Organizational Learning Capability in SMEs: An Empirical Development of Innovation in the Supply Chain

Thomas, Andrew; Dorrington, Peter; Costa, Filipa; Loudon, Gareth; Francis, Mark; Fisher, Ron

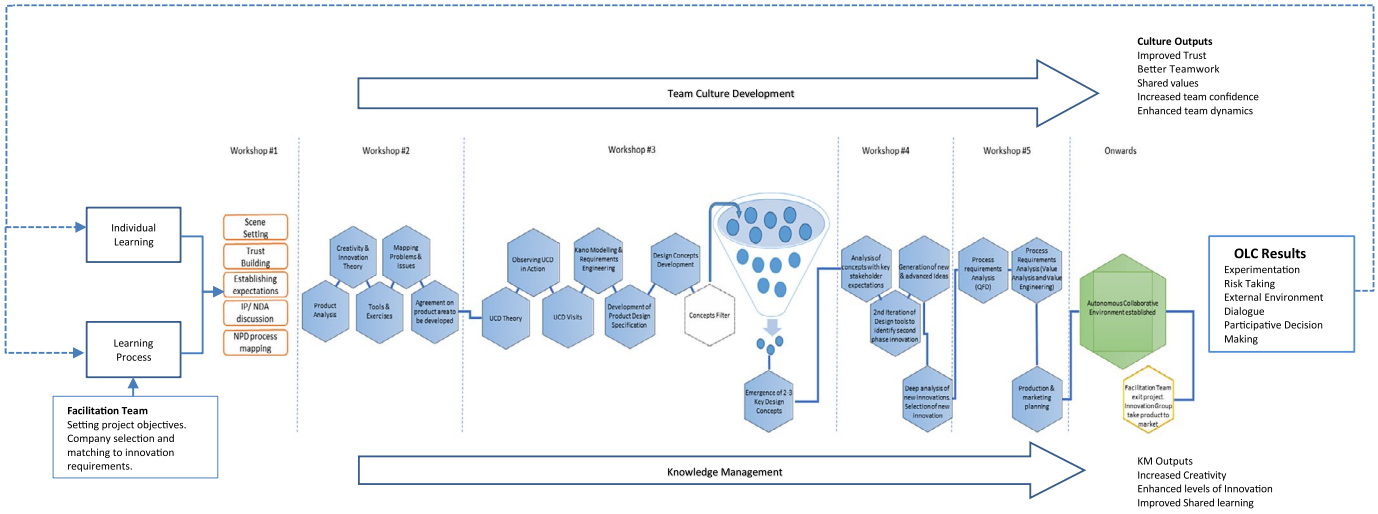
Published in:
Cogent Business and Management

DOI:
10.1080/23311975.2017.1364057

Publication date:
2017

Citation for published version (APA):
Thomas, A., Dorrington, P., Costa, F., Loudon, G., Francis, M., & Fisher, R. (2017). Organizational Learning Capability in SMEs: An Empirical Development of Innovation in the Supply Chain. *Cogent Business and Management*, *4*(1), [1364057]. https://doi.org/10.1080/23311975.2017.1364057

cogent business & management



OPERATIONS, INFORMATION & TECHNOLOGY | RESEARCH ARTICLE

Organisational learning capability in SMEs: An empirical development of innovation in the supply chain

Andrew Thomas, Peter Dorrington, Filipa Costa, Gareth Loudon, Mark Francis and Ron Fisher

Cogent Business & Management (2017), 4: 1364057

cogent business & management

OPERATIONS, INFORMATION & TECHNOLOGY | RESEARCH ARTICLE

Organisational learning capability in SMEs: An empirical development of innovation in the supply chain

Andrew Thomas[1]*, Peter Dorrington[2], Filipa Costa[2], Gareth Loudon[3], Mark Francis[1] and Ron Fisher[1]

Received: 17 July 2017
Accepted: 01 August 2017
First Published: 05 August 2017

*Corresponding author: Andrew Thomas, Cardiff School of Management, Cardiff Metropolitan University, Cardiff CF5 2YA, UK
E-mail: ajthomas@cardiffmet.ac.uk

Reviewing editor:
Shaofeng Liu, University of Plymouth, UK

Additional information is available at the end of the article

Abstract: Evidence that a company's innovation performance, Knowledge Management capability, and its corporate and operational performance are inextricably linked has been the focus of numerous academic studies over recent years. Whilst a significant body of research exists focusing on learning at company level, little research exists on how supply chains learn and innovate in collaborative working environments. The aim of this paper is to determine the learning and innovation skills that emerged from a collaborative project with new developed supply chain. Its focus is on identifying how each organisation within the supply chain developed its Organisational Learning Capability (OLC) when the companies were tasked to collaborate and develop a new and innovative product. The companies had not previously worked with each other and so the project monitored the level of collaborative activity as well as innovative output from the collaboration. The results suggest that improved organistional learning capabilities led to increased levels of organisational innovation as well as improved supply chain collaboration. The paper concludes with the development of a Supply Chain Organisational Learning and Innovation Framework (SCOLIF) and the identification of a number of cultural dimensions which are considered useful for managers and engineers to consider when implementing innovation projects.

ABOUT THE AUTHORS

Professors Thomas, Francis and Fisher are Professors of Operations Management in the Value Flow Centre at Cardiff Metropolitan University. Their research interests include: supply chain management, quality management, and production management. More specifically, their interests include; Lean management, Knowledge Management and understanding the issues around value and the perceptions of value in business.

Dorrington, PhD, and Costa are senior researchers from Product Design and Research Centre at Cardiff Metropolitan University whilst Loudon, PhD, is a principal lecturer at the University. Their research interests include: innovation, creativity and design process management. More specifically, their research focuses upon Knowledge Management, the use of technology in assisting the creativity process and, user-centred design processes. Their articles have been published in International journals and conferences.

PUBLIC INTEREST STATEMENT

This research investigates the effect of inter-company collaboration and its impact on the Organisational Leaning Capability of the participant companies. The companies were tasked to design and develop a new and innovative product. The focus of research was in determining the level of learning that occurred between these supply chain companies and, whether the companies could collaborate effectively towards the development of a new and innovative product.

The paper identified a number of key cultural dimensions that were seen as critical to the success of the project. The work also developed a Supply Chain Organisational Learning Innovation Framework that emerged from the collaboration. It is believed that the Framework will provide guidance and structured support to practitioners who intend to implement innovation based action learning in to their companies and supply chains. It is also aimed at extending the body of knowledge in the area of Knowledge Management and Innovation.

Subjects: Engineering Management; Business, Management and Accounting; Industry & Industrial Studies

Keywords: organisational learning capability; supply chain; innovation

1. Introduction

Evidence that a firm's innovation performance, knowledge management (KM) capability and its corporate and operational performance are inextricably linked has been the focus of numerous academic studies over recent years (Aboelmaged, 2014; Darroch, 2005; Yang, 2008). However, whilst much research has been developed in this area, the research has uncovered a complex interaction between these three key elements. For instance, Darroch's work identified that knowledge management was a coordinating mechanism between that of innovation and company performance and stated that a firm with a knowledge management capability will use resources more efficiently and so will be more innovative and perform better. However, Aboelmaged explained that it was innovation performance that played the key mediating role between knowledge management capability and operations performance. He went on to highlight that managers needed to facilitate the dynamics of knowledge acquisition, sharing and application, and then utilise it to cultivate a better level of technical and administrative innovation performance, which in turn will result in favourable operations performance. Yang on the other hand deduced from their study that a company's "learning orientation" had a significant interacting effect on long-term corporate growth. This therefore leads towards the theory that Organisational Learning (OL) (of which Learning Orientation is a key part of the theory) plays an important role in the improvement of operational performance in companies (Calantone, Cavusgl, & Zhao, 2002). OL is complementary to KM. Where KM focuses upon the planning, organising, motivating, and controlling of people, processes and systems in the organisation to ensure that its knowledge-related assets are improved and effectively employed, OL focuses upon embedding what has been learned into the fabric of the organisation (King, 2009). Calantone et al. also state that OL is associated with the development of new knowledge, which is crucial for firm innovation capability and firm performance Therefore, it is not surprising that the link between OL, Innovation and company performance is subject to much research and analysis.

This paper will focus on the development of a Small and Medium Enterprise (SME)-based framework that facilitates the development of high-quality learning and innovation skills aligned to the innovation management process of the participating companies in a new collaborative supply chain. This framework emerged as a result of a twelve-month innovation project with four manufacturing SMEs which formed the collaborative supply chain. The paper will focus initially on highlighting and analysing the key literatures in the area of OL and Organisational Learning Capability (OLC) and will then move on to describing the project through a case study. The development of the Supply Chain Organisational Learning and Innovation Framework (SCOLIF) is presented and will show how the primary information obtained from the project merged with the existing secondary information on OL and OLC to create the structure of the SCOLIF. The paper closes with an analysis of the framework's effectiveness in generating organisational innovation within a supply chain.

2. Background to organisational learning and organisational learning capability

Research in the field of OL has been well developed by both practitioners and academics over the years. The link between Organisational Learning and manufacturing performance (and in particular supply chain performance) is identified in the work of Azadegan and Dooley (2010) in which they posit a strong positive link between the use of OL theory and resulting supplier innovativeness and manufacturer performance. Furthermore, academics have undertaken studies to explore the dimensions of OLC and, whether these dimensions impact upon Organisational Innovativeness (OI). The results of their work indicated that OLC significantly and positively influence OI within companies (Onağa, Tepecib, & Başalpc, 2014). Organisational Innovativeness can be considered for this paper as the adoption and application of new knowledge from external sources. Alexander and Childe (2013) focus on the transfer of knowledge between universities and businesses that are collaborating together as an example of OI. The findings of this work highlighted that successful

knowledge transfer comes from the transfer of tacit knowledge and that tacit knowledge can best be transferred in this arena using a range of rich media channels.

Academic theory around learning in organisations has traditionally been divided into two theoretical areas of literature namely: Organisational Learning (OL) literature and, the Learning Organisation (LO) literature (Chiva, Alegre, & Lapiedra, 2007). The former has focused on the learning process of an organisation and the latter on the factors that facilitate the process of becoming a learning organisation (Chiva, 2004). Focussing on the OL area, the literature around this subject attempts to analyse and determine whether and how a certain process of learning is being accomplished in organisations. OL thinking has developed over time and many perspectives have appeared. Chiva and Alegre (2005) identify two OL perspectives namely: the individual and, the social perspective. Chiva (2004) further explains that the individual perspective considers learning as an individual phenomenon and consequently understands that organisations learn through individuals who learn (Senge, 1990). The social perspective however, considers learning as a social phenomenon and as such understands that organisations learn through communities and groups (Lave & Wenger, 1991). Advances in the area of OL show that organisations, and the people in them need to learn constantly through facilitating learning for all members of the company which in turn continuously transforms the company by way of its services, products and innovation which emerges from this learning process (Kumpikaite, 2008).

The application of KM and OL specifically in SMEs is a complex and often misunderstood concept. Desouza and Awazu (2006) studied the application of KM in SMEs and found that the mechanisms to develop effective KM practises were very different in SMEs when compared to larger companies. A range of specific SME-related issues emerged from their work and include; resource constraints, loss of knowledge, failure to exploit external sources of knowledge. However, on a positive front, knowledge is disseminated quickly and directly through shorter communication channels thus providing SMEs with an advantage in the management and delivery of knowledge. This would therefore suggest that KM practices could be significantly enhanced in SMEs if it were possible to develop an efficient KM delivery mechanism to the resource-constrained SME whilst capitalising upon the pre-existing shorter and more efficient communication and dissemination mechanism available in SMEs.

Whilst significant research has been undertaken in both the social and individual aspects of OL, the work has primarily focused upon individual organisations and, has by result measured the OL performance of individual companies and, the individuals within such companies. What this paper aims to do is to widen the scope of OL theory by developing key research around the concept of OL in an SME-based supply chain. It will consider the application of OL on manufacturing SMEs within a four-tier supply chain and will measure the OLC of the companies within the chain as well as attempt to identify the OLC of the complete supply chain. Furthermore, through the use of a case study approach, the paper will attempt to show how OLC and the organisational innovativeness of the supply chain are connected. The authors believe that this paper provides a unique contribution to knowledge and practice in that it is one of very few studies which describe the development of an KM/OL framework for the implementation of KM practices in to SMEs.

2.1. OLC and OI theory and literature

Organisational Learning Capability (OLC) is seen as the source of competitive advantage and a key to future organisational success and, has been subject of a number of key studies (Chiva et al., 2007), (Jerez-Gómez, Céspedes-Lorente, & Valle-Cabrera, 2005). OLC is defined as the organisational and managerial characteristics, practices, skills and factors that facilitate the organisational learning processes (e.g. generating, acquiring, disseminating and integrating information/knowledge) and, allows an organisation to learn (Jerez-Gómez et al., 2005; Onağa et al., 2014). Furthermore, when considering the application of OLC specifically in SMEs, Salim and Sulaiman (2011) confirm the positive relationship between OLC and an SME's innovation capability and operational performance. However, few case studies exist to show how Organisational Innovation and OL is developed and applied in SMEs. Table 1 provides a literature analysis of the key studies in OL and OLC in SMEs and shows that much of the literature is focused upon the identification of a clear and positive

Table 1. Review of collaborative innovation in supply chain literature

Author	Methodology Applied	Key Issues highlighted	Contribution	SC	OL	Inn
Argote (2011)	Research article identifying past, current and future research trends in OL	Research outlines that OL will continue to develop in to the foreseeable future. The research in to OL is likely to advance through different disciplines and methods	States that the future enhancement of OL will come from further empirical research in to the mechanisms of knowledge creation and organisational capabilities		✓	
Bigliadi and Galati (2016)	Survey of 157 Italian SMEs is undertaken to identify barriers towards the adoption Open Innovation in SMEs	The study focuses upon the issue of Open Innovation specifically but highlights the critical nature of OL development as a key driver to achieve effective Open Innovation in companies	Four main barriers are identified, namely, knowledge, collaboration, organisational, and financial/strategic		✓	✓
Chapman and Corso (2005)	This work considers the growing importance of inter-company collaboration, and develops the concept of intra-company continuous improvement through to what may be termed collaborative innovation between members of an extended manufacturing enterprise (including supply chains).	The work proposes the development of continuous innovation to work alongside continuous improvement strategy to be delivered through inter-company collaborations. Due to organisational and geographical separations between partners involved, SCs can hardly rely on established organisational and managerial mechanisms that support continuous improvement at company level	The authors identify that there is still a substantial lack of empirically grounded contributions and theories on the concept of continuous in an inter-organisational learning	✓	✓	
Chiva (2004)	Through secondary data analysis the author highlights fifteen factors that facilitate organisational learning. These factors are then tested on employees working within Spanish SME tile manufacturing industry to validate the secondary research findings	Four companies are analysed against the fifteen factors that facilitate Organisational Learning. From this, the combinatory factors are identified across all four companies and, differences between the factors are discussed and analysed. The work then outlines through case study development how the factors are further analysed and then validated in four ceramic tile manufacturing companies	15 key facilitating factors of OL identified namely: experimentation, observation, risk acceptance, heterogeneity, dialogue, training, delegation, teamwork, worker improvement, leadership, learning, management structure, knowledge, humour, creativity	✓	✓	
Chiva et al. (2007)	The study proposes then validates a measurement scale that aims to capture an organisation's capability to learn, based on a comprehensive analysis of the facilitating factors for learning.SME companies in the ceramic tile industry are used	Data is collected from eight Spanish ceramic tile manufacturers. The survey was addressed to shop floor workers. A total of 157 valid questionnaires were obtained, Using confirmatory factor analysis, the construct measurement model was tested and the scale was validated	The organisational learning capability scale consisting of 14 items grouped into five dimensions: experimentation, risk taking, interaction with the external environment, dialogue, and participative decision-making is proposed and tested	✓	✓	
Chiva and Alegre (2005)	This paper investigates the relationship between organisational learning capability and job satisfaction. SME companies in the ceramic tile industry are used	A case study approach is proposed and the analysis of the findings of 157 questionnaire responses from eight companies in the Spanish ceramic tile industry was undertaken	Through a statistical analysis of the questionnaire responses, a strong positive correlation is made between OLC and Job Satisfaction		✓	

(*Continued*)

Table 1. (*Continued*)

Author	Methodology Applied	Key Issues highlighted	Contribution	SC	OL	Inn
Desouza and Awazu (2006)	Study in to the application of KM in a small range of generic SMEs through questionnaires and interviews	Research found that the mechanisms to develop effective KM practises were very different in SMEs when compared to larger companies. The principles that are effective for developing KM in larger companies are unsuitable for small companies	Barriers and drivers for KM in SMEs include: resource constraints, loss of knowledge, failure to exploit external sources of knowledge. However, knowledge is disseminated quickly and directly through shorter communication channel		✓	
Feller, Hirvensalo and Smeds (2005)	This research develops a theoretical approach on how and what partner companies in an R&D collaboration relationship can jointly learn to improve their R&D processes	The authors test the effectiveness of the use of the SimLab business process simulation method in the context of collaborative process innovation. The main finding of the case study is a set of direct process improvements that the case companies have developed during the projects undertaken	Methodological triangulation is applied: by using the business process simulation method as well as interviews from two-case studies, a set of process improvements for the collaborative R&D process of the case companies is developed		✓	
Nasab (2016)	Research investigates the effect of inter-organisational learning on the operation of innovation in the supply chain of Sapco company	Quantitative analysis which seeks to find a correlation between inter-company learning and supply chain innovation. Provides an effective model of research in the study	Statistical analysis validates the hypothesis that inter-company learning improves the level of supply chain innovation. However, a deeper analysis of the main causal relationships is not provided	✓	✓	✓
Opengart (2015)	Through secondary data analysis and reviews of key literatures, analysis was undertaken of collaborative SCM and OL theory to identify overlapping themes	Findings indicate multiple themes in common between collaborative SCM and the Learning Organization. Research suggests to approach SCM with the framework of the Learning Organisation to encourage those principles to drive behaviour	Focused upon secondary data analysis. Author recommends empirical research should be conducted to investigate and quantify advantages of this approach/perspective. Proposes the concept of the "learning chain"	✓	✓	
Salim and Sulaiman (2011)	Quantitative analysis of 320 manufacturing SMEs. Study considers whether OL has a positive effect on promoting innovativeness and in turn, whether this innovation supports improved company performance	The work shows that both hypotheses (OL supports innovation and, Innovation supports improved company performance) are supported and that OL is a driver of growth in manufacturing companies	Identifies possible causal relationship between OL and firm performance. Work is survey based and does not show how SMEs engage in OL and Innovation practices		✓	✓
Spicer and Sadler-Smith (2006)	Quantitative analysis of 294 small and medium manufacturing firms with five hypotheses being tested against the learning orientation scale	Study raises the potential for a causal relationship between organisational learning and performance, in which a higher order learning orientation (double loop learning) can be identified as a driver of a firm's growth and the success of its operations	Identifies the causal relationships between OL and firm performance. Identifies that higher order (*double loop learning*) was a key driver in company growth	✓	✓	

(*Continued*)

Table 1. (*Continued*)

Author	Methodology Applied	Key Issues highlighted	Contribution	SC	OL	Inn
Wang and Ahmed (2003)	Secondary data analysis of key literature in Organisational Learning	Authors redefine the concept of OL by the inclusion of radical innovation and creativity as key features of a new OL approach	Identify 5 key features for OLC namely; *individual learning, the learning process, culture, knowledge management and, continuous improvement*		✓	✓
Yu, Jacobs, Salisbury and Enns (2013)	This study investigates the relationships among internal integration, external integration (i.e. with customers and suppliers), customer satisfaction, and financial performance using survey data collected from 214 manufacturing firms in China	The results suggest that OL improve internal integration within supply chains (shared values etc.) and significantly influences external integration, (customer / supplier integration). Supplier integration is significantly and positively related to financial performance	The study positions the benefits of integration as accruing from learning and financial performance being correlated to information flows. The work outlines the strength of OL in delivering improved supply chain performance	✓	✓	

connection between OL and its impact on supply chain effectiveness and innovation. In addition, other academic studies identify the key features of OL and OLC whilst some develop instruments for effectively measuring OLC performance (Chiva et al. 2007).

Wang and Ahmed (2003) identify five key features for OLC namely; individual learning, the learning process, culture, knowledge management and continuous improvement. Likewise, Barlow and Jashapara (1998) focus more specifically upon the issue around inter-firm partnering and the impact that this partnering has on OL. Chiva and Alegre (2005) identify five key dimensions to OLC, they are: (a) Experimentation, (b) Risk taking, (c) Interaction with the external environment, (d) Dialogue and (e) Participative decision-making. It is from here that Chiva and Alegre develop the OLC criteria further in to developing an effective instrument for measuring OLC (Chiva & Alegre, 2009).

A structured literature review of key KM and OL texts is described in Table 1. A review of the key literatures in the area identifies that little research exists in the practical implementation of OL and, the empirical development of a supply chain-oriented model for OL development in manufacturing supply chains. Whilst significant information exists on the positive correlation and connection between OL and innovation and company performance, the knowledge base around the design and implementation of KM/OL models and the practical implementation of such models in to SMEs is very light. Therefore, this paper will provide a contribution in this area through the development of a SCOLIF. The key findings of the literature review are:

- Wang and Ahmed (2003) identify five key features for OLC namely; individual learning, the learning process, culture, knowledge management and continuous improvement.
- Chiva (2004) identifies five key facilitating factors of OL identified namely: experimentation, risk acceptance, interaction with the external environment, dialogue, participative decision-making.
- Focus on the delivery of high-level learning through double-loop learning methods (Spicer & Sadler-Smith, 2006).
- Desouza and Awazu (2006) identify a number of SME-based dimensions for developing KM in SMEs. These dimensions are: resource constraints, loss of knowledge, failure to exploit external sources of knowledge.
- Argote (2011) states that the future enhancement of OL will come from further empirical research in to the mechanisms of knowledge creation and organisational capabilities.
- Barlow and Jashapara (1998) outline the importance of inter-firm partnering on successful OL development.

The identification of these key features will assist in the development of the initial SCOLIF (which will be the basis for the creation of the research framework). Focusing upon the development of the SCOLIF as the focal point of this study, the aim is to design, develop and implement a framework which allows for the development of high-quality learning and innovation skills aligned to the innovation management process of a new collaborative supply chain. Validation of the framework will be through monitoring and measuring the growth in OLC as the companies progress through the innovation project, identifying the key stages within the innovation/learning process that enabled the supply chain to develop its learning capability. The paper will return to the issue of OLC development and measurement a little later in the text. Information will now be provided on the case study element of the work.

2.2. Supply chain and OI theory and literature

A fundamental objective of this proposed collaboration is to develop high-quality innovation skills aligned to the innovation management process of the newly formed supply chain. Whilst the issue of supply chain integration and collaboration has been around for many years, most supply chain development is focused upon companies developing ad hoc approaches towards developing their supply chains. Furthermore, companies within traditional supply chains have little opportunity to develop products in a co-ordinated and collaborative manner where they are afforded the opportunity to enhance the product and process and align it to their specific core competencies (Ramanathan, Gunasekaran, & Subramanian, 2011; Scholten & Schilder, 2015).

Accompanying these issues, the risk of entering a new market for companies (especially SMEs) is high, and often, even though they have novel technologies and approaches to add to these markets, companies often do not have the knowledge of the new markets or accompanying market skills to adapt to these new sectors. As such, it is easier for the companies to remain in their competence zone, even if facing tougher conditions (Spekman, Spear, & Kamauff, 2002). Organisations with transferrable technologies/skills/products to other sectors need a way of accelerating their knowledge of the new markets, and a "safe" way of entering that market, whilst still maintaining their core business (Ellinger et al., 2012). In order to facilitate the process of innovation, companies need to develop Knowledge Management capabilities (Aboelmaged, 2014). Armed with these issues, it is possible to identify the importance on ensuring that companies are able to collaborate and innovate as part of a larger community of learning where innovative products are developed in a less risky environment. Pooling of key technical knowledge and skills to co-innovate in the development of new products is essential and so the development of supply chains capable of rapidly innovating whilst acquiring new skills and knowledge is key to future performance and sustainability. Therefore, OL theory is linked to the issue of innovation and this paper will explore this interconnection.

3. Methodology

This paper presents an applied research project which focuses on the development of a connected supply chain network of companies that work towards a shared vision; this vision will be to design, develop a new product whilst simultaneously creating a resilient and sustainable supply chain capable of breaking into a new market sector. The specific research question(s) being asked in this research programme were *what is the nature of the supply chain collaboration and innovative activity that emerged from this project and, what were the key inter-company dimensions that enabled collaboration and innovation to take place*. During this process of innovation and discovery, the respective OLC profiles were measured and a qualitative analysis was undertaken to determine whether there is a connection between the levels of innovation which emerge from the project and, the respective OLC profiles achieved by the new supply chain. As part of the project, a four-tier supply chain system was developed. This required the active involvement of four companies which had not previously worked together and who had very different skills and knowledge attributes. A feature of the research was to observe how each company collaborated in the project and, how they interacted and learned through the innovation which emerged from this project. The supply companies were targeted and selected by the project team as being a potential "good fit" with the project aims and objectives as well as having complementary and not competing technical skills so that the

companies could work effectively together and consider themselves as having an equal role to play in the innovation and creativity process. Outline details of each company are as follows:

SME 1 – An engineering department with a knowledge of patient physiology and assisted living devices.

SME 2 – A specialist assisted living device manufacturer with a knowledge of design and manufacture of various assisted living devices. Frames, lifts and slings etc.

SME 3 – A specialist equipment building supplier to the automotive industry with a skill set in systems integration, robotics and sensor integration systems.

SME 4 – A specialist equipment tracking company with knowledge and skills in the design and development of asset tracking and Active IR tracking systems.

The first issue for the author team (now called the facilitator team) was to design and develop a research framework in which to deliver the key innovation theories and later, to test and collect the data and information in order to establish the level of innovation and collaboration which had occurred. Figure 1 outlines the research framework employed (this framework can be considered as a first stage SCOLIF) and is constructed in the main from the key literatures identified earlier in this work. The research framework starts by focusing upon how the individual's learning needs will be best delivered. Once developed, the next stage is to focus on how the overall learning process is managed and led before focusing on the development of five workshops. The workshops show both feed forward and feedback paths. The feed forward pathways lead to the OLC results stage (the Chiva OLC criteria) whilst the feedback paths show the innovation group feedback which assisted in the facilitation team being able to design and deliver the content of the next workshop. Also, evaluation of each workshop stage was fed back to the facilitation team after each workshop stage. The workshop phases enabled the facilitation team the opportunity to measure and monitor the improvement in culture as well as enabling them to set up the Knowledge Management programme. The feedback loop shown after the results stage which feeds back in to the Individual learning and learning process stages allows for the facilitation team to review and adjust the overall research framework.

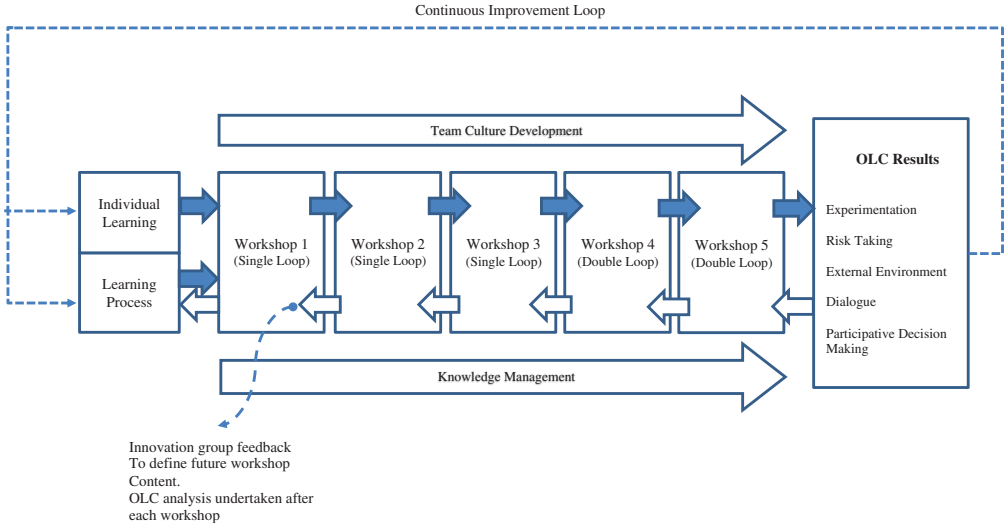


Figure 1. Research design framework (first Stage SCOLIF).

3.1. Workshop development and delivery

The facilitators initiated a series of five workshops with the newly established innovation group. Apart from the initial workshop which was aimed at establishing, the ground rules, aims and objectives of the programme, the content of the other four workshops were driven by the innovation group. This approach was termed as a "reverse facilitation" process by the facilitation team. This meant that the key content and requirements of the workshop was identified by the innovation group based on what they believed to be their next set of learning requirements having just undertaken the previous workshop. The innovation team and facilitator group would then co-create the content for the next workshop including the design of the exercises, tools and techniques in the workshop. This enabled the facilitator team to identify how the innovation group was absorbing the learning process and, could ascertain the level of self and group learning that was developing within the project.

It is important to note at this stage that the delivery of the workshop content was designed through either single- or double-loop learning modes. Workshops 1–3 were delivered via a single-loop learning approach. This meant that content delivery for these workshops focused upon the delivery of standard innovation models and content. Single-loop learning was needed at these points as the workshops aimed to deliver the ground rules and basic innovation content and to also lead the companies through some structured approaches before more advanced learning approaches were applied. Workshops 4 and 5 were delivered through a double-loop learning approach (Spicer & Sadler-Smith, 2006). This called for the innovation group to question current norms relating to innovation (its models and approaches) and to focus upon adjusting such models to improve their adaptability to the specific work at hand. The purpose of introducing the double-loop approach was to identify the effectiveness of such an approach and to test whether the level of innovation increased as a result of the adoption of this learning mechanism. Details of the workshop content are now shown in Figure 2. Brief details of each workshop are now provided.

3.2. Workshop 1—Introduction and new product development process

The first workshop was centred around building trust and understanding between the partner organisations (which now became the innovation group), and the facilitation team. Champions and senior managers from the design and engineering departments of each SME were invited to the workshop. The project aims and objectives were recapped, and the SMEs presented a background to their company operations and their expertise. An expectation mapping session was conducted and discussions were started around the area of future Intellectual Property (IP).

At the end of the workshop, the facilitation team explored a number of themes and challenges faced by members of the innovation group in their daily operations. Each member highlighted a

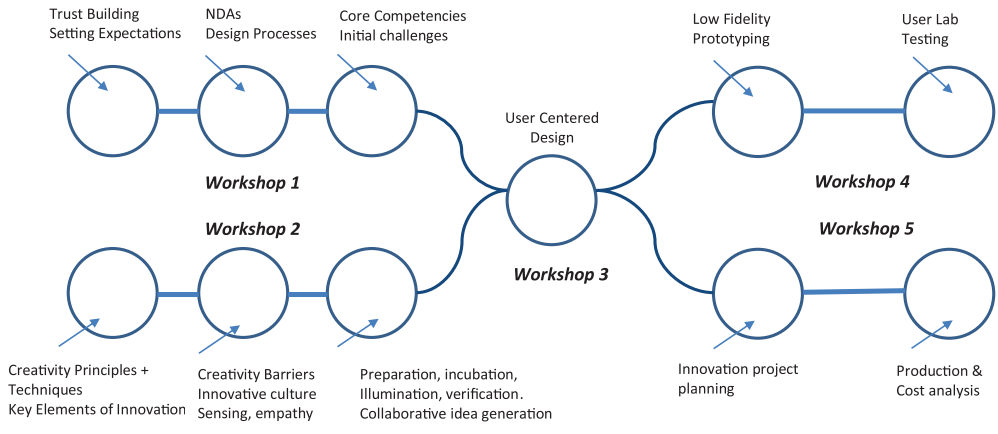


Figure 2. Workshops to engage, develop and support the innovation and learning in the supply chain companies.

particular challenge and all members present considered the challenge with the innovation team then working to developed ideas of how their competencies and skills could address the issues raised. The session finished with a discussion and agreement on the type of product that the team would focus upon for the remainder of the project period. The group agreed to focus on the design and development of an innovative assisted living device for specific use in care homes, hospitals and individual homes. Further outline discussions on where each member's competencies might fit in to the project and product were then explored in order to identify a number of high-level design objectives. The result of this workshop highlighted the need for the innovation group to be trained in creativity and innovation practices. Therefore, a workshop focusing upon these themes were developed by the facilitation team.

3.3. Workshop 2—Creativity and innovation workshop

This workshop focused upon the principles of creativity and specific techniques were delivered, including the factors and processes which affect creativity at an individual, team and organisational level. Common barriers to creativity were discussed, such as time, finance, skills, fear of failure and motivation. The importance of giving employees "permission" to be creative were also emphasised when fostering a creative culture.

Wallas' theory on the Creativity Process was introduced (Wallas, 1926) which describes the four key tenets of creativity. An integral part of the workshop was the introduction of the "Listen, Connect, Do (LCD)" model (Loudon & Deininger, 2014) which aims to support sustained creativity. Particular aspects of this model were emphasised such as: "empathising" with the end user; "listening" to what they have to say; observing how products are used *in situ*; connecting and engaging with others; listening and observing. During this workshop, a number of collaborative idea generation techniques were introduced and put into practice with relevant exercises, leading to the investigation of potential products to take forward. These opportunities were built around the broad challenge assigned to the innovation group with the focus on the design of an assisted living device: "How (and when) to move people with limited function safely: in the home environment, care home, or hospital environment". The result of this workshop led to the innovation group identifying the need for a workshop which focused upon User-Centred Design (UCD) systems.

3.4. Workshop 3—User-centred design

Workshop 3 reinforced the importance of empathising with, connecting to, and observing the user of the products or services under development. Design approaches have traditionally been alleged to fail when it comes to engaging with the end user (Hansen, Percival, Aldred, Brownsell, & Hawley, 2007), and criticism directed toward designers instinctively designing for able-bodied users, being unaware of the needs of users with different capabilities, or not knowing how to accommodate their needs within the design cycle (Keates, Clarkson, Harrison, & Robinson, 2000). User-Centred Design (UCD) is a design philosophy that looks to overcome this, by placing the needs, wants, and desires of users at the centre of the design process, allowing those needs and desires to drive a product, system, or service's development. UCD places the end user and their experience of a product, system or service at the centre of the design process and allows the user to contribute to every stage.

UCD requires the participation of a multidisciplinary team (Mao, Vredenburg, Smith, & Carey, 2005) that captures the needs of the end users (von Hippel, 1986) in the context of use. This increases the relevance and acceptance of the output design and reduces the risks associated with the use of a product (Norman, 1988). This workshop focused on the different types of knowledge (explicit, observable, tacit, latent) and different methods used to gather data and information on key user-centred processes (generative, interpretive, specification, ideation, user trials). The clinical engineers from SME 1 arranged for three observations of lifting devices being used in the following environments: a user of a lifting devices in their home; users of lifting devices in care homes; users of lifting devices in a hospital department.

Following the visits, journey maps were created, and fed back and analysed by the innovation group. The workshop then progressed to developing a set of ideas of how a new type of lifting device design could be developed, building on the learning from the workshops and observations this far. The innovation group then went on to produce an initial Product Design Specification for the lifting device which would be used for future development and planning. Following this workshop, the innovation group identified the need for a workshop focusing upon prototype development and analysis.

3.5. Workshop 4—Prototype development

This workshop focused on the further development of a more detailed Product Design Specification as well as the production of a three low fidelity prototypes and their subsequent analyses. The participants were asked to critically analyse the previously taught design and creativity models and to develop and adjust the models to meet the specific project needs. It was here that the double-loop learning methodology was applied. The innovation group was asked to critically analyse the previously developed models and approaches and to focus on what was specifically needed to assist them in the development of the prototype models. This included encouraging members to bring in their own design and engineering skill sets and to add these to the existing body of knowledge so that a new process of innovation could be developed. The result of this process enabled the members to modify models to produce three prototype lifting devices. Following this stage, the team then chose the most suitable lifting device design. From here, the chosen design was then taken to the final workshop which focused on the detailed design and analysis of the chosen product.

3.6. Workshop 5—Detailed design and production planning

This workshop focused upon the delivery of key design process management tools which enabled the innovation group to consider the wider aspects of the chosen design (such as the manufacturability of the product and the systems infrastructures needed to make the product operable in the workplace). Again, the members were asked to integrate the Value Analysis and Value Engineering methodology with their own engineering and design experience and knowledge so as to seek further innovation in the existing design framework. As a result of this higher level analysis, the team identified a new product called a "sling configurator system". The details of the configurator were fleshed out at this workshop with the team continuing to develop the concept as a further new and innovative product to take to market.

During each of the workshops, the project management team observed each individual and company to ascertain their levels of interaction and contribution to the project. This information was collected individually from each of the facilitation team members and was subsequently moderated and discussed in the post-workshop analysis meeting that was undertaken after each workshop. The scoring of the companies was measured using the Chiva OLC model and in line with the research framework shown in Figure 1 and details of which are shown later in the paper. The team used the five key OLC criteria and the fourteen key learning variables found in Chiva's model. Table 2 outlines the OLC criteria and the fourteen variables that were measured as a result of the study. Using the fourteen variables, the team observed the activities undertaken by the team at each workshop and applied a Likert scale of 1–5 to measure each variable (see Table 3). The companies within the supply chain were scored by the three facilitation team members independently after each workshop session. Alongside this, members of the innovation group were also required to self-assess against the OLC criteria after each workshop in an attempt to garner the widest level of feedback in order to make the OLC analysis meaningful. Where disparities in the marks existed between the facilitation team and innovation group, a discussion was had between both groups to agree on a given mark for each OLC point. Marks were awarded to each variable by direct observation of the participant's levels of activity and involvement in the project activities. For the innovation group members, the marks were awarded based on their reflections on how they felt their own company was performing and meeting each of the key OLC criteria. Following the measuring phase, OLC plots were produced for each company. Figure 3 shows the OLC plots for each company.

Table 2. - OLC Criteria and the Variables

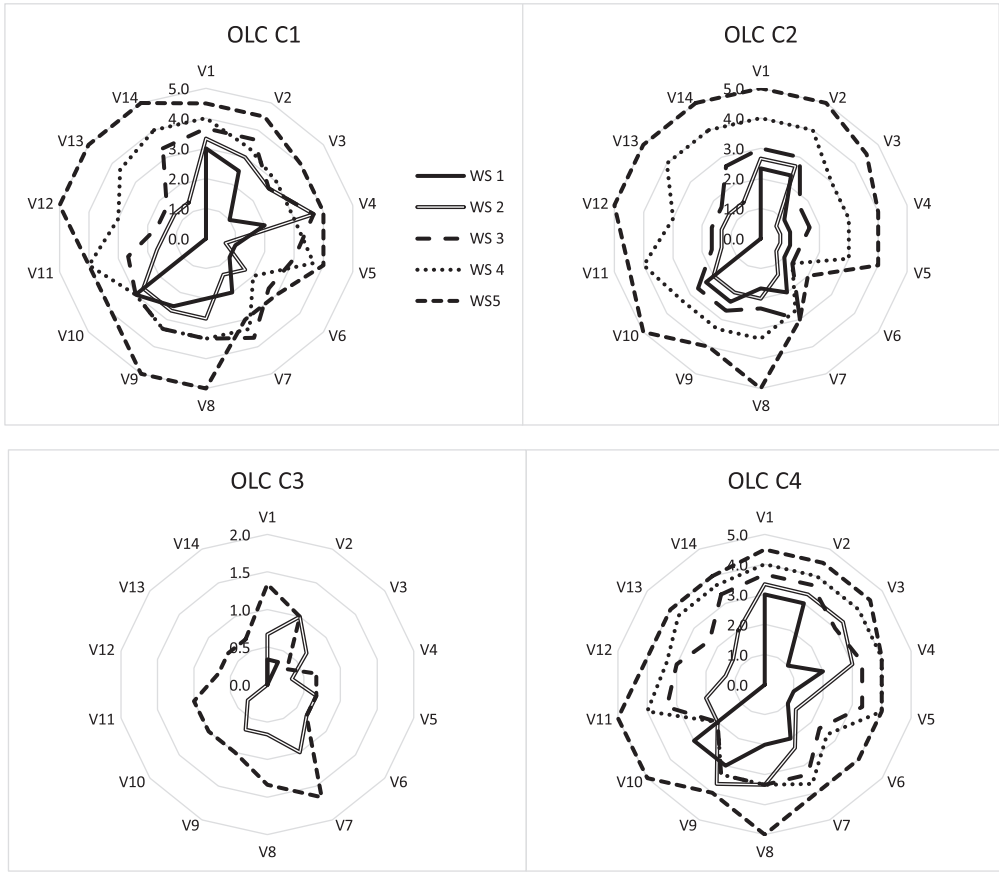
OLC Criteria	Variables
Experimentation	V1. Participants provide support and encouragement to others when presenting new ideas from the team members
	V2. Participants provide and receive favourable responses to new initiatives and feel encouraged to generate new ideas
Risk taking	V3. Participants take risks in the design and processes for the new product
	V4. Participants are seen to venture into unknown territory
Interaction with the external environment	V5. Participants collect, bring back and report information about what is going on outside the company
	V6. Participants use the systems developed for receiving, collating and sharing information from outside the company
	V7. Participants interact with the environment: competitors, customers, technological institutes, universities, suppliers etc.
Dialogue	V8. Participants are encouraged to communicate
	V9. There is a free and open communication within the project team
	V10. Managers facilitate communication within project teams
	V11. Cross-functional teamwork is in place
Participative decision making	V12. Managers in this project frequently involve employees in important decision
	V13. Products and processes are significantly influenced by the view of employees
	V14. Participants feel involved in project decisions

Table 3. OLC Marking Criteria

	1	2	3	4	5
V1	No support	Limited support	Frequent support	Regular support	Full support
V2	No response	Limited response	Frequent response	Regular response	Enthusiastic
V3	No risks taking	Limited risk taking	Frequent risk taking	Regular risk taking	Informed risk taking
V4	No venturing	Some/limited venturing	Frequent venturing	Regular venturing	Routine venturing in to new areas
V5	No work undertaken	Limited work undertaken	Frequent work undertaken	Regular work undertaken	Fully engaged and leading work
V6	No engagement with systems	Limited engagement with systems	Frequent engagement with systems	Regular engagement with systems	Fully engaged and leading work
V7	No engagement with outside stakeholders	Limited engagement with outside stakeholders	Frequent engagement with outside stakeholders	Regular engagement with outside stakeholders	Fully engaged and leading work
V8	No communication with other team members	Limited communication with other team members	Frequent communication with other team members	Regular communication with other team members	Fully communicating with all members
V9	No open communication between teams	Limited communication between teams	Frequent communication between teams	Regular communication between teams	Full and effective communication taking place
V10	Managers disengaged in leading communication	Managers providing some engagement in leading communication	Managers frequently engaging in leading communication	Managers regularly engage in leading communication	Fully engaged in leading communications
V11	No x-functional teams set up	Limited Cross-functional team development	Cross-functional teams frequently set up	Cross-functional teams regularly set up	Full and effective x-functionality resulting in new product development
V12	No employee decision-making	Limited employee decision-making	Frequent employee decision-making	Regular employee decision-making	Full and effective employee decision-making
V13	Team members do not influence ideas	Team members show some influence ideas	Team members frequently influence ideas	Team members regularly influence ideas	Team members fully engaged and influence project effectively
V14	No feeling of involvement	Some feeling of involvement	Feeling of involvement is frequent	Feeling of involvement is regular	Feeling fully involved in project

cogent business & management

Figure 3. OLC maps for each company within the supply chain.



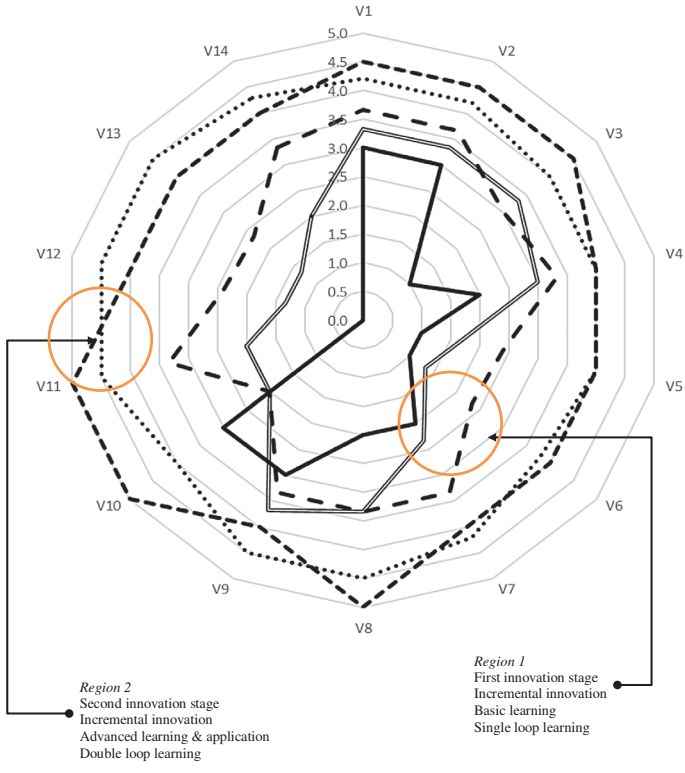
4. Measuring the OLC – Results and analysis

The OLC plots shown in Figure 3 show the development of each individual company following each of the innovation workshops. In each case it is possible to identify the OLC profiles following each workshop phase. In all but one case, steady improvement in each of the five OLC elements was made. The workshops were seen as significant catalysts for growth in experimentation and innovation which was brought about from the increase in trust and confidence gained by each company within the supply chain. Impressive results were seen by companies SME 1 and SME 2 where these companies frequently took the lead in the development of new and innovative products. As the workshops progressed, members of these companies became the catalysts for innovation and subsequently developed close, meaningful and sustainable relationships with the other companies in the group. Company SME 4 was highly influential in the innovation process. Rather than taking a central role in the development of the core product, this company, due to its knowledge and skills base was highly influential and crucial in the development of innovation around systems tracking and mapping. This prevented the project from going down an incremental innovation route and was influential in achieving step changes in product development and, significant innovation from the collaborations. However, company SME 3 showed problematic signs at an early stage in the project. The OLC plots reflect the lower levels of engagement by the company and, the OLC plots became a strong predictor of potential failure of the company which resulted in the company failing to engage in the project after Workshop 3. Early stage intervention by the project team after Workshop 1 ensured that the company continued through to Workshop 3 although its growth and development measured through the OLC continued to be low. The company eventually left the project after Workshop 3.

The composite OLC map shown in Figure 4 showed the overall OLC for the established supply chain (the innovation group). The results of this map were obtained by finding the median values from each of the individual company OLC maps and then moderating the resulting map with the other members of the facilitation team and innovation group to ensure that agreement was obtained from all in the team as to whether the composite OLC map accurately reflected the group dynamics after each workshop. Through analysing the composite OLC map, it is possible to identify a significant step change in performance after workshop 4. This was an important finding as it was at workshop 4 that the double-loop learning process was also introduced to the learning process. It is possible that the jump in the OLC scores may have been down to the adoption of double-loop learning but it is likely that it was this in combination with the strengthening team dynamics and greater levels of experimentation and trust being developed between the members that may have contributed to the improvement in the OLC scores after workshop 3. Also, it was observed that during workshop 4 and 5 that the level of innovation in the group jumped significantly where an additional and highly innovative product emerged from the group.

Between workshops 1 and 3, the innovation group succeeded in producing a new patient sling which enabled a potential client to benefit from greater safety and security when being lifted and also providing greater flexibility and support when the patient was seated. This output was significant and one which further enhanced the team dynamics especially at the early stage of the innovation process. However, it was agreed that the sling product only made an incremental improvement in product innovation. In order to drive for increased levels of innovation, workshops 4 and 5 were restructured and the facilitation team pushed the innovation group to focus more on step changes in innovation focusing upon double-loop learning where the participants' own design/engineering experiences and knowledge were utilised much more and integrated in to the existing design frameworks. This work paid off and the team eventually designed and developed a sling configurator product. Figure 5 shows the jump in OLC scores following Workshop 4. Further analysis is needed here to identify whether any single key characteristic was responsible or whether it was a more complex integration of a number of characteristic. This product idea was taken to experts in an NHS

Figure 4. Composite OLC map.



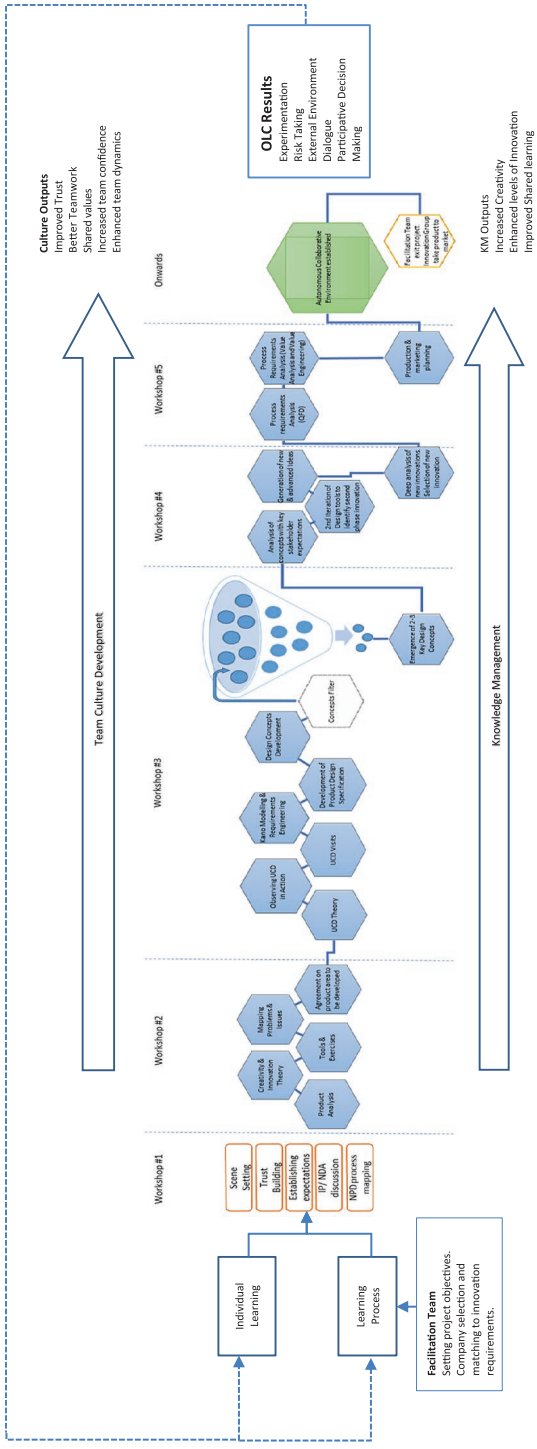


Figure 5. Supply chain organisational learning and innovation framework (Final SCOLIF).

rehabilitation unit who confirmed that the configurator was genuinely innovative and marked a significant level of innovation in the area.

5. Development of the SCOLIF

Up to this point, the facilitator team and innovation group used the research framework as a means of testing the process. This was in essence a first stage SCOLIF and was produced through an analysis of key literatures of KM and OL. This initial framework provided the research model from which the case study could be developed.

A final workshop (workshop 6) was set up at the end of the project to identify lessons learnt and best practice developed during the project. The innovation group and facilitation team focused on the initial SCOLI Framework and analysed it with a view of identifying further enhancements and improvements that could be made to the framework following the experiences obtained from its initial implementation. The updated SCOLIF is presented in Figure 5 and shows the nature of the flow between the workshop content and, its interaction with the enabling elements of the framework that sit outside the workshop programme.

The team believed that the focus on specific company selection and the associated planning around individual learning and the learning process was a critical factor towards developing an effective project plan. Likewise, the KM and Cultural development stages of the SCOLIF were able to yield key outputs as the workshops progressed and the innovative ideas and enhanced learning amongst the group were achieved. Key factors such as improved trust and collaboration emerged from the attention to the KM and Culture factors. The team also identified the need for strong and effective feedback loops and the need for the co-creation of teaching and learning content so as to maintain interest and moment in the innovation group. The workshop detail was fleshed out and a schematic of the workshop content is provided within the body of SCOLIF. Chiva's OLC criteria are used to measure and monitor the learning capability of the supply chain and the feedback loop from the OLC scores provides an accurate platform to adjust and improve the framework on a continuous basis and, to identify early onset of company failure (as seen in SME 3).

6. Conclusions

To answer the initial part of the research questions namely what was the nature of the supply chain collaboration and innovative activity that emerged from this project? It was observed that there was a clear connection seen between the growth in the level of innovative activity undertaken by the newly formed supply chain company and the corresponding OLC scores calculated. Growth in confidence and trust amongst the team members resulted in greater experimentation and risk taking brought on by more effective and frequent communication between the team members. Improved participative decision-making driven by the closer communication and trust amongst the team resulted in more innovative designs emerging at each workshop. The OLC profiling approach was a good predictor of early stage company engagement. In this instance, the issues around company SME 3 losing motivation and failing to engage was identified very early in the project and whilst the company eventually withdrew from the project, it was possible to identify problems much earlier in the project and for the team to draw in a replacement company as a result of the OLC profiling.

This project was able to achieve its aim of developing a prototype product from the collaboration between these companies. The project also yielded two distinct product innovations. Whilst the initial product lacked significant levels of innovation, the project management team was very happy to see the levels of engagement by the companies in the project and, the way in which communication systems, dialogue between team members and participative decision-making developed as the project progressed. This proved to be key to future workshop delivery and, coupled with innovations in double-loop learning and changes made in content delivery at the later workshops, a more innovative product resulted from the collaboration by the end of workshop 5.

The project yielded the production of an empirically derived SCOLI Framework (Figure 5). This is seen as a unique contribution to the field of OL and, provides a blueprint for companies and academics to further develop knowledge creation and organisational capabilities (Argote et al., 2001).

To answer the second part of research question namely; What were the key inter-company dimensions that enabled collaboration and innovation to take place?, through observation of the companies, it was possible to identify a number of "cultural dimensions" which assisted in the success of the project. These dimensions can be considered as a blueprint for other companies wishing to embark on similar projects. These dimensions are:

1. A specific and deep-rooted understanding of SME limitations and constraints to OL and, a single-minded group approach towards overcoming these barriers and limitations.
2. An open-minded team of collaborating members willing to accept and act upon advice.
3. A training programme consisting of co-created workshop content between the innovation group and the facilitation team aimed at maintaining project momentum and participant engagement.
4. Inclusiveness, the recognition that all personnel within the group/team make a contribution and that this can be encouraged by training together with involvement, to make these efforts more effective
5. The availability of flexible, intelligent and innovative human resources leading to increased creativity and innovation within the group.
6. The presence of excellent inter-personnel attitudes and communications leading to enhanced group dynamics and trust.
7. The application of an immersive and collaborative working environment and the empowerment of the team to self-organise
8. The use of simple and clear design and management principles to direct the innovation activities.
9. The establishment of key leaders and effective leadership in the innovation group.
10. Adaptability in the development of new skills and capabilities together with the adoption of a customer-focused company orientation. Shared learning and improved trust amongst team members.

Engaging with a small network of SMEs has its problems. SMEs suffer from resource capacity problems and so the release of staff to attend workshops was a continuous issue, one that required excellent inter-communication skills and working relationships to be established between the facilitation team and the innovation group. However, the motivation created and the excellent team dynamics developed through the workshops meant that the innovation group drove the project forward with key members of the group emerging as natural leaders.

This project was seen as a success in part due to the judicious selection of the project partners (Yoon & Song, 2014). The facilitation group undertook a substantial period of time to identify company partners who have both the technical capabilities to contribute effectively to the innovation process but also, the interpersonal skills and the ability to set up trusted relationships quickly. This was achieved through knowing each of the key participants in the companies well and taking a calculated risk in seeing if the team members would gel and function as a coherent group. Also, through a "reverse facilitation" approach, workshop content (and delivery of such content) was defined by the innovation group and delivered by the facilitation team. This allowed for Open Innovation group dynamics to emerge whilst the facilitation team were able to guide and manage the innovation process. The establishment of co-created knowledge delivery and acquisition was a key output of this project.

This project has yielded some interesting and original research outputs relating to OL and innovation development in supply chains. However, the authors are aware that the research has a number of limitations in both its scope and approach to the research work. Firstly, the work has only been undertaken with a limited set of four companies. There will need to be further work with multiple innovation groups in the future in order to develop a body of knowledge that can help enhance the existing body of knowledge in this area. The authors have immediate plans to roll out this work in to other supply chains and innovation groups.

Funding
The authors received no direct funding for this research.

Author details
Andrew Thomas[1]
E-mail: ajthomas@cardiffmet.ac.uk
Peter Dorrington[2]
E-mail: p.j.dorrington@swansea.ac.uk
Filipa Costa[2]
E-mail: filipacos@gmail.com
Gareth Loudon[3]
E-mail: gloudon@cardiffmet.ac.uk
Mark Francis[1]
E-mail: mfrancis@cardiffmet.ac.uk
Ron Fisher[1]
E-mail: rfisher@cardiffmet.ac.uk
[1] Cardiff School of Management, Cardiff Metropolitan University, Cardiff CF5 2YA, UK.
[2] Product Design Centre, Cardiff Metropolitan University, Cardiff CF5 2YA, UK.
[3] Cardiff School of Art and Design Cardiff Metropolitan University, Cardiff CF5 2YA, UK.

Citation information
Cite this article as: Organisational learning capability in SMEs: An empirical development of innovation in the supply chain, Andrew Thomas, Peter Dorrington, Filipa Costa, Gareth Loudon, Mark Francis & Ron Fisher, *Cogent Business & Management* (2017), 4: 1364057.

Cover image
Source: Authors.

References

Aboelmaged, M. G. (2014). Linking operations performance to knowledge management capability: The mediating role of innovation performance. *Production Planning and Control, 25*, 45–58.
Alexander, A. T., & Childe, S. J. (2013). Innovation: A knowledge transfer perspective. *Production Planning and Control, 24*, 208–225.
Argote, L. (2011). Organizational learning research: Past, present and future. *Management Learning, 42*, 439–446.
Argote, L., Gruenfeld, D., & Naquin, C. (2001). Group learning in organizations. In M. E. Turner (Ed.), *Groups at work: Theory and research* (pp. 369–411). Mahwah: Lawrence Erlbaum.
Azadegan, A., & Dooley, K. J. (2010). Supplier innovativeness, organizational learning styles and manufacturer performance: An empirical assessment. *Journal of Operations Management, 28*, 488–505.
Barlow, J., & Jashapara, A. (1998). Organisational learning and inter- firm "partnering" in the UK construction industry. *The Learning Organization, 5*, 86–98. https://doi.org/10.1108/09696479810212051
Bigliadi, B., & Galati, F. (2016). Which factors hinder the adoption of open innovation in SMEs? *Technology Management and Strategic Management, 28*, 869–885.
Calantone, R. J., Cavusgl, S. T., & Zhao, Y. (2002). Learning orientation, firm innovation capability, and firm performance. *Industrial Marketing Management, 31*, 515–524.
Chapman, R. L., & Corso, M. (2005). From continuous improvement to collaborative innovation: The next challenge in supply chain management. *Production Planning & Control, 16*, 339–344.
Chiva, R. (2004). The facilitating factors for organizational learning in the ceramic sector. *Human Resource Development International, 7*, 233–249.
Chiva, R., & Alegre, J. (2005). Organizational learning and organizational knowledge: Towards the integration of two approaches. *Management Learning, 36*, 49–68. https://doi.org/10.1177/1350507605049906
Chiva, R., Alegre, J., & Lapiedra, R. (2007). Measuring organisational learning capability among the workforce. *International Journal of Manpower, 28*, 224–242. https://doi.org/10.1108/01437720710755227
Chiva, R. & Alegre, J. (2009). Organizational learning capability and job satisfaction: An empirical assessment in the ceramic tile industry. *British Journal of Management, 20*, 323–340. doi:10.1111/j.1467-8551.2008.00586.x
Darroch, J. (2005). Knowledge management, innovation and firm performance. *Journal of Knowledge Management, 9*, 101–115.
Desouza, K. C., & Awazu, Y. (2006). Knowledge management at SMEs: Five peculiarities. *Journal of Knowledge Management, 10*, 32–43.
Ellinger, A., Shin, H., Northington, W. M., Adams, F. G., Hofman, D., & O'Marah, K. (2012). The influence of supply chain management competency on customer satisfaction and shareholder value. *Supply Chain Management: An International Journal, 17*, 249–262 https://doi.org/10.1108/13598541211227090
Feller, J., Hirvensalo, A., & Smeds, R. (2005). Inter-partner process learning in collaborative R&D—a case study from the telecommunications industry. *Production Planning and Control, 16*, 388–395.
Hansen, J., Percival, J., Aldred, H., Brownsell, S., & Hawley, M. (2007). Attitudes to telecare among older people, professional care workers and informal carers: A preventative strategy or crisis management? *Universal Access in the Information Society, 6*, 193–205.
Jerez-Gómez, P., Céspedes-Lorente, J., & Valle-Cabrera, R. (2005). Organizational learning Capability: A proposal of measurement. *Journal of Business Research, 58*, 715–725.
Keates, S., Clarkson, P. J., Harrison, L. A., & Robinson, P. (2000). Towards a practical inclusive design approach. *Proceedings on the 2000 Conference on Universal Usability* (pp. 45–52). Washington, DC: ACM. https://doi.org/10.1145/355460
King, W. A. (2009). Knowledge Management and Organisational Learning. *Annals of Information Systems* (Vol. 4). Hamburg: Springer. ISBN 978-1-4419-0007-4
Kumpikaite, V. (2008). Human resource development in learning organization. *Journal of Business Economics and Management, 9*, 25–31.
Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press. ISBN 0-521-42374-0. https://doi.org/10.1017/CBO9780511815355

Loudon, G. H., & Deininger, G. M. (2014). A new model for supporting creativity in research organisations. In S. Schimpf (Ed.), *Proceedings of the R&D Management Conference* (pp 93–100). Stuttgart: Fraunhofer IAO.

Mao, J. Y., Vredenburg, K., Smith, P. W., & Carey, T. (2005). The state of user-centered design practice. *Communications of the ACM, 48*, 105–109.

Nasab, M. K. (2016). Investigating the effect of inter-organizational learning on the performance of innovation in the supply chain of engineering and supplying automotive parts of Iran Khodro (Sapco). *International Academic Journal of Business Management, 3*, 28–44.

Norman, D. (1988). *The design of everyday things*. New York, NY: Doubleday.

Onağa, A. O., Tepecib, M., & Başalpc, A. A. (2014). Organizational learning capability and its impact on firm innovativeness. *Procedia - Social and Behavioral Sciences, 150*, 708–717.

Opengart, R. (2015). Supply chain management and learning organization: A merging of literatures. *International Journal of Commerce and Management, 25*, 183–195. https://doi.org/10.1108/IJCoMA-10-2012-0063

Ramanathan, U., Gunasekaran, A., & Subramanian, N. (2011). Supply chain collaboration performance metrics: A conceptual framework. *Benchmarking: An International Journal, 18*, 856–872. https://doi.org/10.1108/14635771111180734

Salim, I. M., & Sulaiman, M. (2011). Organizational learning, innovation and performance: A study of malaysian small and medium sized enterprises. *International Jounral of Business and Management, 6*, 118–125.

Scholten, K., & Schilder, S. (2015). The role of collaboration in supply chain resilience. *Supply Chain Management: An International Journal, 20*, 471–484.

Senge, P. M. (1990). *The fifth discipline*. New York, NY. ISBN 0-385-26094-6

Spekman, R. E. Spear, J., & Kamauff, J. (2002). Supply chain competency: Learning as a key component. *Supply Chain Management: An International Journal, 7*, 41–55. https://doi.org/10.1108/13598540210414373

Spicer, D., & Sadler-Smith, E. (2006). Organisational learning in smaller manufacturing firms. *International Small Business Journal, 24*, 133–158.

von Hippel, E. (1986). Lead users: A source of novel product concepts. *Management Science, 32*, 791–805.

Wallas, G. (1926). *The art of thought*. New York, NY: Harcourt Brace.

Wang, C. L., & Ahmed, P. K.(2003). Organisational learning: A critical review. *The Learning Organization*, *10*, 8–17. https://doi.org/10.1108/09696470310457469

Yang, J. (2008). Antecedents and consequences of knowledge management strategy: The case of Chinese high technology firms. *Production Planning and Control, 18*, 67–77.

Yoon, B., & Song, B. (2014). A systematic approach of partner selection for open innovation. *Industrial Management & Data Systems*, *114*, 1068–1093. https://doi.org/10.1108/IMDS-03-2014-0086

Yu, W., Jacobs, M. A., Salisbury, W. D., & Enns, H. (2013). The effects of supply chain integration on customer satisfaction and financial performance: An organizational learning perspective. *International Journal of Production Economics, 146*, 346–358.

Cogent Business & Management **(ISSN: 2331-1975) is published by Cogent OA, part of Taylor & Francis Group.**