisted of open-ended questions allowing the interviewees to give and discuss their view on such questions as: why the strategy was initiated and developed at this moment; possible organizational consequences; the current project's relation to other projects and challenges (past and current) within and outside the organization(s). In addition, field notes conducted at a national conference on planning for premises in Stockholm, 30-31 May 2016, which members from the PMO attended, was included in the final analysis. All data was converted into text and stored in NVivo. An initial analysis of the interviews revealed that reasons given for the strategy to be developed at a certain moment were different, depending on for example; whether the interviewee belonged to a certain organization and/or the role the interviewee held in that organization. Also, the answers appeared to depend on (different) interpretations of past events. This initial finding led to the inclusion of a previously conducted research report of the organization, in which another project/strategy regarding energy efficiency was investigated (Ludvig 2010), in the analysis. In the next step, theoretical thematic analysis (Braun and Clarke, 2006) was used as organizational phenomenon and processes related to the implementation of energy efficiency targets were identified and set in relation to the multiple change framework. The themes/processes that will be presented in this paper were chosen for the purpose to give illustrations of the multiple change perspective, capturing the framework's main ideas in the context of implementing energy efficiency targets in a public construction client organization. The processes mentioned are examples of ongoing processes that might be forgotten or overlooked, using previous and linear notions of change. This is because they do not look like the change processes that organization usually mobilize for. Instead they are examples of ongoing, continuous processes with no start and no end.

In sum, data consisted of field-notes from observations of meetings, presentations and a conference, interviews, organizational documents and a previously conducted research report.

## BRIEF DESCRIPTION OF CASE ORGANIZATION

The Municipal Premises Management Office (PMO) in the City of Gothenburg (PMO) with its 415 employees build, manage and amend municipal premises, including, schools, preschools, housing for elderly and housing for people with special need. The PMO provide premises for public administration in 10 different City Areas (CA). Responsible for the strategic planning of providing municipal premises for the CAs, coordinates the need for premises and is responsible for optimal use of the premises, is the Premises Secretariat, with around 6 employees. The PS was established in 1999, prior to this the responsibility to provide the CAs with premises were the two facilitates organizations; one larger unit responsible for facilities management and smaller construction projects (mainly school-premises) (SCP) and a unit responsible for housing for elderly (HFE). The Municipal Facilities Board (MFB), which consist of laymen politicians decides focus, goals, policies and directions that governs both PS and PMO's operations. The PS are given investment funding from the MFB on a yearly basis, which they thereafter allocate to the PMO depending on investment needs. For reinvestments into existing buildings the PMO get funding directly from the MFB.

With a beginning in 2008, both the PMO and the PS have undergone significant reorganizations. The PMO as it looks today was established in 2011 through the merging of the SCP, HFE and the "project department" at PS. The strategic planning unit for new premises remained at the PS. When the PS was established 10 people worked in the organization, but in 2008 the organization had grown to around 40 employees. In 2011, the PS was downsized again, to a handful of employees.

## FINDINGS: LOCAL AND NATIONAL CHANGE PROCESSES

Below, I will present the organizational implications from the implementation of energy efficiency targets, using a multiple change perspective. I will do this by firstly presenting the "main" or "grand" event/process, followed by a presentation of other related processes. The grand/main event/process is presented in a rather linear fashion, more according to example A in figure 1. The other processes take the perspective of example B in figure 1, and include the context, past processes as well as intertwined processes.

### **The development of a strategy for sustainable facilitates management – the "grand" event/process**

In 2015 MFB assigned the PMO with the task to develop a long-term strategy for the premises built between the 50's and the 70's. The strategy should be developed together with stakeholders (such as the CA's and the PS) and include common goals and directives regarding renovation and energy-efficiency (energy-efficiency being a main objective).

Prior to the PMO receiving the assignment, the issues regarding the large building stock in need of renovation, together with new energy efficiency regulations had been discussed at the PS by especially a consultant and a sustainability manager. In 2015, after the re-organization, the sustainability manager was now working at the PMO. Together with the director of the PMO and a coordinator from PMO working at the facilities department, the consultant and the sustainability manager discussed the task together, and began developing a new model/strategy for working with premises in the city. What they came to realize was that all the buildings in need of renovation could not be taken care of at the same time. Neither would the organization be able to handle it; nor would they find enough building professionals to do the job. This dilemma is proposed to be resolved by evening out the stock over time, providing each building with four different options (as opposed to the previously three categories); 1) comprehensive refurbishment; 2) replace with new building; 3) Re-investment/ less comprehensive refurbishment; 4) pavilion (s). Further, taking the

whole building stock of the city (or the CA) in consideration when planning for the future was also mentioned as a strategy. Thus, with this new model/strategy, the idea is also to take a larger “take” on the premises which includes not only renovation measures but also planning for new premises at the same time.

### **Adopting a multiple change perspective**

#### *The “grand” event*

Organizing the work according to the new strategy gives several organizational consequences which have been discussed during interviews and meetings. For example, the new way of working does not only consider renovation, it also includes actions for making strategic and long term decision when building new premises. By building bigger premises than needed, these extra spaces will be provided for children who are evacuated from other premises while they are being renovated. Another example concerns the demands on facilities managers, who now will be requested to assess their building stock and make decisions regarding which of the four options to choose. Thus, what began as an assignment to implement energy efficiency targets while renovating, evolved into a larger project with several (change) processes connected to it, including shifting work roles/descriptions and tasks.

#### *Recognizing the political context*

At the PMO, much time on meetings during the development of the strategy were spent on discussions of how to approach politicians and how to “convince” them of the benefits of the new way of working. These issues were also brought up during interviews and the political laymen were referred to as “the politic”, as something undefined, yet extremely important to “handle” or convince. Since a municipality has several public administrations, which all are “competing” over the same financial resources, it is important to be able to argue for one’s cause. According to some, maintenance of buildings is harder to argue for than other more acute measures which are easily visible to the public such as to increase the amount of personnel in a home for elderly.

In sum, the public and/or political context implies that the PMO are constantly involved in processes of finding ways to legitimize and “convince” the elected politicians of their preferred ways of working. At the same time as this is a rather predictable process- the politicians are always re-elected every fourth year- the reality is that mandates and roles are unclear which also implies a more unpredictable, changing reality.

#### *Intertwined and overlapping processes – shifting competences and enhanced collaboration*

Within 10 years some Swedish cities have gone from having an overcapacity to a shortage of public premises; there is a lack of new buildings and at the same time the old ones need to be renovated. Further, not only is this a new phenomenon, but at the same time the public sector is facing a generations shift, thus resulting in lack of both general and specific experience in facilities management related to the current challenges at hand. To manage the old buildings, new, more and different competencies are needed. This includes knowledge in construction but also knowledge in process- and project management as strategic planning and increased collaboration is seen as crucial factors in meeting the new challenges. At the conference, persons who had previously been working in the private sector expressed a fair degree of astonishment that the public sector seem to lack “general” project management tools, implicating that working in a structured way with projects and planning, is something new for PCCs. At the PMO this need for enhanced competence was particularly discussed with regards to the facilities managers (At the PMO facilities managers are responsible for the buildings stock in one City Area and the contact with costumers). According to the new strategy, the facilities managers are supposed to be able evaluate the building stock in their area and to choose one of the four options mentioned earlier for each premise, also taking into account buildings that are not built yet. In order to be able to implement this new process, closer

collaboration with members from other departments have been suggested, as well as extra time for education and also hiring extra IT-personal to help with administration.

Further, several interviewees mentioned the tendency that people use the PMO as a stepping stone for a career in the private sector. Thus, a challenge for the PMO will be not only to find skilled professionals for different (new) roles but also to keep the once already working in the organization and being able to manage and incorporate a longterm vision an organization in which people are “coming and going”.

At the conference, strategic planning, meaning thinking and planning “ahead”, was mentioned as a means to manage the building stock as well as adopting a “holistic” and processual perspective, which include enhanced collaboration both between different stakeholders within and across municipalities. This national movement towards enhanced collaboration was reflected at the PMO in the larger “take” to their premises and in enhanced collaboration between stakeholders. To manage the task to develop a long-term strategy for facilities management at the PMO, two new (project) teams were formed, a key project team, responsible for the development plan and a pilot- project team, investigating the new way of working during spring 2016. The pilot team consisted of members from both the PS, the CA and the PMO in addition to a consultant. Thus, introducing the new energy targets and developing the new plan meant creating new work groups with new routines and rules. Further, in order to speed up the building process, a new type of school was developed within the organization a “concept pre-school”, which is supposed to have a “base-structure” and then be able to be adjusted and fit for different locations. For this development, yet another project team was formed.

Further, one proposition of the ‘strategic development plan’ is that reinvestments and investments shall be decided on in a combined investment plan and that decisions whether to build new would be made by facilitates managers at the PMO. If the new plan gets accepted this would mean an enhanced collaboration between the PMO and the PS. This collaboration is argued to be affected by previous events. Several interviewees and previous studies (Ludvig 2010) have mentioned that there have been discussions between the PS and the Facilities Management organizations regarding the goals of respective organizations. Some considered the PS to be too project oriented, lacking a long-time horizon. Findings from the current case study suggest that experienced differences in perspectives between the Premises Management Office (The PMO) and the PS are still alive in the organizations. As one interviewee stated when explaining the relationship between the PMO and the PS: “...dissatisfaction from PS where they think that PMO has not had an eye on their properties ‘you have not been able to describe this well enough what your needs are’ ...similarly PMO has looked at PS and ‘you have not... you are unable to manage your planning ‘...’”. Due to these previous divergences between the organizations regarding the goals of their operations, many are stressing the importance of taking small steps toward enhanced collaboration.

The examples above shed light on the importance of recognizing intertwined processes of change as well as the different paces of different processes. Nationally and locally, enhanced collaboration within, and especially between, municipalities were believed to be dependent on “small steps” and thorough preparations. At the same time PCCs ought to meet new requirements with rather sharp deadlines. Several interviewees at the PMO pointed to the importance of the PMO and the PS being able to successfully cooperate in order for the strategy project to be implemented, thus seeing these processes as intertwined. Argo, the examples above illustrate the existence of both large-scale change processes in parallel with more incremental change processes.

#### *The impact of previous events and history*

To use a multiple change perspective also requires a notion of the past, and its effects in the future. An example of how interpretations of previous events are effecting current processes is how actions with regards to planning are explained. A previous lack of planning is by some put forward as the

reason to why the buildings are in bad shape today. Yet others refer to that there was no possibility for long term planning previously because there were no financial resources that enabled that and also that more things were actually done, then maybe recognized today. "...it is not so that we have not done anything over the years, they (the premises) have been maintained after their ability and according to the resources that the municipality had back then..." Thus, by some the planning in itself is used as a means, and an argument, to solve current problems and explain previous ones, whereas others argue that it is the lack of resources that is the problem both then and now. Several interviewees mentioned that it will be difficult to carry out the new way of working since there is a lack of skilled professionals to do the job that is needed: "...there are no people even if we had the financial resources..." and "...thinking of all the construction work in our geographical area, so financially this project is mistimed ... and well, the market is overheated so there is a total lack of resources..."

So perhaps the solution is not (solely) a plan? But if previous lack of accomplishments is viewed in terms of lack of planning, and not because of the limited resources, then (of course) planning is the answer. Hence, the (subjective) views of the past effect the strategies in the present and therefore needs to be acknowledged.

## **CONCLUDING REMARKS AND FUTURE RESEARCH**

Findings indicate that governmental sustainability targets together with a large run-down building stock in need of measures and rapidly growing cities force Swedish PCCs to find new ways to manage their building stock. Previous research also indicates that given the complexity of renovation processes and change in public construction client organizations, the conditions and consequences of a multitude of processes needs to take into account when analysing the implementation of new strategies and ways of working. As such, in this paper I have introduced the framework of 'multiple changes' in order to deeper the understandings of processes of organizing in relation to the implementation of energy efficiency targets. The findings give an illustration of the importance to acknowledge several phenomena in relation to the implementation process, when trying to incorporate new energy goals in a PCC organization, such as the context, parallel and intertwined (change) processes, as well as past processes.

In this paper, I have claimed for the constant presence of ongoing processes of change in organizations. If change is such a natural state, how should one account for the previous evidence of resistance to change? To say that change is the normal state, does not mean that organizations constantly change (Tsoukas and Chia 2002). Hence, there is difference between "change in organizations" and "organizational change". In order for organizational change to be possible I argue that a first step is to recognize the true nature of change, to view the organizations from the inside and to take an interest in several change processes on the organizational/micro level, processes that might otherwise be overlooked. This view is shared by Tsoukas and Chia (2002): "If we focus our attention only on what becomes institutionalized, an approach largely assumed by synoptic accounts of organizational change, we risk missing all the subterranean, microscopic changes that always go on in the bowels of organizations, changes that may never acquire the status of formal organizational systems and routines but are no less important (p.580)". The processes presented in this paper are just examples, illustrations, in reality there are probably more processes going on.

This paper suggests that PCCs ought to recognize that the introduction of sustainable measures and targets alone, such as energy efficiency, do not result in the creation of new structures and practices; instead, it is a combination of other changes that collectively shape practices of facilitates management. Consequently, in order to be able to (successfully) implement sustainable measures targets PCCs are suggested to acknowledge the different change processes related to these measures

and treat them uniquely, since they are all part of the arrangement and development of what we call the organization.

As the notion of multiple change challenges traditional models of change, new issues and tensions emerge that require further research, such as the investigation of possible tensions and contradictions between different change processes as well as the impact of respective process on each other.

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# **METHODS USED FOR KNOWLEDGE MANAGEMENT AND ORGANIZATIONAL LEARNING IN THE PRACTICE OF CONSTRUCTION PROJECTS: A SYSTEMATIC LITERATURE REVIEW**

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There is a need to refurbish many of the apartment blocks that were built in Europe's big cities during the 1960s and 1970s, the same applies to the Million Homes programme in Sweden. Many of the housing complexes consist of numerous similar apartments that will be refurbished in the same manner. To learn from previous refurbishment projects, a method for knowledge management to facilitate organizational learning would be useful. In new build, one method for managing knowledge is to use a platform concept. Drawing on this, applying a knowing in practice perspective and adopting methods for the sharing, codifying and transfer of tacit knowledge is recognized as crucial for successful knowledge management when using a platform concept. The aim of this research is to identify methods used in the everyday practice in construction projects for the sharing and transfer of tacit knowledge and to address this; a systematic literature review has been conducted. Findings indicate, e.g. different kinds of mentoring, especially in the form of learning by doing or working side by side with more senior colleagues are recognized as being used as a method for the sharing and transfer of tacit knowledge. Further, the adopted methods for managing knowledge, e.g. by the use of a platform concept, should involve both technological and social elements. Hence, involving different actors, and methods including social elements such as different kinds of face-to-face meetings, mentorships, i.e. learning by doing under supervision, and site visits are recognized as being especially useful for knowledge sharing and knowledge transfer per se.

Keywords: refurbishment, knowledge sharing, knowledge transfer, platform, knowing in practice

## **INTRODUCTION**

The rapid urbanization in Sweden during the 1950s in combination with growing demands on housing standards and state regulations resulted in housing queues of ten years or more (Hall & Vidén 2005). To solve the problem of the housing shortage, the Swedish parliament adopted the target of completing a million new homes in ten years, between the years of 1965-1975, The Million Homes Programme. The Million Homes programme was carried out and now more than 40 years later the buildings from the Million Homes programme are in need to be refurbished. The technical quality of those buildings is often low, and in many cases the external environment is poor (Hall & Vidén, 2005). There are large variations in the building technology that was used in the Million Homes programme (Formas, 2012). Despite this fact per se, many of the housing complexes consist of numerous similar apartments that will be refurbished in the same manner. A major Swedish contractor has identified refurbishment as an emerging market and has decided to collect knowledge and experiences from the execution of refurbishment projects within their organization. The contractor wants to obtain benefits, hence reducing the risk of wasting time and efforts in new refurbishment projects, when learning from previous refurbishment projects by systemizing the knowledge and experiences obtained from previous refurbishment projects. With this scope, a method for managing relevant knowledge to facilitate learning between refurbishment projects and the permanent organization is highly useful, i.e. increase organizational learning. In new build, a

platform concept is recognized as one method for managing knowledge. However, in their study about testing a platform concept as a knowledge management method for refurbishment Lundberg & Lidelöw (2016) indicate that applying a knowing in practice perspective and adopting methods for the sharing, codifying and transfer of tacit knowledge are crucial for successful knowledge management. Additionally, that the tenants have a prominent role during refurbishment is also recognized by Lundberg & Lidelöw (2016) which is also supported by Lind et al. (2016). The aim of this research is to identify methods used in the everyday practice in construction projects for the sharing and transfer of tacit knowledge.

Knowledge takes various forms, as argued by Nonaka & Takeuchi (1995): one form of knowledge is explicit knowledge, which can be expressed in words and numbers and thus can be transferred as information between individuals formally and systematically. Another form of knowledge is tacit knowledge, which is highly personal and deeply rooted in individual's actions, experiences, ideas, values and emotions. Hence, tacit knowledge is often difficult to verbalize and communicate to others (*ibid*). Lam (2000) holds that large parts of human knowledge are tacit, particularly operational skills and know-how acquired through practical experience. Thus, as large proportions of the work carried out on a construction site is inherently action-oriented, practical, experience-based and performed according to rules of thumb, much of it is arguably rooted in tacit knowledge. Further, the view of knowledge as a dynamic and ongoing social accomplishment, referred to as knowing in practice by Orlitzk (2006), is adopted. Jonsson (2012) supports this view and argues that knowledge is a process and further emphasize that the use of knowledge is expressed as an individual's ability to mobilize it in action.

Since the 1990s, when the knowledge-based view of the firm emerged, many organizations have invested in various solutions for managing knowledge (Easterby-Smith & Lyles, 2011). Most organizations seem to be stuck with solutions intended to improve the accessibility of information by using information technology (Jonsson, 2015). However, a key step towards effective knowledge management and ultimately experience feedback is to understand how knowledge is shared in practice, in the day- to-day work (*ibid*.). Javernick-Will (2012) further argue that knowledge management scholars mostly have focused on macro-level constructs and relationships, i.e. at the organizational level. Thus, they have recognized the importance of technology, communication strategies and resources for sharing knowledge. Nevertheless, processes of locating, providing and reusing knowledge within an organization largely occur on the micro, individual employee level. Similarly, the individual is the key to organizational learning because it is individuals' thinking and acting that result in learning (Argyris, 1995). Two main approaches to knowledge management can be discerned: one focus on technological elements and the other on social elements (Newell, 2015). Some authors treat knowledge as a resource that can be managed like any other (tangible) resource, while others focus on managing knowledge work rather than knowledge itself (*ibid*.). However, "Effective knowledge management in organizations involves a combination of technological and social elements" (Easterby-Smith & Lyles, 2011, p.106). The view of the connection between information, knowledge and learning when managing knowledge as described by Winch (2010) is adopted: information is knowledge in use by a resource mobilized to create new values, and the learning generated during this mobilization has the potential to enhance the existing stock of knowledge and it is this process of organizational learning by the resource bases that has become known as knowledge management.

Dubois & Gadde (2002) argue that in a construction project collective knowledge is created and forms a shared understanding regarding what is done and how it is done. They further identified patterns in the construction industry as tight couplings in individual projects and loose couplings in the permanent networks, i.e. learning both between different projects and learning from projects to the permanent organization in a construction company is a challenge. Additionally, Styhre, Josephson & Knauseder (2004) empathize that in construction projects know-how is primarily shared

through informal and personal contacts, and new arenas are needed where various professional groups can share knowledge and information, i.e. experience feedback can occur, for the beneficial joint learning.

In the process of implementing industrialised house building, contractors have recognized the use of the platform concept as one method to become more efficient and reduce costs. For instance, Thuesen and Hvam (2011) presented quality and lead time improvement as well as a reduction of project cost by 30% in a study of a German Housing platform. Also, Bonev et al. (2015) have studied the precast sector and the findings suggest that utilising platforms involves the creation of an optimum cost – value relation for the target market segment. Further, in contemporary studies on platform concepts various authors have highlighted the importance of integrating experiences gained from earlier projects into the platform, i.e. to increase organizational learning (Dave and Koskela, 2009, Meiling, 2010, Styhre and Gluch, 2010, Thuesen and Hvam, 2011, Jansson et al., 2014, and Lessing et al., 2015). Drawing on these studies a platform concept is regarded as a vehicle for transfer of information from construction projects. Additionally, contemporary studies on platform concepts in the construction industry mainly concerns new build. According to Robertson and Ulrich (1998), a platform is the collection of assets that are shared by a set of products. These assets are components, processes, knowledge, and relationships. Platforms for the refurbishment of buildings would largely consist of processes, knowledge, and relationships.

## **METHOD AND STRUCTURE ADOPTED FOR THE SYSTEMATIC LITERATURE REVIEW**

To identify methods used in the everyday practice in construction projects for the sharing and transfer of tacit knowledge, a systematic literature review was performed. A systematic literature review is a question-driven methodology, and involves identifying and sifting through relevant literature and evaluating each according to predefined criteria. Further, a systematic literature review must be transparent and use a standardized, structured and protocol driven methodology (Jesson, Matheson & Lacey, 2011). The systematic literature review was conducted between February and June 2016 and covered the databases of Web of Science and Scopus, and included publications from the year of 2005 to the year of 2016, because from the year of 2005 the publications increased considerably. As described by Walker (2016), well -publicised reports from Latham (1994) and later Egan (1998, 2002) prompted serious rethinking of how construction management practice could be improved leading to much of the substance in the rethinking debates has been focussed on enacting effective innovation through improved knowledge management and organizational learning practices. Additionally, a whole new subset of knowledge management and organizational learning has risen out of understanding learning through practice (*ibid.*).

The research question underlying the search was:

RQ: What are the methods for organizational learning in terms of knowledge sharing and knowledge transfer in the everyday practice of construction projects on site level in a western world context?

The following search string and combination of keywords were used: ((“construction industry” OR “building industry”) AND (“organizational learning” OR “knowledge sharing” OR “knowledge transfer”)). The rationale for using the chosen keywords are, firstly, it is in the context of the construction industry (or building industry) the refurbishment of the Million Homes Programme will be carried out. Secondly, organizational learning has the potential to be the outcome of knowledge management and for a knowledge management initiative to succeed; both sharing and transfer of knowledge must take place. Inclusion criteria for further analysis were; peer-reviewed journal papers written in English describing methods for organizational learning/ knowledge sharing/ knowledge transfer, encompassing empirical data from practice, site level in construction projects and western world context. As argued by Jonsson (2015), to better manage knowledge within an organization we

need to develop our understanding how knowledge is used and shared in practice, i.e. having a knowing in practice perspective. Further, since much of the work in construction projects are carried out on construction sites, analysing the site level is appropriate. Additionally, Kurth's (2004) definition of "the West" was adopted, i.e. the West includes the United States, Europe, Canada, Australia and New Zealand. The search from using the search string identified 99 papers in Scopus and 32 papers in Web of Science. Duplicates of the papers were deleted. Each title and abstract was screened using the inclusion criteria leaving 53 potential papers. The remaining potential papers were read more closely for information about methods for organizational learning, knowledge sharing and knowledge transfer in the everyday practice of construction projects at a site level in a western world context. The final number of papers which met the inclusion criteria was 11. See Table 1 for the search report. The fact that only 11 articles qualified for the final analysis was slight surprising. However, it seems to indicate that despite calls for more emphasis on more empirical foundation especially in terms of viewing from an organizational learning perspective at a construction project level, i.e. site level, (Chan et al., 2005), methods used for the sharing and transfer of knowledge at a construction site level has been embraced somewhat sparsely in the empirical construction project literature to date.

*Table 1 Search report*

Scopus	99 papers
Web of Science	32 papers
Potential in scope and interesting	53 papers
In scope after reading	11 papers

To analyse the 11 included papers and by adopting an interpretivist approach, the researcher ordered, systematized and grouped the included papers in ten themes. The themes recognized as technological elements are ICT, platforms, formal processes, formal documentation and different kinds of revisions, and the themes recognized as social elements are workshops, different kinds of face-to-face meetings, use of moderators, use of mentors and visits.

## **RESULT FROM THE SYSTEMATIC LITERATURE REVIEW**

The result of the systematic literature review, which also is an answer on the research question underlying the search for literature, is presented in condensed form in Table 2. The first page of Table 2 address technological elements and the second page of Table 2 address social elements.

Regarding technological elements, in 9 out of the 11 papers, ICTs such as intranets and e-rooms are used with the purpose to facilitate communication. Intranets are primarily used for transfer of general company information. Further, in 6 papers prescribed formal processes for live capture and reuse of project knowledge are described. The objective is to capture and systemize knowledge and experiences to facilitate knowledge transfer and learning. Also, in 5 papers formal documentation are described as being important for systemizing and transfer of knowledge. Revisions are recognized in 4 papers and are supposed to function as a process for learning from mistakes by the capture and systemizing of knowledge. Then, as described in 3 papers, there is an indication that a platform, functions mainly as a technical platform prescribing technical solutions, i.e. functioning as a tool for information and knowledge transfer for new housing, and further, coordinates the work within a project.

Regarding social elements, in 9 out of the 11 papers, face-to-face meetings, often involving different actors in a construction project are commonly used for knowledge sharing and knowledge transfer. Also, mentoring, as recognized in 5 papers and site visits, 4 papers, are described as being important for knowledge sharing and knowledge transfer. Especially, mentoring in the form of learning-by-doing or working side by side with senior colleagues are described as working well for the sharing and transfer of practical knowledge, i.e. tacit knowledge. Site visits are carried out, e.g. to study and evaluate different issues in practice. The use of a moderator, 4 papers, are mainly functioning as a facilitator for coding and transfer of knowledge with the purpose to increase learning in the company. Finally, workshops are less used as a knowledge sharing and knowledge transfer activity, 2 papers.

To increase the use of a technological element such as an intranet Styhre & Gluch (2010) argue that it must be more user-friendly. Further, Ingirige & Sexton (2007) mean that intranet use of site staff is low because of the lack of information regarding task specific issues and conclude there is still much to be done for intranets and their role as a functioning knowledge sharing and knowledge capturing tool. Regarding e-rooms the risk of information overload has been identified, this issue is handled by having a designated person, e.g. a moderator which in this study is regarded a social element, to administrate the flow of information, acting as a kind of filter (Bigliardi, Dormio & Galati, 2010, Tan, Carrillo & Anumba, 2012).

Out of the 11 papers included for in-depth analysis only the paper written by Haapalainen (2008) concerns refurbishment. The importance of involving the end-users, i.e. the tenants, early in the planning is emphasized (*ibid.*).

During the systematization process it became clear that a majority of the papers involve a combination of technological and social elements for knowledge management. Whether they are effective regarding knowledge management, i.e. leading to organizational learning is not studied though. Nevertheless, in some papers there is a predominance of one of the two. Hence, papers identified as studying cases with a predominance of technological elements for knowledge management, i.e. ICT, platforms, formal processes, formal documentation and different kinds of revisions, had a more intra organizational focus regarding learning, i.e. a focus on learning within the organization. Whereas papers identified as studying cases with a predominance of social elements for knowledge management, i.e. workshops, different kinds of meetings, moderator, mentoring and visits, had a more inter organizational focus regarding learning, i.e. a focus on learning across organizations.

*Table 2, first part address tech. elements & the second part address social elements*

	Intra	Inter	ICT	Platforms	Formal processes	Formal documentation	Revisions
Ingirige & Sexton (2007)	X	-	Intranet for static company communication				
Haapalainen (2008)	-	X					
Styhre (2008)	-	X				Paper books at an individual level	
Bigliardi, Dormio & Galati (2010)	X	X	Integrated information system, database, e-mail discussion groups		Method including six phases	Paper-based system	
Bresnen (2010)	-	X	ICT, e-mail for general communication			Booklets to workforce informing about the importance of collaboration	
						Paper-based system	
Styhre & Gluch (2010)	X	-	Internet based media	Technical platform			
Hallowell (2012)	X	-	Intranet showing safety records, rec. for prevention and planning from workers		Analyzing accidents		Performing self-inspections
Tan, Carrillo & Anumba (2012)	X	-	Web-based knowledge base allowing individual submission Staff profile, e-forum		Prescribed methodology for capture and reuse of project knowledge		Project reviews
Håkansson & Ingemannsson (2013)	-	X	ICT tools for planning	Technical platform	Routines, partnering		Exchanging experience from finished projects
Jansson, Lundkvist & Olofsson (2015)	X	-	Feedback systems logging individual reflections	Technical platform	Design optimization twice/project A formal process how to handle routines	Routines and documents to facilitate knowledge transfer	Internal reviews
Peters, Pressey & Johnston	-	X	e-mails	-	Sign-off system after	Technical drawings and	

(2016)					each stage	diagrams	
	Intra	Inter	Workshops	Meetings	Moderator	Mentoring	Visits
Ingirige & Sexton (2007)	X	-	Internal workshops				
Haapalainen (2008)	-	X		Both informal and formal meetings	Mock up room		Site visits to evaluate in practice
Styhre (2008)	-	X		Informal, (coffee breaks) Verbal comm. important		Learning-by-doing	
Bigliardi, Dormio & Galati (2010)	X	X		Regular interorg meeting (customers, suppl. & own staff)	A person responsible for handling & storing information	Junior managers working side by side with senior managers	
Bresnen (2010)	-	X	High level works. (senior staff from client, consultant & contractor) Project specific workshop (site personnel incl. subcontractors)	Face-to-face meetings			Weekly design meetings on site
Styhre & Gluch (2010)	X	-			Knowledge centres		
Hallowell (2012)	X	-		Safety related discussions among workers		Safety mentorships	
Tan, Carrillo & Anumba (2012)	X	-		Project meetings	Person responsible		
Håkansson & Ingemannsson (2013)	-	X		Internal & external courses		Learning by doing through mentoring/ coaching	Study visits at clients place
Jansson, Lundkvist & Olofsson (2015)	X	-		Improvement meetings once per month. Client feedback meetings			
Peters, Pressey & Johnston (2016)	-	X		Monthly face-to-face meetings	Senior champions	Informal site visit	

## DISCUSSION AND CONCLUSIONS

In their study about testing a platform concept as a knowledge management method for refurbishment Lundberg & Lidelöw (2016) indicate that applying a knowing in practice perspective and adopting methods for the sharing and transfer of tacit knowledge are crucial for successful knowledge management. Therefore, the aim of this study was to identify methods used in the everyday practice in construction projects for the sharing and transfer of tacit knowledge.

A question-driven systematic literature review has been performed and the result indicate that different kinds of mentoring, especially in the form of learning by doing or working side by side with more senior colleagues are recognized as being used as a method for the sharing and transfer of tacit knowledge. Also site visits, in particular when used for evaluate and study some issues in practice, have a potential as a method for sharing and transfer of tacit knowledge.

Winch (2010) means that organizational learning has the potential to be the outcome of knowledge management. Further, the research question underlying the literature review was: what are the methods for organizational learning in terms of knowledge sharing and knowledge transfer in the everyday practice of construction projects on site level in a western world context? The results indicate that in a majority of the cases, a combination of technological and social elements (methods) for managing knowledge are used, this is in line with the reasoning by Newell (2015) and Easterby-Smith & Lyles (2011). It is also recognized that only 11 articles qualified for the final analysis. This indicates that from an organizational learning perspective, methods used for the sharing and transfer of knowledge at a construction site level has been embraced somewhat sparsely in the empirical construction project literature to date. Moreover, if these methods lead to organizational learning which has the potential to be the outcome of successful knowledge management as argued by Winch (2010) is not made clear. The results indicate that ICTs are widely spread throughout construction companies. Further, intranets transfer primarily general company information and it is further recognized that there is much to be done for intranets and their roles as a functioning knowledge sharing and knowledge capturing tool (Ingirige & Sexton (2007), Styhre & Gluch (2010)). Also, various forms of e-rooms are implemented with the expectation to facilitate communication, i.e. facilitate knowledge sharing and knowledge transfer. However, with the use of e-rooms the risk of information overload has been recognized. To overcome this, a designated person, i.e. a moderator is used acting as kind of a filter deciding what knowledge and information to store in intranets and formal company documents. Moreover, formal processes, often in combination with formal meetings, are frequently used to capture and systemize knowledge with the purpose to facilitate knowledge transfer and learning. Various forms of revisions have a similar function, and the focus is to learn from mistakes. In construction companies there is an indication that a platform concept function mainly as a tool for prescribing technical solutions, e.g. transfer of knowledge and information. The results further show that social elements such as different kinds of face- to-face meetings, mentorships, i.e. learning by doing under supervision and site visits, often involving different actors, are commonly used for knowledge sharing and knowledge transfer. Papers recognized as studying cases with a predominance of technological elements for knowledge management, i.e. ICT, platforms, formal processes, formal documentation and different kinds of revisions, had a more intra organizational focus regarding learning, i.e. a focus on learning within the organization. Whereas papers identified as studying cases with a predominance of social elements for knowledge management, i.e. workshops, different kinds of meetings, moderator, mentoring and visits, had a more inter organizational focus regarding learning, i.e. a focus on learning across organizations. This observation is interesting given the Million Homes Programme and using a platform concept for refurbishment as a tool for managing knowledge and learning, especially since it is recognized that it is important to involve the tenants in the refurbishment process (Haapalainen (2007), Lundberg & Lidelöw (2016)). With regard to refurbishment Lind et al. (2016) further empathize that both municipal housing companies and some long-term private owners are looking

for a more sustainable refurbishment policy, taking into account environmental, social and economic sustainability. Hence, making a more holistic evaluation of various refurbishment options and involving the tenants in the decision and implementation refurbishment process (*ibid.*). Thus, this is an indication of that a contractor should consider an inter organizational focus regarding learning, i.e. focus on learning across organizations, when refurbishing The Million Homes programme. Further, the adopted methods for managing knowledge, e.g. the use of a platform concept, should involve both technological and social elements. Hence, involving different actors, and methods such as different kinds of face- to-face meetings, mentorships, i.e. learning by doing under supervision, and site visits are recognized as being especially useful for knowledge sharing and knowledge transfer per se. Finally, despite calls for more emphasis on more empirical foundation especially in terms of viewing from an organizational learning perspective at a construction project level, i.e. site level (Chan et al., 2005), there are only a limited number of studies investigating methods used in the everyday practice in construction projects for the sharing and transfer of knowledge. Also, what these methods actually mean for organizational learning benefiting a construction company need to be further investigated.

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# EVIDENCE-BASED SAFETY MANAGEMENT IN BUILDING REFURBISHMENT

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**Abstract:** In response to the long-term need for building asset management, this paper puts forward a new evidence-based safety analysis (ESA) approach to safety management in building refurbishment to prompt the use of evidence-based learning in practice and research in the subject field. This paper initiates a conceptual ESA framework to support the use of evidence-based method in practice-oriented research into safety management for building refurbishment. The ESA approach aims to find an innovative way to facilitate the collection of data and information from accumulated professional knowledge about accidents and failures as well as good practices and innovations, to derive useful lessons to inform improved practice in safety management in building refurbishment. Through the use of such a theoretical framework, this paper demonstrates through a case study how ESA can effectively support learning lessons from previous building refurbishment projects. It is expected that this paper can make a good contribution to the body of knowledge by providing the new ESA approach and a practice-oriented experimental case study on the use of ESA approach to safety management in building refurbishment so as to inform future practice and research at strategic and tactic level.

**Keywords:** buildings, evidence-based learning, refurbishment, safety management

## INTRODUCTION

Building refurbishment is an important appeal for sustainable built environment and has become one of the main proportions in the whole construction market, especially in the developed world. As described by Ala et al. (1996), it is an ideal option for modernising the existing building in terms of the consideration on a number of related issues such as the environment and it helps in retaining the old charm and significance of the existing buildings in a planned manner to adapt to new physical requirements. Under the nature of building refurbishment, it is always an important technical question as Arayici (2008) has highlighted that safety management strategies and procedures are in place to ensure the physical process to add value to the existing building. It is always a target as well as a challenge to pursue zero accident in safety management on building refurbishment, and innovative solutions to continuously improve safety management are therefore in demand.

The technical value of case or evidence based learning has been widely recognised within the learned society in the construction industry. For example, RICS (2014) as a representative from professional bodies has started to publish a series of case studies to guide strategic facilities management, and Liu, et al. (2013) as representative from academics have applied case-based reasoning technique for safety early warning in construction project. Through a preliminary literature review, it has been found that there has been a lack of research into the application of case method for safety management in building refurbishment, and a dedicated research may help to explore a formal procedure with regard to making a good contribution to the body of knowledge in this area.

This paper describes the structure of and preliminary outcomes from an ongoing research into evidence based learning for safety management in building refurbishment projects. Based on a brief literature review on safety management in building refurbishment and evidence based practice, the aim and objectives of the described research were defined and then achieved through the use of a set of research methods including literature review, system analysis and design, and case study in order to present a new technical framework to facilitate the procedure of evidence based safety analysis

(ESA) for safety management in building refurbishment. It is expected that this paper could attract interest in discussion about the research in terms of its usefulness and further research development and collaboration at this ARCOM workshop.

## **BACKGROUND**

The aim and objectives of the research described in this paper were set up through a preliminary literature review in two related areas covering techniques for effective knowledge reuse for safety management in building refurbishment and evidence based learning in relation to safety management. This background review aims to justify whether it is necessary and how to conduct the research into a new ESA approach to safety management in building refurbishment.

### **Knowledge driven safety management**

Safety management in building refurbishment needs to address a similar set of technical issues that building construction needs to deal with in terms of a series of health and safety risks associated with various issues such as Access on site; Welfare; Scaffolds; Ladders; Roof work; Powered access equipment; Traffic, vehicles and plant; Hoists; Cranes; Excavations; Manual handling; Hazardous substances; Noise; Hand-arm vibration; Electricity and other services; Confined spaces; Tools and machinery; Fires and emergencies; and Protecting the public, which have been specified by HSE (2006). For safety management in building refurbishment, there are other specific issues for professionals to deal with. For example, the health and safety risks of demolition and structural instability (Anumba, et al., 2004). Since the Construction (Design and Management) Regulations 2015 (CDM 2015) came into force on 6 April 2015, and the adoption of Building Information Management/Modelling (BIM) in the construction sector, safety management for building refurbishment is in place to incorporate new techniques to well connect stages across the whole lifecycle of building projects. In another words, safety management should be conducted from design through construction into operation in a continuous manner. While it has been always important to adopt a systematic approach (Mills, 2001) to risk management towards the target on zero fatality in construction, new practice on using knowledge through the entire or part project lifecycle has demonstrated the importance of knowledge driven safety management. For example, AstraZeneca (IOSH, 2010) in Manchester, UK has realised additional benefits through using an extended knowledge base during the design phase in a variety of projects. Therefore, it has become more and more important for safety management professionals with duties under the regulations to have new techniques that can support effective use of accumulated professional knowledge such as lessons learnt from past case projects in a BIM pervasive working environment across work stages (Hare, et al., 2006; HSE, 2015; and WBDG Secure/Safe Committee, 2017) such as RIBA (2013) Plan of Work from design through construction/refurbishment into operation.

The need for seeking informed decision making support in project management has put knowledge reuse in a demanding place in order to effectively learn lessons from past experience for better performance in new project. For safety management in building refurbishment, the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) (HSE, 2013) have made a formal procedure to accumulate lessons learnt from incidents and accidents from workplaces, and RIDDOR records have actually become a reliable source of knowledge for professionals in building refurbishment, for example, to learn lessons from past projects. It will effectively support informed decision making if both learning lessons from individual projects and identifying reasons and associated risks through statistics from reports on incidents and accidents on site can be made possible. As described by Anumba, et al. (2006), a decision support system can be applied to avoid structural collapses in building refurbishment; while Kaklauskas, et al. (2008) also described a knowledge-based decision support system for building refurbishment. It is therefore expected that the research into knowledge reuse in safety management can provide sufficient support to decision making in building refurbishment.

## **Evidence based learning**

Evidence-based method as a practical approach to supporting effective professional learning and problem solving has increasingly gained ground in clinical practice in the past more than two decades, and has been applied with good outcomes in many subject fields. According to Sackett et al. (2000), evidence-based practice has been introduced into clinical practice for conscientious, explicit and judicious reliance on current best evidence in making decisions on the care of individual patients by involves integrating individual clinical expertise with the best external clinical evidence available drawn from systematic study, and the general procedure of evidence-based practice includes assessing the patient, asking clinical questions that arise from the case, acquiring evidence, appraising the evidence, integrating the evidence with clinical expertise and evaluating performance. For buildings, evidence-based design has been adopted in numerous projects as mentioned by (Clipson and Johnson, 1987) and it involves the consideration of facts, rational experience, building regulations and guidelines, as well as existing practice in design through a similar procedure. On the other hand, the research into and practice on evidence-based management (Kovner and Rundall, 2006) have further incorporated evidence-based learning in the management world at both strategic and tactical level. It has been found through a preliminary literature review on evidence-based learning that the formal practice adopting evidence-based method with positive outcomes have indicated a potential useful adoption in safety management in terms of many comparable similarities.

The literature review on existing research into knowledge driven safety management relating to building refurbishment and the lack of research into evidence based learning in project management has indicated a new research to bridge the gap between evidence based learning and knowledge driven safety management in building refurbishment, and the evidence-based safety analysis (ESA) approach is therefore proposed for research described in this paper. As a generic method, it is also expected that the ESA could potentially have a wider application on safety management in not only refurbishment projects but also new construction projects.

## **RESEARCH STRATEGY**

The preliminary literature review summarised in the background on safety management in building refurbishment and the need for innovative tools to improve the practice, and this has led a research aiming at a new ESA approach to supporting evidence-informed safety management in building refurbishment. This research has been being conducted through considering the following objectives to achieve the aim:

A generic theoretical framework called ESA to support the use of evidence-based method in practice-oriented research into safety management for building refurbishment.

A procedure to implement the framework through the collection of data and information from accidents and failures as well as contemporary good practices and innovations that are relevant to safety management in building refurbishment in order to eventually derive useful lessons to form improved strategies and processes on safety management in building refurbishment projects.

A demonstration through a series of case studies on how ESA approach can effectively support learning lessons from previous building refurbishment projects and improving safety management in new refurbishment projects.

The research methodology adopted comprises an extensive literature review to justify the aim and objectives of the study, a system analysis and design to derive the ESA framework based on current techniques for best practice in safety management, a case base to support evidence based learning in safety management in building refurbishment projects, and a series of experimental case studies through the use of ESA and the case base to demonstrate its effectiveness.

## **ESA**

### **Technical analysis**

The evidence-based safety analysis (ESA) being put forward in this paper is generally defined as a technical approach to safety management by incorporating evidence based method into the whole work process of an ongoing project, and a technical framework of ESA has been first developed in the research for building refurbishment projects. The purpose of such a technical framework is to facilitate the adoption of evidence based method in well-regulated work process for safety management in building refurbishment, and the person who will conduct ESA is assumed a CDM Coordinator or Health and Safety Manager for building refurbishment projects. According to the preliminary literature on the background of described research, technical components/processes to be integrated together to form ESA framework include the process of RIDDOR, the process of staged building refurbishment, the process of evidence based method, and the process of decision making on ESA. These technical components need to be well connected to set up an ESA integrated work programme for building refurbishment projects, and the connections across these technical components are procedures which need to be further defined to support the collection, storage, and use of evidence including data and information from past experience on similar projects undertaken by professionals inside and outside the company.

The entire work procedure for implementing an ESA framework in individual building refurbishment projects needs to comply with existing work procedures widely adopted in practice. For this preliminary research, it is ideal to adopt a formal work procedure covering the whole lifecycle of buildings because of the need for incorporating technical review on health and safety management from design through refurbishment into operation for individual refurbishment projects, and the RIBS (2013) Plan of Work is an ideal work procedure to be adapted for a ESA framework for building refurbishment.

The implementation of ESA also needs a case base that has a good amount of evidence in related areas from a rich source of past projects undertaken by both the company that will conduct an ESA in a particular building refurbishment project and other companies in local, regional, national and international scope. Despite of many other sources of evidence relating to health and safety management in building refurbishment, one particular source of evidence, for example, is the set of documentations from RIDDOR, and the structure of each case study needs to be designed with regard to the availability of data and information from RIDDOR. A specified structure of case studies is in need for collecting evidence for case studies in a unified consistent format, and this will facilitate retrieving evidence from the ESA case base.

A conceptual framework of ESA for building refurbishment projects has been developed according to this technical analysis, and presented in Figure 1. Descriptions on processes of this technical framework are given below to explain how ESA can be implemented through a formal procedure.

### **Technical description**

An indicative technical framework of ESA has been developed at the initial stage of the described research. As illustrated in Figure 1, the framework is designed to incorporate activities to implement evidence based learning throughout a generic work procedure for which RIBA Plan of Work was chosen to adapt to the need for use in building refurbishment projects, and these activities include

Conducting ESA in connection with other supportive activities described below, including collecting technical solutions, collecting evidence (reported case studies, and other data and information from past projects), collecting technical solutions for building refurbishment across work stages, and making judgment on technical solution assessment and execution

plan for health and safety management at further work stage. The ESA process will be conducted through several technical steps including

- Step 1: Preparing evaluation criteria and checkpoints for health and safety review and assessment at individual work stages of building refurbishment in a particular project,
- Step 2: Acquiring related evidence on internally and externally reported injuries, diseases and dangerous occurrences and other related data and information from past practice in similar projects,
- Step 3: Assessing the technical solution upon a particular refurbishment project at individual work stages.

Collecting reported case studies from ESA case base based on data and information in formal documentation under regulations such as the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) in UK. The case base to be developed as part of ESA prototype provides technical evidence accumulated from past projects in a wide scope covering related practice in local, regional, national, and international scale. The process to collect reported case studies is expected to be conducted from internal and external sources of an organisation where ESA is adopted, and the reason for collecting reported case studies is to ensure the reliability of evidence to be used for ESA.

Collecting other data and information on health and safety management from projects for which internal and external reports on injuries, diseases and dangerous occurrences are eventually collected in a case base for ESA.

Collecting technical solutions for building refurbishment at each work stage across work stages integrated within the ESA framework. These technical solutions are to be provided by a technical coordinator such as Construction (Design and Management) (CDM) Coordinator or Building Information Modelling (BIM) Coordinator (Shepherd, 2015) at each work stage for specific health and safety review according to related regulations such as the Construction (Design and Management) Regulations 2015 in UK and industry standards.

Making judgment on the acceptance of the technical solution at each work stage.

Making an execution plan for safety management at next work stage after a technical solution passes staged assessment.

The ESA framework presented in Figure 1 is developed to incorporate the function of evidence based learning and practice into the current work process such as the RIBA Plan of Work in building refurbishment. All ESA related activities and its technical steps are interconnected to ensure an effective implementation of evidence based learning towards a series of review on staged technical solutions and a series of execution plans for safety management at various work stages.

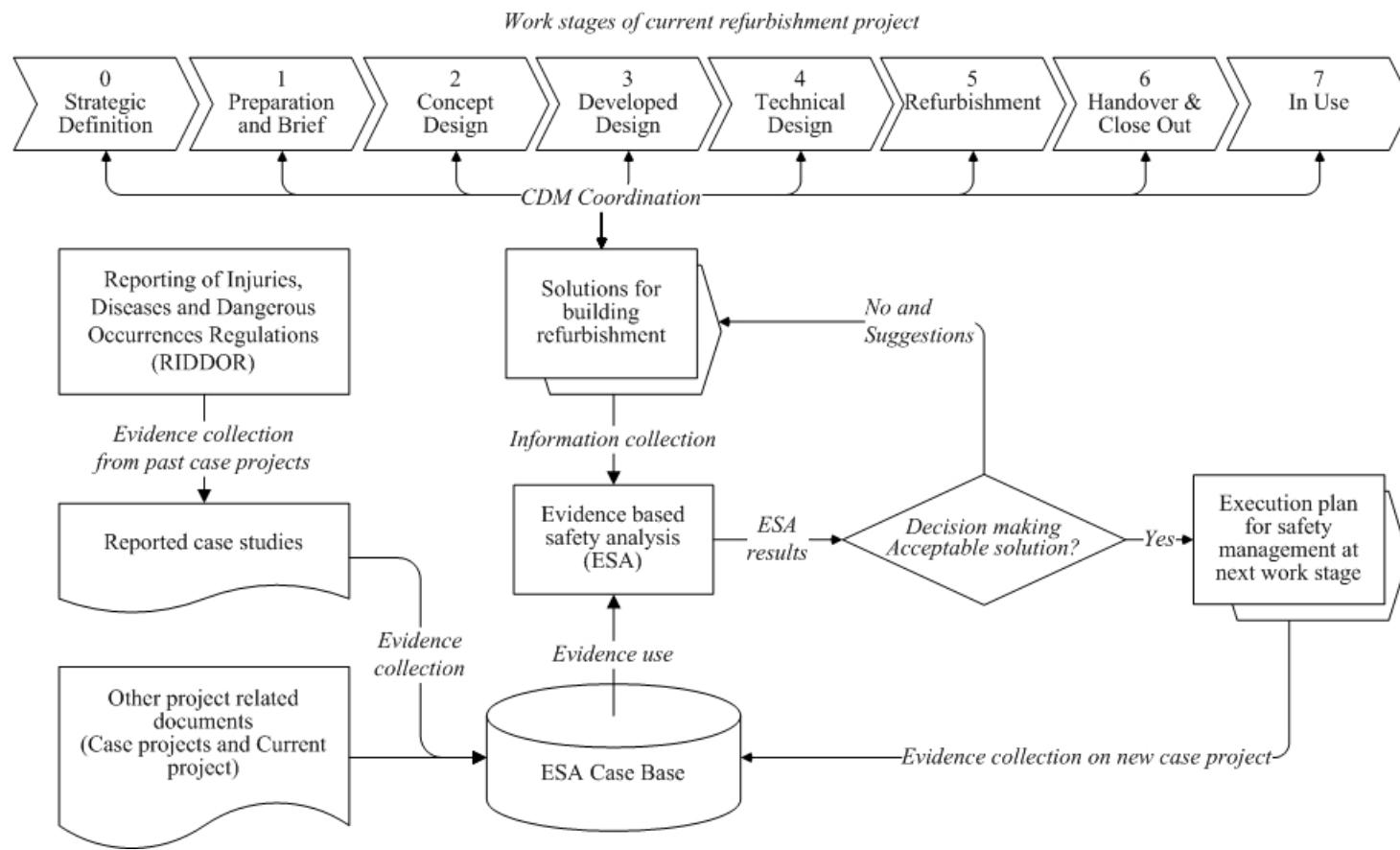


Figure 1: ESA framework

## DISCUSSION

It is necessary to demonstrate the effectiveness of ESA in real projects after the technical framework is developed. As it is an on-going research into ESA framework and its toolkit including the ESA case base and ESA evaluation criteria and checkpoints, this paper just provides a brief discussion on the use of ESA on a scenario base in one building refurbishment project in London.

The scenario based case study is a façade replacement project for one office building alongside a busy street in central London. As shown in Photo 1, which was taken on site on 20 July 2016, a team of workers were dismantling a scaffold system in front of the building after it had been well equipped with a brand new façade system. However two risks relating to potential falling objects were spotted at that moment when the photo was taken, and these include

The handle of one piece of steel scaffold board on the top of scaffolding, and  
Several large pieces of reinforced polyethylene scaffold sheeting flapping on the scaffolding without control.



*Photo 1: Risk of falling objects*

By using ESA for this scaffold dismantling process, which was part of the entire façade replacement project, the three technical steps given in the Technical Description section above need to be conducted, and a brief discussion is given below:

Step 1: A general set of evaluation criteria and checkpoints for safety review and assessment on a scaffold dismantling plan needs to be set up, and it needs to focus on risks in connection with falling objects and structural stability of the scaffold system. In this case study, it was obvious that the risks of falling objects were still high during scaffold dismantling, and evidence associated with falling objects need to be further added in Step 2 in this ESA.

Step 2: In the review and assessment of a scaffold dismantling plan prior to operation on site, lessons need to be learned and/or revisited from similar projects focusing on scaffold dismantling. As this case study is for demonstration only, evidence were therefore first collected in terms of accidents that had happened in connection to falling objects from scaffolding in building refurbishment projects in London. The following accidents were found identical from reported accidents in the City of London in recent years with regard to the risks of falling objects spotted in this project:

- Al-Othman, 31 May 2016: A pedestrian was rushed to hospital with serious head injuries after she was hit by a piece of falling scaffolding in Rathbone Place.
- Rucki, 5 May 2015: A pedestrian was treated for serious injuries in hospital after she was hit on the head by scaffolding which fell from a building site in Manor Park Road.
- Blundy and Mann, 20 January 2015: Two women, both aged in their 50s, were taken to hospital with serious head injuries after being hit by falling debris in Eldon Street; while witnesses described their horror at seeing the women hit by a metal pole, which catapulted to the floor towards the opposite side of the street.
- Morgan, 23 October 2014: A young child on his scooter escaped death “by inches” after scaffold workers dropped a 2kg metal clip onto the pavement below on a side street just off Oxford Street in front of dozens of shoppers. The terrified child froze in horror and then vomited in front of his shocked father after a metal clip used to secure the rigging fell and clipped the rear wheel of his micro-scooter. Scaffolders working on site were dismantling the scaffolding when the clip broke free.

Step 3: A scaffold dismantling plan and its process as shown in Photo 1 is then reviewed and assessed. Based on evaluation criteria and lessons learned from partially collected evidence, conclusion from technical review and assessment on the technical solution including techniques and processes for scaffold dismantling was therefore made to amend the plan in order to reduce risks of falling objects.

This scenario based case study aims to demonstrate the procedure of ESA in technical review and assessment for reliable safety management planning on scaffold dismantling process. Although the two spotted risks of falling objects might not have led to any serious accident or injury on site, the photo taken from a site visit had revealed defects in that scaffold dismantling process, and the adoption of ESA prior to dismantling the scaffold system can ensure a safer plan of work so as to eliminate risks of accidents. In addition to ESA review and assessment, an improved scaffold dismantling plan will need to show a comprehensive consideration on directly related issues including the protection of the public and scaffolders

working at height, and the entire stability of scaffold system in the dismantling process; and include a safety management procedure to cover monitoring, supervision as well as training; and these will form a safety management plan prior to scaffold dismantling.

## CONCLUSIONS

The described research in this paper has achieved preliminary outcomes on a conceptual framework of ESA and technical descriptions on the use of ESA as an integrated technical process for safety management in building refurbishment projects. The ESA process requires collaborations between safety management and CDM coordination throughout a chain of individual work stages to make effective and efficient review and assessment on a technical solution coming from one work stage and to make safety management plan for the next work stage if the technical solution can pass ESA review and assessment. The ESA process can therefore reinforce safety management in design through refurbishment into operation with regard to eliminating risks of accidents. Under the ESA framework presented in this paper, further research is under consideration to focus on several key technical components including an ESA case base and a set of evaluation criteria and checkpoints for ESA review and assessment.

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# 'BECOMING COLLABORATIVE': A STUDY OF INTRA-ORGANISATIONAL RELATIONAL DYNAMICS IN TERM MAINTENANCE CONTRACTS

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The intra-organisational relationships of through-life support services providers are complex, especially given the multifaceted nature of the provision required. For example, capabilities within the UK highways maintenance arena must support engineering design, routine maintenance and the ongoing management of the network. While collaboration in construction projects has formed a major research focus in recent years, there is a paucity of work examining collaboration in-flight. Through a micro-practices approach two contracts delivering highway infrastructure maintenance and renewal services are examined to explore the intra-organisational relationships that determine the quality of service delivered. Despite the rhetoric of collaboration and integrated working that pervades the contemporary project discourse, there was a clear focus on addressing immediate technical and commercial concerns rather than on creating the conditions for integrated working to flourish. On the occasions where the collaborative environment was prioritised a more integrated service was delivered. In contrast to other accounts of the ways collaborative working shapes performance, this research reveals an acute need for a sustained collaborative effort; as soon as 'collaborative working' was normalised, the level of integration and seamlessness of service was diminished. This questions normative notions of what defines collaborative working in projects, and suggests a need for reframing it as an ongoing accomplishment of actors involved. Such a perspective resonates with notions of 'organizational becoming', particularly in that attempts to foster collaboration are themselves constitutive of the unfolding and shifting nature of intra-organizational relationships that emerge in complex contractual arrangements.

Keywords: collaboration, highway maintenance, infrastructure, organisational becoming.

## INTRODUCTION

Major infrastructure schemes have received a great deal of attention in the project literature where it is largely concerned with large one-off projects. Ongoing term maintenance contracts, on the other hand, receive rather less attention even though they present very different challenges. Specifically, strategic highway maintenance and renewal services must deal with the effects of ongoing programmes of work, complex multifaceted project environments, geographically disparate teams and the legacy of previous incumbents, including the transfer of project staff according to Transfer of Undertakings (Protection of Employment) Regulations (TUPE) in the UK. The rapid mobilisation of projects sees significant numbers of staff transfer to the supplier on day one of the new contract. This creates a challenging environment for intra-organisational relationships whereby project staff dependent upon a diverse skills and the collective knowledge have little time to sort out who knows what (Meyerson et al., 1995). Despite a plethora of literature within the field of construction management attending to the benefits of a collaborative approach to project delivery, there is a paucity of research that seeks to understand the micro-practices at play

within intra-organisational collaborative working relationships and how these relationships are sustained in such through life service arrangements.

The prevailing methods used to govern delivery of highways maintenance contracts in the UK are at odds with the industry's desire to take a collaborative approach. Despite the adversarial contracts employed to govern highways maintenance projects in the UK, a collaborative approach to project delivery is attractive to the sector and features a core value for many. Collaboration is supported and encouraged through British and international standards (The British Standards Institute, 2016) and is celebrated by industry awards (New Civil Engineer, 2016). Despite the pervasiveness of collaboration as a non-financial indicator of project success, we know very little about how it unfolds in through life service agreements.

This study recognises that actors within organisations form intricate networks that simultaneously collaborate around more complex issues and understanding how this happens is crucial for understanding how actors organise themselves to address important (Tello-Rozas et al., 2015). This is not explored in extant construction management literature which is more concerned with normative explanations and antecedents for collaborative working arrangements. To address the observed deficiency this research adopts a micro-practices approach to understand empirically how collaborative working plays out in these difficult scenarios and the resulting effects it has upon project delivery. This paper contributes theoretically to debates in collaboration and management literatures as it adopts the lens of organisational becoming (Tsoukas and Chia, 2002) through which to examine the framing and reframing of collaborative working vision statements.

## LITERATURE REVIEW

Arriving at an acceptable definition of collaboration for the industry has proved to be troublesome as its meaning alters depending on perspective (Hughes et al., 2012) which is problematic when attempting to uncover the expertise involved (Poirier et al., 2016). The variety of organisational and individual agendas present in collaborative situations makes it difficult to agree on the common practice (Huxham, 2003). While a universally accepted definition may not be available in the literature, a working definition is required here. A widely cited definition by Gray (1989) defines collaboration as the “process through which parties who see different aspects of a problem can constructively explore their differences and search for solutions that go beyond their own limited vision of what is possible”. We adopt this definition and view it as applying equally to two or more individuals within an organisation, between divisions within organisations as well as across organisational boundaries.

In construction management research (CMR) there is much rhetoric around the benefits of collaborative approaches to delivering complex programmes with a significant volume of research commenting on factors that encourage and inhibit it (Bresnen and Marshall, 2000), how to measure it (Yin et al., 2011), control it (Ballard, 2000), how to employ fit-for-purpose contracts to foster it (Cox and Thompson, 1997), and the best tools to support it (Bolstad and Endsley, 2003). The trend in current literature is to identify antecedents or conditions for successful collaborations. Such explorations and descriptions of the features of collaboration and the consequences of intervention provide useful accounts of the merits and demerits tools and techniques have on management practice. In this sense, collaboration is conceptualised as something that can be externally created and applied to situations under specific conditions by certain people, for example business improvement consultants. Normative views of collaboration are however unhelpful for dealing with contingent circumstances. We see a need to move beyond the assumptions that the correct collaborative processes can be applied,

resulting in collaborative working and instead attempt to think of collaboration on its own terms and we are therefore recommending a more nuanced understanding which takes greater account of the micro-level practices in action.

Far from being externally created and applied we argue that collaborative working is a phenomenon socially constructed from within organisations by the actors involved. This reversal of ontological priority has resonance with Tsoukas and Chia's (2002) call to treat change as a normal condition of organisational life. Attempts to impose a structured approach to collaborative working should be viewed as Tsoukas and Chia view the imposition of change initiatives; attempts to shape change result in further change. In the same way, attempts to control and shape collaboration affects the underlying relationships which in turn impacts upon the emergence of subsequent collaborative behaviours. We argue here that a conceptualisation of collaboration as an ongoing endeavour is more helpful for our understanding of what constitutes collaborative working and a focus on the micro-practices is advantageous for three reasons which we will now explore.

### **Lack of empirical evidence**

Firstly a micro-practices approach attends to the dearth of grass-roots level empirical research into organisational collaboration. Organisational studies tend to be separated into macro (concerned with organisational theory) and micro (concerned with organisational behaviour) (Pondy and Mitroff, 1979). Collaboration has been the focus of many researchers work but few have looked into the underlying micro-practices with prevalent neo-institutional, macro views (Suddaby et al., 2013) of collaboration concerned with meta-analyses that document antecedents and provide normative explanations.

Whilst the focus for this paper is to understand collaboration with attention turned toward micro-practices, we recognise this must occur with sight of the macro and the associated broad and complex sets of meta problems (Trist, 1983). Combining the macro and micro perspectives encourages researchers' think of organisations as contingent outcomes of on-going interactions and to offer a more nuanced view. Routines and conversations are elementary forms of daily life and, despite their mundane nature; they relevantly link the micro and the macro (Feldman, 2000). We get a richer picture when we do not separate routines from the people applying them (Feldman, 2000). To describe the adjustment in the level of analysis and how this refocusing on the micro reveals otherwise hidden knowledge, we take Tsoukas and Chia's analogy of a tightrope walker (Tsoukas and Chia, 2002) and apply it to a car travelling along a motorway. If the focus of analysis is upon the car, it may be viewed as stable as it travels within the lane markings at a constant speed. But if we reduce the level of analysis to the driver if becomes possible to observe the constant adjustments made to the steering wheel, the rise and fall of the foot on the accelerator pedal and the eyes that make regular glances to the mirrors to check for other road users. At certain levels of analysis stability can be seen and yet at others high degrees of dynamism are apparent. Both the macro and micro view are important.

As discussed, organisations have high level aims and strategic objectives to work collaboratively and much research exists describing the collaborative working practices at the project level. What we do not know is how the two are linked. Criticism has been levelled at management and organisation theorist for not fully capturing the complexity of organisational dynamics (Smith and Lewis, 2011) and there are calls to re-theorize the firm from the perspective of the individuals who reside within it and, simultaneously, define it from the perspective of their lived experience (Suddaby et al., 2013). But developing routines for knowledge dissemination in this way is a double-edged sword (Powell, 1998): informal mechanisms (at the micro level) may preclude wide dissemination, while formal procedures

(at a macro level) can inhibit learning and the challenge is to develop regular venues for the informal transmission of information, such that the process itself becomes tied to knowledge seeking and creation (Powell, 1998). In an effort to avoid the classical macro/micro dichotomy we instead attempt to trace the micro-practices as they play out in order to understand the linkages and complementarities between them.

### **An ongoing accomplishment**

Secondly, as well as not knowing enough about the micro-practices of collaboration we do not know how collaborative working is accomplished. The concept of micro-practices adopted here is drawn from social movement literature which has much to say about the micro-practices of protest tactics and mobilisation mechanisms but struggles to articulate how they might lead to a refinement of political agendas at a macro-level. Tello-Rozas et al (2015) takes a micro-practice approach to describe the social movement phenomenon in South America and trace how actors organise themselves and collaborate to address important issues that political authorities seems unable or disinclined to address. In devising their processual model, Tello-Rozas et al (2015) directed attention toward the detailed actions and interactions of people's activities by opening the "black box" and revealing that where numerous collaborations coexist, informal authority usually prevails over formal and that such informal authority emerges dynamically from different meetings and events. Their model identifies the micro-practices of collaboration at play within social networks organised around issues of quality of life and sustainability and describes how collaborative behaviours increase in scale to affect change at a greater scale. Whilst concerned with the micro level of analysis, it is important to avoid the "descriptive trap" of offering detailed micro-ethnographies that are almost too contextualized for the reader to appreciate the far-reaching insights they can produce (Suddaby et al., 2013). The ability to make the link between the micro and the macro is important here.

CMR could learn much from Tello-Rozas appreciation of the micro-practice of collaboration, not only for the rich description of the practices described but for the attempts to document the change that occurs as collaborative behaviours transition from one stage to the next. The normative descriptions found within CMR tend to paint a picture of collaboration that was once like this, now it is like this and in the future it may be like this. Tsoukas and Chia (2002) note that such definitions fail to capture the motion of getting from A to B. It could be argued that as the number of these snap shots in time increase we receive a fuller description of the motion but the fact remains that each snap shot on its own contains no element of movement and we are still without an account of the change between the stages.

### **Normative approach**

Thirdly, taking a micro-practices view attends to our dissatisfaction with the prevailing normative approach to understanding collaboration in CMR. Such explorations into the act of collaboration tend to explain it as a desirable achievement; as an end goal. This approach is mirrored with industry where vision statements, value propositions and strategy documents talk of a desire to be collaborative. Tools and techniques such as collaborative planning initiatives born from the Last Planner System (Ballard, 2000) are frequently applied within the industry to facilitate and formalise interactions. But these systems tend not to take account the more subtle behavioural aspects that carry the potential to affect the consistent realisation of collaborative planning benefits. For instance, BS11000 attempts to deliver stability and control by providing structure to collaborative working practice. It deals with collaboration as something that can be reduced to routines and processes. In contrast we propose that it should instead be viewed as an ongoing achievement under constant

renegotiation for which prescribed standards are not helpful for understanding the emerging properties of working collaboratively.

It is the inevitability of human interaction and the resulting adaptation to new challenges and opportunities that leads Tsoukas and Chia to describe organisations as being in a “state of perpetual becoming” (2002 p.576). Most concepts, they say, are radially structured (Tsoukas and Chia, 2002) with a stable centre that defines communal practice, surrounded by a less stable periphery. Where action stems from this stable central core, the resulting action tends to be stable. The conceptualisation of collaboration as something that can be created and controlled assumes a central stability. But, as we will discuss later, life can throw unexpected events into the periphery. In response to these unexpected events, actors must extend their imagination beyond the stable central core. This is complicated further by the fact that as humans we not only draw on experience from the world around us but also on our own thoughts as we continually reweave our beliefs. The actions we take as a consequence of this reweaving undoubtedly alters subsequent organisational routines. This bears risks for the organisation when we consider our earlier point regarding definitional ambiguity and how collaboration as a term means different things to different people.

The multiplicity of expertise required for engineering projects results in significant differences in the values of the professionals involved which are difficult to integrate (Fellows and Liu, 2012), particularly where two main parties have different commercial and/or social objectives (Ball et al., 2014). As such, collaborative structures are likely to change over time because of ambiguity of membership and complexity in local environments (Bryson et al., 2006) and in response to the specific activities in which the team is embedded (Marshall, 2014). Rather than trying to control collaborative behaviour through the application of tools and techniques, we are instead advocating an appreciation of its fragility and an effort to learn to see how and why interactions occur whilst working to continually refine and modify practice to handle problems and opportunities as they arise. In this sense we promote the conceptualisation of collaboration as becoming.

## METHODS

This research takes a micro-practices approach to collaboration to explore inter-functional and intra-organisational relationships to discover the extent to which espoused intentions correlate with experienced realities. In much the same way that Tello-Rozas et al’s (2015) model describes the varied and intricate micro-practices within complex collaborations involving civil society we apply the same approach to tracing the complex collaborations within project organisations in the context highway infrastructure management. It is intended that this understanding will be used to give meaning to what is implied by working collaboratively.

A case study design has been used to support the argument through an in-depth, exploratory research approach of the ethnographic type (LeCompte and Schensul, 1999) taken to examine an organisation. The case study organisation was large private sector company providing a diverse range of services to the public sector, including infrastructure maintenance and renewal services. The study featured two embedded units of analysis. Each unit is a separate contract delivering highway maintenance and renewal services to separate public sector clients. During a twelve-month period, the researcher spent five days a week in the supplier organisation, participating in activities related to the two observed contracts and following managers in their operational tasks. In exchange, the researcher provided supporting activities (coordinating document reviews, supporting report compilation, analysing data, facilitating workshops and so forth). The triangulated research design included semi-participant observations, semi-structured interviews, and document analyses.

Practice was observed to explore and understand what form collaboration takes, how it is enacted and by who with the aim of unearthing and documenting the micro-practices of collaboration in a highways engineering context. Interpretive analysis of the observed daily work activities and interactions between employees provided a deep appreciation of the micro-practices at play and permitted identification of boundaries between micro-practice and strategic level rhetoric. The observations were supplemented with nine face-to-face semi-structured open-ended interviews lasting between 30 and 90 minutes. The interview participants were key project team members within the supplier organisation working directly on the case study projects. Data was supplemented with analysis of company documents, produced predominantly as outcomes of workshops. The semi-structured interviews were audio recorded and transcribed verbatim for analysis. The interview transcripts were thematically coded and abstractions were made. The analysis focused on emerging themes from the data for a qualitative interpretation.

## FINDINGS AND DISCUSSION

### Informal collaborations: the inevitability of interaction

In CMR literature collaboration is treated as exceptional; a situation that requires specialised applied intervention to be achieved. During the early stages of the observation period within the case study organisation, it quickly became apparent that working collaboratively was not an exceptional occurrence but a “normal” part of the working day. The interactions of project staff were observed to coalesce around a common goal to “get the job done” and emerged in the absence of a convener and without organised facilitation or direction (Tello-Rozas et al., 2015, Trist, 1983). This informal relational behaviour typically took the form of ad-hoc discussions between colleagues. During these interactions individuals were seen to identify linkages and signpost one another to potential sources of knowledge elsewhere within the project and occasionally, outside of the boundaries of the project and across the wider business. Collaborating constructively to explore options to overcome the day to day challenges faced was observed to be something that project staff did intuitively. Far from being a formally instigated collaboration initiative, the collaborations observed were an outcome of inevitable human interaction (Tsoukas and Chia, 2002).

Less apparent was the increasing disconnection between strategic project objectives and operational practice. When faced with challenges that emerged during project delivery, project staff were observed making decisions informally and amongst themselves to act contrary to the method prescribed in formal documentation. This deviant behaviour was not the action of mavericks intent on defying instruction but instead an illuminating example of the evolution of project delivery methods whereby project personnel, over time, neglected to undertake certain specified activities in an effort to get the job done via a quicker and easier route. For the adaptations to become an accepted, albeit informally recognised, alternative approach to project delivery, collusion with other project team members was required. Acting collaboratively to alter organisational routines (Feldman, 2000) saw project participants co-evolving to yield self-organizing governance as projects progress within an often fixed formal framework (Fellows and Liu, 2012). To overcome the unhelpfulness rigidly fixed frameworks bring to project delivery, team members at the grassroots level devised their own working methods in isolation, disconnected from any strategic visions for project delivery.

These constant revisions remained informal and explicit details of this subversive action were not routinely shared with management beyond the team level. The evolution of job roles is but one example of sub-groups within the project delivery team collaborating informally to devise ways of working that better suit themselves. Interviews revealed that it was not uncommon for contract staff to be unaware of the documented processes and procedures or

how they applied to their day to day role: “It would help if this [method statement] made any semblance of sense to me but it doesn’t [...] from my perspective, if I picked up [this method statement] now and put it in the bin nothing would change on a day to day basis”. What Delbridge (2007) terms conflicted collaboration sees simultaneous interdependence and disconnection resulting in both coercive and collaborative experiences for workers. At the coal face, team members have just enough knowledge of who is performing which tasks in their immediate network in order to complete their corresponding activities, even if to achieve this they must undertake activities that contravene the formal documentations that were intended to guide project delivery. The project tools (method statements and process maps, for instance) that were designed to facilitate team working were at times the source of frustration as they obscured any shared meaning (Nicolini et al., 2012). A preoccupation with the properties of organisations (rules, organisation charts, roles etc.) neglected the fact that order in organisations needs to be accomplished every day and is in a constant state of revision (Bryman and Bell, 2011).

This later had a knock on effect which led to serious ramification for the project as a whole. From a collaborative working point of view, the problems brought about by well-intentioned people modifying organisational routines had ramifications that stretched beyond the sub-teams involved (Balthazard et al., 2006) and jeopardised the client supplier relationship at the highest level. Much of the adversity experienced centres on the (mis-) interpretation of the commercial aspects of the contract at project mobilisation and as the project was delivered. Early contractual control governance significantly contributed to a less cooperative negotiation strategy (Lumineau and Henderson, 2012). The focus of management was found to be on addressing the immediate technical and commercial concerns of the project with the contract type leading to behaviours that prioritised cost savings over quality. Collaborative environments for the facilitation of integrated working were initially overlooked.

### **Formal collaborations: temporary interventions**

As the extent of the contractual non-compliances became clear a more considered approach to collaborative working was observed whereby small groups of individuals were assembled and problem identification and solution generation was facilitated by individuals brought to the project for that specific purpose. Observations, supported by interviews, suggest that rather than resulting from proactive decisions to coordinate collaborative working in line with strategic aspirations to work collaboratively, the facilitated sessions at this stage were largely reactionary in response to dysfunctional events brought about by reoccurring episodes of contractual non-compliance. Whilst transactional arrangements allowed uncooperative behaviours to entrench and act as blockers to collaborative, open, honest and trusting relationships, in the face of adversity, collaborative approaches were transplanted into project delivery in the form of formally facilitated “collaborative workshops”. This overtly collaborative approach disclosed previously hidden non-compliances through a mutual understanding of past events and by removing uncertainty about issues threatening the project. A lot of the issues that had been aggravating project delivery were brought to the fore. The improvement plans that ensued facilitated an understanding on the part of management of the concerns of project staff.

Findings show that it is possible to foster an environment of co-creation and collaboratively deliver a more integrated service. Furthermore, the case study organisation has shown that a successfully collaborative approach can be realised when working relationships have been under considerable strain. But crucially, what this tells us is that collaborative working left to its own devices is at the mercy of inevitable human interaction. Whilst people largely act with well-meaning intentions, if unguided and without sight of strategic direction there is a risk

that the resulting practice will not align with intended outcomes. As observed, when motivated by a desire to re-frame strategic vision and disseminate project goals in a way that is meaningful for those who need to hear it, employees are more engaged with their work are said to be more likely to behave in positive and cooperative ways, to the benefit of both the firm and themselves (Salanova and Schaufeli, 2008). Without appreciation of the vision and a “what-this-means-to-me” message, we have seen that collaborative efforts, misguided, can lead us in the wrong direction, especially when activity is underpinned by adversarial contractual arrangements.

## CONCLUDING REMARKS

In seeking to understand micro-practices of collaboration this research has shown that operational level knowledge needs be systematically utilised in the framing and reframing of strategic vision as it recognises that collaboration is not an end goal but a constant state of becoming. We have seen that when unguided by strategic direction, collaborative working has the potential to take us away from where we ought to be. It is within this state of operational blindness of strategic vision and organisational strategic intent that we have positioned our discussion of the micro-practices of collaboration, and not in an assumed state of clearly defined and communicated project goals. As discussed, actors within organisations form intricate networks to collaborate around more complex issues that the documented processes of delivering infrastructure maintenance and renewal services do not account for. A joint social construction of reality emerges from shared experiences and enacts formal as well as informal coordinating patterns of behaviour (Bouwen and Taillieu, 2004). We have seen informal coordinated collaborative actions unfold without orientation towards a shared common script. Project teams, in response to challenges facing them, collaborated informally and instinctively to develop reciprocity in the absence of rules (Gray, 1989 p.17) and to find workaround solutions which saw the evolution of organisational routines away from the stable core and manifested as contractual non-compliance.

Through an examination of the micro-practices of collaboration we have offered an alternative perspective on collaborative working which moves away from labelling its component parts towards a view of becoming collaborative as an ongoing accomplishment (Marshall, 2014) which is subject to creep, slippage and drift which needs careful monitoring and management. For team level collaborative practice to be aligned with the strategic rhetoric of collaboration, those charged with the enactment of the vision must receive clear communication of that vision. Through an active appreciation for micro-practices of collaboration, managers would harvest the knowledge required to reframe the vision in order that it consistently and effectively guides subsequent collaborative working practices. In this vein, managers of project teams must work hard to create the collaborative environments required for successful project delivery (given the challenges these types of contracts bring) and learning to view collaborative working as an ongoing accomplishment would assist them in their endeavours. It is not enough to establish a project team with people identified as exhibiting collaborative behaviours and send it off with a message to be collaborative and expect it to happen naturally. We must recognise that collaboration can deteriorate due to its fragility (Marshall, 2014) and it can also, with considerable effort, be transplanted into failing projects. When the level of analysis is adjusted from the macro to the micro it is possible to see that even stable collaborative environments are in a constant state of flux.

Organisations are good at talking the talk; they believe collaboration is beneficial and taking a collaborative approach to working is the way they want to do business. But when it comes to walking the walk, high level aims are not well communicated through project teams. Despite the challenges, senior management can proactively support collaboration in

temporary infrastructure projects and build relationships that contribute positively towards joint performance, when the collaborative environment is prioritised as a foundational aspect of these complex long-term arrangements. In this sense collaboration must be worked at, it is in a constant state of renewal as it is framed and reframed sympathetically in response to the micro-practices of day to day project delivery requirements. Collaborative working therefore is not an achievable state of being but an ongoing journey of becoming.

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# **PERSPECTIVES OF SENIOR STAKEHOLDERS ON THE ROLE OF STRATEGIC PERFORMANCE MEASUREMENT FOR HEALTHCARE ESTATES**

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Formal Strategic Performance Measurement Systems (SPMSs) are not common among international healthcare providers, and those which are adopted are found largely within centralised public healthcare and are often a mandatory requirement of governments. In order to understand the role of SPMSs applied to the management of healthcare estates, this research seeks to explore the perceptions of senior NHS stakeholders across the UK on the usefulness and value of SPMSs for healthcare estates with a view to promoting performance improvement. Twelve semi-structured interviews were performed with senior stakeholders directly involved in managing estate performance across different regions within UK to explore their perspectives of the value and effectiveness of SPMSs. The findings revealed that SPMSs in the NHS are formally designed to support priorities and goals connected to realising the policy visions and agenda of the UK's central and devolved governments, and concern was expressed that this strategic approach often does not reflect the operational priorities for managing the estate. SPMSs are tools mainly used by governments in centralised systems for generating knowledge and exerting power, an understanding which aligns with Foucault's theory of governmentality as governing at a distance and the relationship of power/knowledge. The key question emerging from this research is how well such a governance tool reflects and contributes to the operational realities of estates management which is recognised as important to improving its performance.

**Keywords:** Strategic Performance Measurement, Healthcare estate, National Health Services (NHS), Govermentality

## **INTRODUCTION**

Facilities are a very important component of the healthcare system highlighted financially in the National Health Service (NHS) in Scotland through the building stock being worth around £5.7 billion (The Scottish Government, 2015). Organisationally, they contribute to achieve the organisation's vision, mission and objectives; and symbolically, they are viewed by the public as the main physical manifestation of the quality of the health care system. Managing a facility portfolio strategically involves decision making on capital allocation and planning regarding acquisition, renovation, operation, repair and disposition of facilities. In centralised public healthcare systems, governments play an important role in the strategic planning and management of the estate portfolio through policy making, capital investment allocations and overseeing the governance and performance management arrangements. In the four UK regions (England, Scotland, Northern Ireland and Wales) the respective Departments of Health (or devolved equivalent) have adopted formal systems for measuring and monitoring the performance of the NHS estates. A large number of studies have addressed the benefits for adopting strategic performance measurement systems (SPMSs) across the public sector. These include from supporting decision-making that lead to improved outcomes for the organisation and meet external accountability requirements, to helping organisations to understand how decision-making processes or practices lead to success or failure and how that understanding can suggest improvement (NRC, 2005).

Measuring facilities performance strategically has been also highlighted by bodies such as the International Organisation for Standardisation (ISO) and the Royal Institution of Chartered

Surveyors (RICS). Despite this, findings from preliminary research evaluated the application internationally of SPMS across health care systems revealing that SPMS's are not a common tool for healthcare estates. In particular, across Europe the NHS UK presents an isolated example of centralised SPMSs applied nationally, aligned to government policy priorities and visions reflective of the variations of four NHS regions. Evidence was also presented in Rodriguez-Labajos et al. (2016) that identified that English speaking nations such as New South Wales (Australia), New Zealand and the United States draw similarities with the centralised approach in the UK. These findings raised the question about the usefulness and value of formal SPMSs for healthcare estates; if they are strategic tools solely adopted to support and legitimise government policy, or whether they are intended to also reflect the priorities of estates management and even to inform its operational practice.

This question led the authors to identify and outline current practice around the use of SPMSs through the examination of the NHS UK. Findings are interpreted through Michael Foucault's theory of governmentality to explore the potential implications of governing at a distance, hence providing a wider theoretical consideration. The findings from this research will inform further research exploring how governance of the health care system manifests itself in other countries with other healthcare governance and funding configurations.

### **Overview of the hospital governance and funding in the NHS**

Analysis without context can be meaningless and so, before discussing the role of SPMSs for the NHS estate it is essential to set the background of the hospital governance and healthcare funding model in the UK. The NHS is the most popular public healthcare system in the world, financed out of general taxation, being largely free at the point of need and available to all inhabitants. Each of the four constituent regions has its own "National Health Service" that is managed at the level of constituent region and it is characterised for being highly centralised (European Union, 2012). This type of governance differs from decentralised health services in that the "authority for policy making, planning or management is transferred to a higher (more central) level of government from a lower (more decentralised) level of government (e.g. from district to state or from state to national authorities)" (Sreeramareddy and Sathyanarayana, 2013). Within each NHS region, governments are responsible for allocating capital investments but also for setting healthcare policy, providing strategic direction to healthcare bodies and oversee delivery of services; while the healthcare bodies have operational functions. Regarding estate management, in practical terms this means that in centralised systems there is an abundance of government-wide strategies, policies and rules that imply that criteria related to asset management effectiveness or efficiency covers public property in just one portfolio, which is managed under the same norms. This can be explained in the lens of Michel Foucault's theory of governmentality as governing at a distance; a theory that provides a fruitful conceptual framework for exploring the research questions.

#### *Governmentality - Governing at a distance*

The study of governmentality draws attention to the powerful processes through which particular techniques and forms of knowledge govern us. Foucault introduces the notion of governmentality as the liberal form of power that governs at a distance utilising the principle of freedom as a way of moulding the individual and society (East, 2015). This concept came to be understood as the type of laissez-faire form of governance that finds its expression in civil society, legitimated through the liberal concern that one must not govern too much (Foucault, 2008). In this type of governance, governmental norms and techniques become embedded in individuals' lives allowing 'private' spaces to be 'ruled' at a distance without losing their sense of freedom (Miller and Rose, 2008). In other words, it consists in the

subject's ability to govern her/himself although under strategies, parameters or techniques set by the governor. This type of governing creates the impression of individual choices, while these choices are imposed by particular techniques or provided within a clear political rational (Gutiérrez-Rodríguez, 2010).

### **History of the strategic performance measurement in the NHS Estate**

The strategic performance measurement (SPM) frameworks of Northern Ireland and Wales are similar, being used since 2002 with minor changes since then. On the other hand, England and Scotland have adopted more recent SPM frameworks. In England, the Premises Assurance Model (PAM) management tool was adopted in 2014 that addresses the challenges of funding in the future, and is aligned with the NHS Constitution regulatory requirements of ensuring the safety of the service users. In Scotland there is the National Asset and Facilities Services Performance Framework (2011) that consists of 20 performance measures that underpinned the facility performance to service and patient needs addressing the three Quality Ambitions: Safe, Effective and Patient centred, and monitor year on year progress in asset performance towards the achievement of the 2020 Vision targets. Table 1 shows the performance facets of the estate that are measured and monitored by each territory. Although the four SPM frameworks are different, they present similarities based on the six facets proposed in the Estatecode Guidance Document published by the NHS Estates (2002) that include physical condition, functional suitability, space utilisation, quality, statutory compliance and environmental management.

*Table 1: performance facets of the estate that are measured by the four territories of the UK*

Organisations	NHS England (PAM NHS)	NHS Scotland (National performance monitoring framework)	NHS Wales	NHS Northern Ireland
Performance facets				
Operational cost				
Maintenance cost				
Backlog maintenance cost				
Productivity				
Physical condition				
Overall condition				
Age				
Statutory compliance				
Level of risk associated with outstanding backlog maintenance				
Fire incidents				
Space utilisation				
Functional suitability				
Quality of the building				
Single bedrooms				
Patient perception and feedback				
Energy performance				
Water and Waste				
PAMS* Quality				
Organisation Governance				

\* Property Asset Management Strategy (PAMS)

### **RESEARCH AIM**

This research attempts to progress findings emerging from a preliminary research, which forms part of a wider project in collaboration with Health Facilities Scotland (HFS). This sought to compare the extent to which formal SPMSs are applied within healthcare systems internationally to evaluate the strategic performance of healthcare estates. Findings revealed that SPMSs are not a common tool for healthcare estates, but are found in centralised healthcare systems aligned to government policy agendas and visions. These findings drove the authors to question the role and value of SPMSs within this context. Hence, this research attempts taking the NHS UK as a case study, to identify and outline current practice in order to critically analyse the influence of governance and power due to the centralised nature of the NHS system in the four regions of the UK, and examine the role that formal SPMSs play in practice for operational management.

### **RESEARCH METHODS**

This research takes an inductive approach to knowledge building with a view to allowing the authors to explore the purposes and value of formal SPMSs within the NHS. For this

research, the UK NHS estate performance measurement systems are taken as a case study and the main research strategy. The research is guided by two research questions that form a basis to explore the problem and make it possible to investigate two different themes that are underpinned to each other:

Q1. Are formal SPMSSs used in practice for estate management, or they simply support government policy and legitimise power?

Q2. What is the potential influence of governance and power regarding SPMSSs for healthcare estates due to the centralised nature of the UK NHS system?

To answer the questions 12 semi-structured interviews were performed with senior stakeholders with the selection criteria based primarily on the level of their involvement in the estate performance. A number of twenty professionals were contacted from the Departments of Health (or devolved equivalent) and Senior Estate Managers from the four regions of the UK. They were invited to participate in one-to-one semi-structure interviews conducted via telephone or video conference due to geographical spread. Only twelve professionals agreed to participate representing four Government Officers from the Departments of Health (two from Scotland, one from Northern Ireland and one from Wales), six Senior Estate Managers (two from Northern Ireland, one from Wales and three from Scotland), and two Estate Advisors at Health Facilities Scotland. Two different types of interviews were designed for each group, to elicit: the purposes of formal SPMSSs from the Government Officers' perspectives; and for Senior Estate Managers to identify how the information provided by the performance measures is used and their perceptions on the usefulness of SPMSSs. More interviews will be conducted at a later stage of the research in order to obtain stronger evidence for the findings.

## FINDINGS

### **The role of SPMSSs viewed from the perspective of Government Officers**

There was a common agreement across the government officers on the purposes and the value that formal SPMSSs bring to the organisation, including: to show accountability; to support governments decision making on where to allocate the capital investments; and to allow Estate Senior Managers to evaluate progress towards government policies goals and visions. These are analysed in-depth below:

#### *To show accountability*

Public healthcare providers have a strong requirement to show accountability and transparency to ministers, stakeholders and public. A large number of studies have found accountability as one of the main outcomes for measurement performance. In the UK, the NHS is one of the largest domains of public expenditure which requires political accountability for how money is spent from the providers and commissionaires. According to a Government Officer from Northern Ireland "the estate constitutes a small part of the whole accountability system, as there is a large range of measures reported that are more clinical performance related, but reporting on the estate performance is still regarded as being important".

#### *To support governments decision making on where to allocate resources*

There was a consensus across the Government Officers that formal SPMSSs offer a more consistent approach among the different healthcare bodies and enabling national comparison. This consistency provides governments with a better understanding of the performance of estate portfolios across the different healthcare bodies informing better decisions on where to prioritise capital investments within the region. In the NHS, evidence informed decisions are becoming increasingly necessary taking into account that budgets in the UK are constrained

and capital allocation is under scrutiny from media (Rich-Mahadkar, 2015). This is leading to an increasing evidence base and competition among healthcare bodies when requesting government funding. In centralised systems such as the NHS, governments are the main investors. With capital allocations to individual NHS boards determined by business cases, which in the case of NHS Scotland, these are allocated with a view to achieving the Scottish Government's ambitious 2020 policy agenda (Vision 2020). In other countries outside Europe, such as in Canada, the Ontario Ministry of Health uses the metric Facility Condition Index (FCI) for making funding planning decisions on what hospitals will need to invest in renewal and when to build new facilities (Ministry of Health and Long term care, 2015). The problem of using performance measures data as the basis of requesting funding is the phenomenon of 'gaming'. This issue has been addressed by many authors in literature and the Estate Advisor at HFS stated that there existed potential for 'gaming' to exist in NHS Scotland where health boards focus on specific indicators to align with funding priorities. Add to this, each of the Government Officers highlighted an issue about the often varying quality of the data being presented. This was also identified by the Estates Advisor with HFS who stated that "there is perceived a lack of interest from Estate Managers due to a perceived lack of alignment with operational priorities. In specific scenarios, lack of resources to keep the data updated has led to continued inconsistencies in the performance measure returns to the Government". Lack of resources has been addressed by most of the Estate Senior Managers as the main issue regarding SPMSs. An Estate Senior Manager from Scotland mentioned that "estate is only a small part of the whole healthcare picture and there are other priorities to satisfy". In Northern Ireland it was also mentioned among the Estate Senior Managers that the lack of credibility and consistency of the surveys makes the data across the different healthcare bodies not comparable. Therefore, the issues of gaming and quality of data drive the authors to question the effectiveness of measuring performance for capital allocations.

*Support senior managers to evaluate progress towards government objectives and policies*

In the NHS, Ministers and Chief Executives in the healthcare boards require Estate Senior Managers to improve performance in order to increase the value provided and comply with policy agendas and strategies. Government Officers agreed that SPMSs support Estate Senior Managers to have a greater understanding of their assets, how they are currently used and how they are likely to be used in the future given changes in demand and the need for addressing new policies. According to the Government Officer interviewed from Wales "formal frameworks are powerful tools that allows management to evaluate performance on a year basis to see if progress has been made. Managing healthcare is a difficult task and there are other higher priorities rather than the evaluation of estate performance; hence, the fact that SPMS is a mandatory requirement allows Estate Senior Managers to sit down and review performance annually". In the NHS Scotland and Northern Ireland Estate Senior Managers are required to prepare a Property Asset Management Strategy (PAMS) document annually with the planned actions that are taken in the coming five years to improve the figures of the performance measures. In these documents performance measures are used to address four strategic questions proposed by Lebas (1995): where have we been? where are we now? where do we want to go? how are we going to get there?. According to the Scottish Government (2015) since the formal SPMS was introduced "Scottish Boards have improved their approach to asset management, their performance management of those assets, and their appreciation of how their assets need to be aligned to NHS Scotland's strategic investment priorities". This is an important aspect to consider, as improvements are happening but with regards to policy achievements.

Despite this, the interviews showed that there is little evidence that the performance measures were being used to inform operational decisions with respondents reporting the dominant

information flow being back to the strategic level. Below are the findings from the interviews performed with estate senior managers around their perceptions and value of formal SPMS's.

### **The role of SPMSSs viewed from the perspectives of Senior Managers**

#### *Utility of performance measures*

The interviews revealed some similarities on the perceptions from Estate Senior Managers on how the information provided by the formal performance measures is used, but also differences on the degrees of use of these systems. Across Estate Senior Managers there was a strong feeling that the collection and reporting of determined performance measures does not provide information for management. Rather, it being used merely for accountability reasons to see how progress is achieved towards strategies set by policies and visions. This was emphasised by an Estate Senior Manager from Scotland who stated that "the measures 'condition of the estate' and 'age profile' provide an overview of the performance of the estate to a high level authority. They are not considered for analysis purposes, and neither support the decision making on where to prioritise the resources or what facilities to maintain, repair, or be disposed of". This issue has been also remarked by a few authors within other contexts (Elg et al., 2013).

There is also a high concern about the measure 'backlog maintenance cost'. Special focus has been given to this figure by ministers not only in the UK, but also in other many countries such as Norway (Hareidea et al., 2016) and Canada (Roberts and Samuelson, 2015). This measure is often utilised for the Departments of Health in the UK in order to get more funding from the central governments. The Estate Managers interviewed showed a strong opposition towards this measure as it is seen by ministers as the reflection of the quality at which the estate is managed; hence, in theory high backlog means poor performance, although in reality this is not the case. This position is defended by the Government Officer interviewed from Northern Ireland that argued that "backlog maintenance cost represents a false figure as it impossible to address all the backlog maintenance issues as in some situations they are not considered as a service priority". Add to this, there are some measures that are quite subjective and there is not a proper methodology for their assessment such as the measure of 'quality of the environment'. Only a few measures are relevant locally. These are used by some Senior Estate Managers regardless of the National Government purposes. The three Estate Senior Managers interviewed from Scotland all outlined that these measures are mainly 'functionality', 'space utilisation' and 'high risk maintenance backlog cost'. There are other performance measures which they consider important that are more operational but are not included within the frameworks and are more relevant to the strategic management of the estate such as those relating to energy or health and safety. This was mentioned by the estate senior manager from Northern Ireland who argued that "not all the formal performance measures are critical to their role, whereas there are others more relevant but tend to be more operational related".

This research also studied the use of performance measures for benchmarking, one of the major performance measurement practices. The interviews showed that this is not a common practice in the NHS among different healthcare bodies and neither between the four regions, as each of them has different measures and there is not consistency on the reporting. An Estate Senior Manager from Scotland mentioned that "benchmarking is used for discussion with governments to make the cases when applying for funding, which is common practice taking into account the competition existing amongst the healthcare bodies when requesting investments". On the other hand, another Scottish Senior Manager commented that "in rare cases benchmarking is used for comparisons among individual facilities within a healthcare

body. Better use of the collected data is needed for this purpose". This tends to be driven by a specific issue that requires exploration and is not standard practice. There is a lot of data collected through the existing performance measurements practices but there is a clear need to make better use of it to inform decisions at an operational level.

#### *Benefits/Detriment of SPMSS*

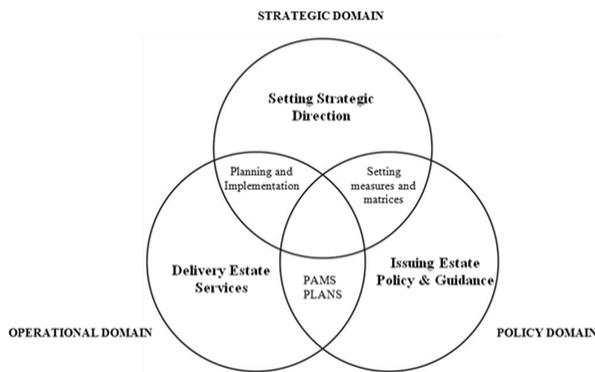
In addition, when interviewers were asking about the value of the SPMSSs, four of them agreed that SPMSSs are a valuable tool, and without being forced to gather performance data and report, they would not be able to celebrate the improvements or respond to negative trends. It is apparent from an operational perspective that estate managers need to be better informed of the objectives of the SPMS to promote understanding and emphasize the value relating to the collection of data. The other two Senior Estate Managers argued that these systems are a waste of resources and the information is collected and reported to merely fill the table.

## **DISCUSSION**

The findings revealed that there is a gap between theory and practice. SPMSSs are tools designed to show accountability on how policy agendas and visions from the central governments are being achieved, rather than reflecting the best priorities for managing the estate. In order words, the information provided by performance measures are not in practice integrated within a true performance management system. Facts that led the authors to hypothesise this as the main reason for the lack of interest from Estate Senior Managers to gather and keep the data updated, as well as a perception that the systems are highly resource and time consuming. This can be explained through the NHS Estate Performance Model designed by the authors for the purpose of this research (figure 1). The model illustrates the interdependencies between the three key domains that impact on estate performance: strategic, political and operational. The strategic domain encompasses strategy determined by both central government and by the health organisations themselves. In the UK, which has a predominantly centralised system, a lot of the strategic direction is determined by the Government. However, in other jurisdictions which operate a more independent and decentralised system the strategies are more likely to be determined at a local level and may have greater convergence with the operational domain. The policy domain covers both, estate policies that in the UK are communicated by means of Health Building Notes, Health Technical Memoranda , Estates Guidance Manuals, Health & Safety Policies, etc, alongside other policies that are directly associated with patient care and safety but have an impact on the estate and the built environment. The operational domain is the area that is largely determined by the Estates Managers in each respective healthcare body. This encompasses the delivery of services to maintain and upgrade the estate and the many statutory duties that Estate Managers have responsibility for. The three domains have significant overlaps and interdependencies. The impact of these and the degree to which they impact on each other is influenced by the level of control exercised from the centre and the model in which they operate. For example, 'planning & implementing' sits within both the strategic domain and the operational domain. In a centrally controlled system the strategic domain may dominate, but conversely in a more independent decentralised system the operational domain will have greater influence. The model locates 'setting measures and KPIs' between the strategic domain and the policy domain, which reflects the centralised control that has been historically applied to this area, and the accountability character with which these measures are used. A relevant study conducted by Chan and Gao (2009) highlighted that performance measures designed to ensure political compliance will reduce the managerial discretion, which is important for performance improvement. Add to this, the model illustrates that the 'performance measures setting' is outside of the operational domain, and this a key point to

understand the testimony of Senior Estate Managers and the value that they perceive to be gained from the current performance measures.

*Figure1: Estate Performance Model for the UK NHS*



A general conclusion of this cluster analysis is that within the NHS, the SPMSSs are primarily tools to legitimise power connected to accountability. SPMSSs provide governments with a better understanding on how public money is spent and identify underperforming estate portfolios. This knowledge is fundamental when 'governing at a distance', a concept illustrated by the philosopher Michael Foucault. In the NHS, Governments are not closely involved in the affairs of the healthcare bodies; they have freedom to adopt different practices for the strategic management of their estate, though their actions are conditioned by techniques directed to achieve government goals and visions, in this case by policy- driven performance measures. These measures generate a form of knowledge that produces power, a relation used by Foucault to signify that power is produced through accepted forms of knowledge, scientific understanding and 'truth' (Rabinow, 1991). In the NHS, governments act as the main funders for healthcare projects, exercising control over the healthcare bodies through accountability for these funds and on how they contribute to achieve policy goals and visions. This knowledge about how well the estate is managed provided by the performance measures, gives governments the symbolic power to decide prioritisation for funding and point out underperformed estate portfolios. Therefore it can be argued that SPMSSs in the NHS UK are tools for governing at a distance and enables performances to inform strategic decision making around shaping future policy and funding. This is also reinforced by another study conducted by Blomkamp (2014) that mentioned that performance measures are typically designed as incentive structures and mechanisms of control 'at a distance', aiming to foster improvement and accountability, particularly in terms of efficiency and where they play their pervasive and far reaching role. Lait (2010) who stated that benchmarking and performance indicators are techniques for accountability, transparency and democratic control, used an indirect means of regulating agencies.

The authors believe that more interconnectivity among the three domains: political, strategic and operational will lead to a more effective use of the systems by Estate Senior Managers; and better quality of data will be generated that will contribute to more evidence-informed decisions, hence delivering value for money. Therefore, performance measures will not only provide valuable knowledge to governments but also to Estate Senior Managers. The question for future research relates to where the right balance lies between the different domains.

## CONCLUSION

This paper examined the value of formal SPMSSs for healthcare estates taking the NHS UK as the case study. Interviews were performed with selected members of the Departments of

Health (or equivalent) and Estate Senior Managers of the different healthcare bodies across the UK to examine their perceptions regarding the purpose and value of these systems. Both groups showed different opinions and expressed different feelings regarding the value of SPMSs. Two general conclusions are derived of these cluster analyses that are underpinned by each other:

1. The centralised nature of the healthcare in each region of the UK has driven Governments to adopt SPMSs as a means of accountability to evaluate if progress towards the achievement of policies has taken place, rather than being linked to real managerial activities.
2. SPMSs in the NHS are used as tools for governing at distance as a means for acquiring knowledge and the legitimisation of power.

The findings presented in this paper led the authors to ask questions about whether in other countries, with differing healthcare governance and funding configurations, and potentially with more local performance measurement systems. The measures utilised would be more effective and more related to organisational priorities to delivering good estate management or whether it was simply a strategic reflective of government priorities.

## **NEXT STEPS**

The next step of this research will investigate how other European healthcare providers manage their estate to identify the performance aspects that are important for them, what they measure and the drivers, strengths and weaknesses of other models. Findings from the discussions with international stakeholders will be used for comparisons with the NHS model and further improvement.

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