# INNOVATION IN THE CONSTRUCTION INDUSTRY: FACTORS, ACTORS AND THE CLIENT'S ROLE

**Susanna Hedborg Bengtsson**[1]

*Real Estate and Construction Management, Kungliga Tekniska Högskolan (KTH), Brinellvägen 8, 114 28 Stockholm, Sweden*

Innovation in project-based organisations (PBOs), notably in the construction industry, is challenging. Based on a literature review of innovation in PBOs and three empirical cases from the construction industry, this paper explores factors and actors that affect innovation in the 'loosely-coupled' construction industry. The literature review reveals the following factors as important for innovation: solution, initiators, impact, driving forces, development and future aim. When analysing the empirical cases, findings suggest that also the number of interdependent actors affect innovation and that the client´s role becomes increasingly important as the number of interdependent actors increases. On generic level tentative findings suggests that there is a difference in scale between process innovations that are systemic or non-systemic dependent upon the number of actors involved. Furthermore, these findings shape directions for future research: to develop better understanding of systemic process innovation in the construction industry; as well as to increase the understanding of how systemic process innovation can diffuse between the interdependent and fragmented actors in the construction industry.

Keywords: client, project-based organisations, systemic innovation, urban development

## INTRODUCTION

Construction projects are complex as was identified already 50 years ago by Cox and Goodman (1956: 43) concluded in their study of distribution of house-building material that "the number of possible permutations and combinations of specific places and entities is enormous, even for one product" (Goodman 1956: 43). Still, construction projects are performed and houses are built, not always on time or budget but the complexity problem is in fact handled over and over again. Dubois and Gadde (2002) suggest that the construction industry should be regarded as a 'loosely coupled system'. Due to this, issues such as how to enhance innovation (Bygballe and Ingemansson 2014) and how to achieve integration of numerous interdependent actors and processes (Bankvall *et al*., 2010) becomes a challenging task that needs to be studied from a contingency perspective, i.e. not only by studying singular projects but by studying interdependent projects in their context (compare with Engwall 2003).

The paper draws its findings from a systemic literature review on innovation in project-based organizations (PBOs) from where factors that affect innovation are identified. Due to the 'loosely coupled system' view applied here, there is a particular interest on process and systemic innovation (compare with Winch 1998, Taylor and Levitt 2004, Eriksson

[1] susben@kth.se

Bengtsson, S H (2017) Innovation in the Construction Industry: Factors, Actors and the Client's Role *In:* Chan, P W and Neilson, C J (Eds) *Proceeding of the 33rd Annual ARCOM Conference,* 4-6 September 2017, Cambridge, UK, Association of Researchers in Construction Management, 104-113.

and Pesämaa 2012) since innovation is dependent on coordination and collaboration (Mlecnik 2013). The identified factors are then applied to three empirical cases of construction industry attempts to drive innovation and integration by the development and use of different logistic solutions. The overall purpose is to explore differences between non-systemic and systemic process innovation initiatives in the construction sector and in particular which role the client has for such initiatives.

This paper contributes to research on innovation in the project-based construction industry, which is found to develop and diffuse differently than in the extensively researched traditional production chains setting (Taylor and Levitt 2004, Harty 2005, Lii and Kuo 2016). While construction innovation is increasingly researched, it often has a narrow and single project focus (Engström and Stehn 2016). Research on overcoming difficulties and challenges are suggested for achieving innovation in large projects with numerous actors (Davies *et al*., 2014). This is why this paper adopts a contingency approach, or project program perspective (Thiry 2002, Artto *et al*., 2009). The paper will lead to a discussion highlighting the client as a key actor in supporting systemic innovation. Tentative findings presented will also pose questions for future research directions.

To ensure clarity of the paper, the next section will present the research method applied for conducting the literature review and the multiple case study, including discussion of choices made and analysis of the data to validate the findings. Thereafter literature discussing definition, context and management of innovation in PBO is discussed, and factors that affect innovation are identified. Empirical findings are then discussed and analysed from the findings of the literature review, before conclusions and further research directions are presented.

## RESEARCH METHOD

The findings are results of a literature review on process innovation and systemic innovation in PBOs. The literature review took a meta-review approach with aim to document the leading research within the field (Glynn and Raffaelli 2010) and it explore factors to consider in relation to innovation in project settings. The literature review took a systemic approach by using the following steps: design the review, collect literature, extraction and quality assessing, snowballing through references, and analysis. In the design phase, three databases were decided on to retrieve a broad spectrum of potential literature from both technical and management journals, namely: Scopus, Web of Science and ScienceDirect. Following standard practice for literature reviews, a combination of search terms were used to search in title/abstract/keywords from the year 2000 until present; Table 1 presents the combinations (i.e. project AND systemic innovation, project AND process innovation etc.).

In addition to this, criteria for the extraction process were established during the design phase, namely exclusion of articles from low ranked journals and with topics other than innovation in PBOs. Included in Table 1 is a compilation of the number of collected publications per search combination, which totals to 2,527 search results. Apart for eliminating duplicates, conference paper, serials and books the extraction process narrowed down relevant articles by going through title, number of citations and publication journal. This process distilled out 123 articles. After analysing the abstracts, 23 relevant articles were chosen, mainly based on their focus on innovation in PBOs. To reduce the possibility to omit important articles in the field snowballing (Mack *et al*., 2005) was used by going through the relevant articles reference lists. This yielded another 14 articles, which were included in the literature review.

In the final step, the 37 relevant articles identified were first examined separately and then combined and categorized into three groups: innovation definitions, innovation context, and innovation management. The findings from these three groups resulted in six factors useful for exploring innovations. These factors were then applied to the empirical findings described below to establish tentative findings.

*Table 1: A summary of search term combination and their yielded results*

| | Systemic innovation | Process innovation | Technological innovation |
|---|---|---|---|
| Project | 48 | 397 | 1927 |
| Construction industry | 7 | 31 | 117 |

The empirical findings presented in this paper are based on a qualitative study using a multiple case study approach (Yin 2014). The study includes three empirical cases from 2016 and 2017 focusing on construction industry attempts to drive innovation and integration by initiating logistic solutions. Cases 1 and 2 are solutions developed by and for contractors alone to support on-site coordination of material and personnel. While Case 3 is a solution developed as a logistic centre by a municipality aimed for all developers, contractors and subcontractors in an urban development project (UDP) supporting optimisation of material flows, waste management, health and safety and coordination between contractors and subcontractors. The municipality initiated and developed the outlines of the logistic solutions and thereafter procured a logistic contractor to further develop and run the logistic centre, known in the industry as third party logistics (3PL).

Two semi-structured interviews with employees responsible for logistics within the respective firm were conducted in Case 1 and 2. The interviews were combined with a three-hour workshop at each company held by the firms' logistic departments. Case 3 includes a total of 29 interviews with municipality's project management, developers' project managers and contractors' site managers, as well as field notes from 10 hours of meeting observations from clients' meetings held by the municipality. The questions explored were how the logistic solutions were initiated, implemented and used and effects on work methods within projects and firms. The developed empirical material was later analysed based on the six factors identified in the literature review to guide tentative findings and suggestions for future research.

# OVERVIEW OF LITERATURE ON INNOVATION IN PBO

## Definitions of Innovation

By innovation is meant a practice that is perceived as new to an organisation able to adopt it (Rogers 2003). However, as highlighted by Garcia and Calantone (2002) it is important to define different types of innovation both in research and in practice, as many definitions are used interchangeably (Briscoe *et al*., 2004, Hullova, Trott and Simms 2016). The purpose for making such definitions is to create a common understanding of the innovation discussed, to be able to seek source and nature of innovation and to highlight if certain types of innovation can be fostered by co-operation (Propris 2002).

There are different ways to classify innovation in PBOs, for example radical to really-new innovation (Garcia and Calantone 2002), incremental to radical innovation (Slaughter 1998), or adopt environment categories (Johannessen 2013). A common classification originating from manufacturing studies is to separate between product and process innovation (Hullova *et al*., 2016). From research based on manufacturing studies process innovation is commonly seen as a bi-product to product innovation, i.e. when a new

product is changed, parts of the production process also needs to be changed. When looking into PBOs, and specifically the construction industry, process innovation is in contrary to manufacturing seen as something highly relevant and re-occurring in and of itself. The reason for this is that a major part of the costs involved in construction comes from aligning the project and improving the supply chains and construction processes. This is in line with Engwall's (2003) findings of the importance to take history, scope, and environment into account to manage innovation. This contingency perspective is particularly significant in UDPs given the large number of projects, i.e. fragmented and interdependent actors (Winch 1998).

By process innovation is meant new methods that create change in tools and software, or in other words, changes in the supply chain and construction processes (OECD 2015) and by systemic innovation is meant innovation which depends on coordination and collaboration among several key actors during the innovation process (Mlecnik 2013). Systemic innovation success is thus dependent on inter-organisational networks. Such innovation will foster and spread change in systems (Slaughter 2000). The construction industry is, according to Mlecnik (2013), compatible for systemic innovation, in terms of the high interaction between actors and project-based organisations. The results, however, will depend on coordination and collaboration.

**Context Implication on Innovation in PBO**

The context for innovation is defined as the need for the environment to be receptive to innovation (Pettigrew, Ferlie and MCkee 1992) and alignment with the context is seen as vital for innovation to happen (Taylor and Levitt 2007, Alin *et al*., 2013). Aligning the innovation to the project would increase the actors' acceptance (Taylor and Levitt 2007). Treating misalignment between innovation and its context includes stability in relations between actors, accessible boundaries between firms and the use of change agents. Adding to this, Alin *et al*., (2013) investigates the complex process of systemic innovation and aligning it to its project network, suggesting an inter-firm focus for alignment. Inter-firm collaboration to increase innovation is however difficult in the project-based construction industry due to the loose ties between projects and firms (Dubois and Gadde 2002).

Dorée and Holmen's (2004) argue for a distinction between single and multiple actor innovation. Where single actor innovation needs to focus on coupling between a project and its firm, multiple actor innovation also needs to focus on couplings between several projects and different firms, as for example in a UDP. To achieve this, clients are described as an important actor through strengthening relationships, and through creating collaboration and communication channels (Blayse and Manley 2004, Hartmann, Reymen and Van Oosterom 2008). It is also argued that the client must be organisationally ready for process innovation, especially when the innovation development and benefits stretch beyond the singular project, e.g. throughout a program (Engström and Stehn 2016). The client's procurement strategies can serve to enhance the relationships and knowledge sharing can support innovation (Eriksson 2013, Lindgren 2016).

To further discuss the differences between systemic and non-systemic innovation, support can be found in the literature. Harty (2005), for example, separates between bounded and unbounded innovation and equates unbounded innovation with systemic innovation that are able to impact the interdependent and fragmented actors of the industry. Taylor and Levitt (2004) is another example. They categorises innovation depending on its impact on included actors and surrounding and argue that systemic innovation diffuse more

slowly in PBOs due to the impact from regulations, decentralization in PBOs and fragmentation of actors.

### The Importance of Management to Enhance Innovation

Gann and Salter (2000) argue for the importance to also address questions regarding management of innovation in PBOs. While Kale and Arditi (2010) focus on the importance of internal influences to diffuse innovation in the construction industry, research also points to the importance of cooperation (Ling 2003, Holmen, Pedersen and Torvatn 2005, Bosch-Sijtsema and Postma 2009) and communication (Widén and Hansson 2007, Larsen 2011) to enhance innovation in PBOs. These factors are found to be of increased importance for systemic innovation. Another important aspect highlighted by Larsen (2011) is awareness. In a fragmented network of actors, the awareness of innovation must be a key management task, to create a common understanding of the innovation. Hence, the management of innovation in PBOs commonly includes initiation, design and diffusion. From the findings presented in this section six factors can be been identified which together describe innovation and how it will affect and is affected by involved actors, see Table 2. These factors will be used in the next section when outlining the empirical findings.

*Table 2: Identified factors to describe innovation in PBOs*

| Categories | Definition | Context | Management |
|---|---|---|---|
| Factors | Solution | Initiator | Origin |
| | | Impact | Development |
| | | | Future aim |

## RESULTS AND DISCUSSION

### Defining the Logistic Solutions from the Cases

> Today we equate all available solutions; we must differentiate depending on applicability in type of project... [Logistic Manager at contractor, Case 1]

This quote highlights the desire to further explore and develop construction logistic solutions. It also shows the importance to realise that each solution needs to be adjusted to its specific context. The empirical findings in Table 3 are presented from the six factors identified in the literature study. A conclusion drawn from Table 3 is that there are differences between Case 1 and 2 and Case 3. To begin with, Case 1 and 2 represent solutions for single projects from a single actor's (i.e. contractors) perspective. Hence, they can be understood as single actor innovation. Case 3, on the other hand represent a solution for many interdependent projects and actors and can be understood as a multiple actor innovation.

The main difference discovered when comparing the two types of logistic solutions is number of actors involved, which is much higher in Case 3. In Case 3 the municipality procured a 3PL solution in the early stages which they made mandatory for all actors on-site. In Case 1 and 2 on the other hand the contractors developed their solution in-house for their own projects and the solutions are flexible to which projects and actors need to use it. A possible consequence from this is that the solution developed in Case 3 can spread across the industry but will have great need for inter-organisational processes such as coordination and communication (Mlecnik 2013). In contrast, the solutions in Case 1 and 2 are flexible to customize between project and actors, but will not be presented to, and hence have impact on, a larger number of actors. This finding is in line with the

cases driving forces; while Case 1 and 2 focuses on simplifying projects and improve financial result with more efficient logistic, Case 3 is more focused on environmental and development aspects:

> It is important for the municipality with large urban development projects, a place to drive innovation in the industry. [Project manager at municipality, Case 3]
>
> The municipality must see public welfare instead of financial aspects, a tool to reach the environmental goals. [Client Support at municipality, Case 3]

*Table 3: Summary of logistic solutions in Case 1, 2, and 3 from the factors*

| Factors | Case 1, Single actor | Case 2, Single actor | Case 3, Multiple actor |
|---|---|---|---|
| Solution | Designed in-house including purchased software | Designed in-house including influence from software of the market | Designed by municipality and logistic consultants, procured with public procurement |
| Initiators | Purchasing department for single project | Management focus on a single project | Management of UDP (municipality) |
| Impact | Affect the procured suppliers and subcontractor | Affect the procured suppliers and subcontractor | Affect clients, suppliers and all levels of contractors<br>Force increased collaboration between projects |
| Driving forces | Financial incentives<br>Solution to simplify complex projects | Financial incentives<br>Create project specific solution for one client | Minimize disturbance in the city<br>Lower climate influences |
| Development | Possibility for continuous alterations and customization | Possibility for continuous alterations and customization | Alterations possible after contract period, during new procurement process |
| Future aim | Increase use of solution in all larger projects and offer solution within concern | Offer solution within concern and to UDPs (similar to 3PL) | Develop the solution and make standard in UDPs in the municipality |

**Number of Actors to Define Innovation in PBO**

Based on these findings we can establish that both single and multiple actors' solutions can be defined as process innovations (OECD 2015). The new solutions for logistics coordination, during planning and production, creates a need for updated processes, such as increased communication and integration between contractors and suppliers, planning tools (software systems) for on-site deliveries, and integrated waste management. However, from the empirical findings we can also observe a difference in the number of involved actors between single actor solutions (Case 1 and 2) and multiple actor solution (Case 3); see Figure 1a and 1b for visualization. For the single actor innovation in Figure 1a the logistic solutions focus on the on-site actors. The single project perspective makes innovation difficult to adopt in larger complex settings (e.g. UDPs). This suggests that single actor solution should not be seen as systemic innovation. Turning the focus to Figure 1b, the high number of involved actors implies a systemic innovation (Taylor and Levitt 2004, Harty 2005), on account of the possibility for a large diffusion of innovation. On the other hand, the fragmentation of actors (Winch 1998) and the 'loose couplings' between projects in the UDP (Dorée and Holmen 2004) may hamper such diffusion. A

focus on coordination and cooperation for systemic innovation can help reduce this problem (Mlecnik 2013). In other words, multiple actor innovation in the construction industry needs to apply a contingency perspective and use a program perspective rather than a narrow single project perspective.

**Client's role for innovation in PBO**

Having defined the construction logistic solutions as different innovation types there is a need to also acknowledge the context and management of innovation. In all three cases, innovation was initiated and developed top-down, always initiated on a management level (see Table 3). This is in contrast to the findings that highlight the importance of context (Engwall 2003, Harty 2005, Taylor and Levitt 2007, Alin *et al*., 2013).

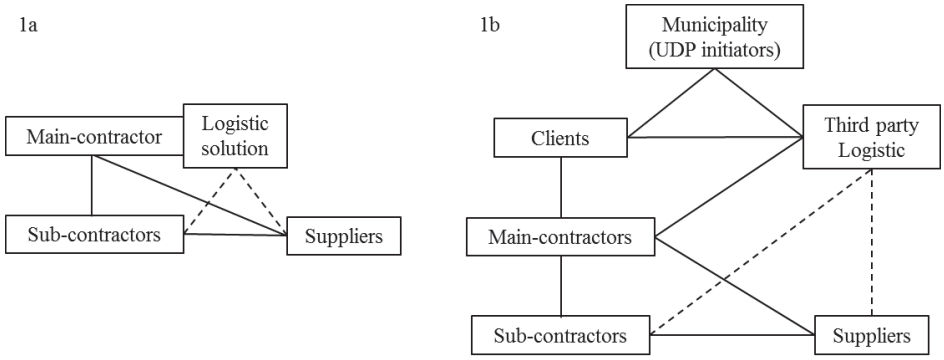


*Figure 1a and 1b: Actors involved in single and multiple actor logistic solutions. Full line implies a contractual relationship, while dashed line implies an informal relationship.*

Guidelines from related work also suggest a need for increased focus on awareness (Larsen 2011), cooperation and communication (Ling 2003, Holmen *et al*., 2005, Widén and Hansson 2007, Bosch-Sijtsema and Postma 2009) for innovation with increased complexity. When the number of actors increase, as visualised in Figure 1, the need for a broader (contextual) perspective on development and diffusion of innovation becomes crucial.

Based on the reasoning above, the conclusion is that context and management is increasingly important for innovation in PBOs when the number of actors increases. It can be argued, based on Figure 1, that the client has a central role to communicate innovation in an UDP. The client also has contractual possibilities to create the context and management for innovation (Bosch-Sijtsema and Postma 2009, Larsen 2011, Eriksson 2013).

## CONCLUSIONS AND FUTURE RESEARCH DIRECTIONS

Innovation in the project-based construction industry is dependent on factors such as solution, initiators, impact, driving forces, development and future aim including the number of actors. As the literature suggests context and management are both important and they must differ depending on number of actors involved. From the discussion the client is identified as an important actor for a multiple actor innovation, identified as systemic innovation, with the possibility to affect the context and management for innovation. For urban development projects the client has a central role to implement and diffuse innovation. An additional conclusion is that systemic innovation in urban development projects needs to take a broader perspective than only the individual project. To develop and diffuse innovation the whole context of the urban development project must be considered with all its different actors, projects and processes. Hence, a program perspective must be taken. In comparison, single actor innovation, e.g. the contractors'

own solutions, can be more flexible and adopt innovation on a per project basis with little effect on other actors, but also with limited possibility to diffuse the innovation more broadly among other actors.

From the tentative conclusions presented above the papers contribution is to present questions for future research direction. A first possible direction is to develop the understanding of the phenomena of different innovation in PBOs on a project, program, and portfolio level. This could also lead to research to increase the understanding of how systemic innovation can diffuse between the interdependent and fragmented actors in the construction industry. By developing the multiple case study with deeper data collection and analysis per case and include more cases from urban development projects the tentative findings from this paper and the question for further research can be explored.

## REFERENCES

Alin, P, Maunula, A O, Taylor, J E and Smeds, R (2013) Aligning misaligned systemic innovations: Probing inter-firm effects development in project networks. *Project Management Journal*, **44**(1), 77-93.

Artto, K, Martinsuo, M, Gemünden, H G and Murtoaro, J (2009) Foundations of program management: A bibliometric view. *International Journal of Project Management*, **27**(1), 1-18.

Bankvall, L, Bygballe, L E, Dubois, A and Jahre, M (2010) Interdependence in supply chains and projects in construction. *Supply Chain Management: An International Journal*, **15**(5), 385-393.

Blayse, A M and Manley, K (2004) Key Influences on construction innovation. *Construction Innovation*, **4**(3), 143-154.

Bosch-Sijtsema, P M and Postma, T J B M (2009) Cooperative innovation projects: Capabilities and governance mechanisms. *Journal of Product Innovation Management*, **26**(1), 58-70.

Briscoe, G H, Dainty, A R J, Millett, S J and Neale, R H (2004) Client-led strategies for construction supply chain improvement. *Construction Management and Economics*, **22**(2), 193-201.

Bygballe, L E and Ingemansson, M (2014) The logic of innovation in construction. *Industrial Marketing Management*, **43**(3), 512-524.

Cox, A and Ireland, P (2002) Managing construction supply chains: The common sense approach. *Engineering Construction and Architectural Management*, **9**(5-6), 409-418.

Davies, A, Macaulay, S, Debarro, T and Thurston, M (2014) Making innovation happen in a megaproject: London's Crossrail suburban railway system. *Project Management Journal*, **45**(6), 25-37.

Dorée, A G and Holmen, E (2004) Achieving the unlikely: Innovating in the loosely coupled construction system. *Construction Management and Economics*, **22**(8), 827-838.

Dubois, A and Gadde, L E (2002) The construction industry as a loosely couples system: Implications for productivity and innovation. *Construction Management and Economics*, **20**(7), 621-631.

Engström, S and Stehn, L (2016) Barriers to client-contractor communication: implementing process innovation in a building project in Sweden. *International Journal of Project Organisation and Management*, **8**(2), 151-171.

Engwall, M (2003) No project is an island: Linking projects to history and context. *Research Policy*, **32**(5), 789-808.

Eriksson, P E and Pesämaa, O (2012) Buyer-supplier integration in project-based industries. *Journal of Business & Industrial Marketing*, **28**(1), 29-40.

Eriksson, P E (2013) Exploration and exploitation in project-based organizations: Development and diffusion of knowledge at different organizational levels in construction companies. *International Journal of Project Management*, **31**(3), 333-341.

Gann, D M and Salter, A J (2000) Innovation in project- based, service- enhanced firms: The construction of complex products and systems. *Research Policy*, **29**(7), 955-972.

Garcia, R and Calantone, R (2002) A critical look at technological innovation typology and innovativeness terminology: A literature review. *Journal of Product Innovation Management*, **19**(2), 110-132.

Glynn, M A and Raffaelli, R (2010) Uncovering mechanisms of theory development in an academic field: Lessons from leadership research. *Academy of Management Annals*, **4**(1), 359-401.

Hartmann, A, Reymen, I M M J and Van Oosterom, G (2008) Factors constituting the innovation adoption environment of public clients. *Building Research & Information*, **36**(5), 436-449.

Harty, C (2005) Innovation in construction: A sociology of technology approach. *Building Research & Information*, **33**(6), 512-522.

Holmen, E, Pedersen, A C and Torvatn, T (2005) Building relationships for technological innovation. *Journal of Business Research*, **58**(9), 1240-1250.

Hullova, D, Trott, P and Simms, C D (2016) Uncovering the reciprocal complementarity between product and process innovation. *Research Policy*, **45**(5), 929-940.

Johannessen, J A (2013) Innovation: A systemic perspective - developing a systemic innovation theory. Kybernetes, **42**(8), 1195-1217.

Kale, S and Arditi, D (2010) Innovation Diffusion Modeling in the Construction Industry. *Journal of Construction Engineering and Management*, **136**(3), 329-340.

Larsen, G D (2011) Understanding the early stages of the innovation diffusion: Awareness, influence and communication networks. *Construction Management and Economics*, **29**(10), 987-1002.

Lii, P and Kuo, F I (2016) Innovation- oriented supply chain integration for combined competitiveness and firm performance. *International Journal of Production Economics*, **174**(1), 142-155.

Lindgren, J (2016) Diffusing systemic innovations: Influencing factors, approaches and further research. *Architectural Engineering and Design Management*, **12**(1), 19-28.

Ling, F Y Y (2003) Managing the implementation of construction innovations. *Construction Management and Economics*, **21**(6), 635-649.

Mack, N, Woodsong, C, MacQueen, K M, Guest, G and Namey, E (2005) *Qualitative Research Methods: A Data Collectors Field Guide*. North Carolina, USA: Family Health International.

Mlecnik, E (2013) Opportunities for supplier-led systemic innovation in highly energy-efficient housing. *Journal of Cleaner Production*, **56**, 103-111.

OECD (2015) *Innovation Strategy: Defining Innovation*. Paris: OECD. Available from: http://www.oecd.org/site/innovationstrategy/defininginnovation.htm [Accessed 19th July 2017].

Pettigrew, A, Ferlie, E and McKee, L (1992) Shaping strategic change - The case of the NHS in the 1980s. *Public Money and Management*, **12**(3), 27-31.

Propris, L D (2002) Types of innovation and inter-firm co-operation. *Entrepreneurship and Regional Development*, **14**(4), 337-353.

Rogers, E M (2003) *Diffusion of Innovations 5th Edition*. London: Simon and Schuster.

Slaughter, E S (1998) Models of construction innovation. *Journal of Construction Engineering and Management*, **124**(3), 226-231.

Slaughter, S E (2000) Implementation of construction innovations. *Building Research & Information*, **28**(1), 2-17.

Taylor, J and Levitt, R (2004) Understanding and managing systemic innovation in project-based industries. *In*: D Slevin, D Cleland and J Pinto (Eds.) *Innovations: Project Management Research*. Pennsylvania, USA: Project Management Institute.

Taylor, J E and Levitt, R (2007) Innovation alignment and project network dynamics: An integrative model for change. *Project Management Journal*, **38**(3), 22-35.

Thiry, M (2002) Combining value and project management into an effective programme management model. *International Journal of Project Management*, **20**(3), 221-227.

Widén, K and Hansson, B (2007) Diffusion characteristics of private sector financed innovation in Sweden. *Construction Management and Economics*, **25**(5), 467-475.

Winch, G (1998) Zephyrs of creative destruction: Understanding the management of innovation in construction. *Building Research & Information*, **26**(5), 268-279.

Yin, R K (2014) *Case Study Research: Design and Methods. 5th Edition*. London: Sage Publications Ltd.