

PROBLEMATISATION OF THE SHIFT FROM PRODUCTS TO SERVICES

Nicola Morrey¹, Andrew Dainty¹, Derek Thomson¹ and Christine Pasquire²

¹ *Department of Civil and Building Engineering, Loughborough University, Loughborough, Leicestershire, LE113TU, UK*

² *Centre for Lean Projects, School of Architecture, Design and The Built Environment, Nottingham Trent University, Nottingham, UK*

Over half of the top 20 UK construction companies aspire to provide services and solutions to their clients. This is a clear recognition that constructing on time, defect free and within budget is no longer a differentiator; instead competitive advantage can be gained from technical expertise, consideration of whole life costs and delivering the client's whole value proposition. The majority of literature addressing the evolution of products to service is theoretical, proposing strategic models and outlining the key characteristics of being an integrated solutions provider. In reality the transition pathway to becoming a solutions provider is difficult for organisations that have hitherto focused on product delivery. Through semi-structured interviews, observation of management meetings and project feedback, the problems encountered when trying to embed the characteristics of integrated solutions provision are examined within a leading construction firm undergoing such a transition. It reveals a disconnect in approach between head office work-winning teams and regional project delivery teams that has resulted in a lack of continuity of service at crucial pinch-points in the delivery process. A silo mentality, resulting in a lack of common understanding across the team, can be traced to an organisational path dependency that stems from historical decisions, and is therefore very difficult to overcome. The paper suggests practical mechanisms to help the business make changes to their working practices, routines and organisational structures. It is intended that these will drive the development of new capabilities allowing the organisation to break free from the paths it has become locked into to become a true solutions provider.

Keywords: integrated solution, path dependency, service, transition, value.

INTRODUCTION

The move towards service-led construction is becoming increasingly prevalent, with over half of the top 20 UK construction companies describing their intentions to provide services and solutions on their company websites. The service offering, also described as providing integrated solutions, involves "the bringing together of products and services in order to address a customer's particular business or operational requirements. Delivering integrated solutions to meet customer needs

¹ N.Morrey@lboro.ac.uk,

A.R.Dainty@lboro.ac.uk,

involves specifying, designing, constructing, financing, maintaining, supporting and operating a system/facility throughout its life cycle" (Brady et al. 2005b: 572.)

To date, the majority of work in the products-service field has focused on the development of theoretical models and the identification of the key characteristics of solutions provision (Foote et al. 2001; Galbraith 2002; Oliva & Kallenberg 2003; Brady et al. 2005; Gebauer & Friedli 2005; Baines et al. 2009). Empirical studies outlining the issues faced by companies undergoing transition are mostly concerned with the manufacturing and service sectors (Johnstone et al. 2009), with the few construction based examples being Private Finance Initiative (PFI) related (Johnstone et al. 2008; Leiringer et al. 2009). There is little comment on the specific difficulties that construction organisations face when they try to embed these characteristics, the root causes of these problems, or solutions available to enable them to overcome them.

Informed by semi-structured interviews and attendance at management and project meetings, the practical problems encountered when trying to embed the characteristics of service provision are explored in a case study of a leading construction organisation that is currently undertaking the transition from product to service provider.

Following a discussion on the existing literature and an explanation of the research methodology, the issues faced by the organisation are discussed along with some practical mechanisms that have been, and continue to be, implemented to drive change in the business.

TRANSITIONING FROM PRODUCTS TO SERVICES

The products-to-services literature originated in the manufacturing and service industries where the primary driver for the move to servitisation was the economic gains to be had through providing services centred on an installed base of products, i.e. service and maintenance contracts for products already sold (Oliva & Kallenberg 2003). The Institute for Manufacturing's high value manufacturing framework (Livesey 2006) classifies the types of manufacturer in a products-service matrix according to whether revenue is being generated by products or services, and whether the majority of costs are associated with production or non-production activities. Manufacturers that have the majority of their costs in production and generate the majority of their revenue from the sales of these products are deemed to be traditional product manufacturers. Those who have begun to generate revenues from services associated with the products they produce, yet whose majority of costs still lie in the production activity, are described as service-led producers. When the majority of costs lie in non-production activities the business is a systems integrator, undertaking the complex activity of organising third party specialists to design and produce components that they must integrate into a functioning product (often a one-off): the sale of which generates the majority of revenue. Finally, service manufacturers have shifted their focus to providing services associated with their products, generating revenue from services and therefore having their costs associated with these non-production activities. Ultimately these companies may sell off their production capability entirely, wholly basing their business on providing support and services across a range of products.

Applying this framework to construction, a product manufacturer would be a company whose revenue is generated mainly through the construction of the product, i.e. the building, with the majority of costs being associated with the production activity, i.e. labour, plant and materials. In other words, a product manufacturer in the

construction industry is a building business that tenders for and builds construction projects, with margin being generated by the act of building alone. Should that type of business then begin to generate the majority of revenue through services associated with that product, for example maintenance of the asset, but with majority of its costs still being associated with the production activity, it would have become a service-led producer. Systems integrators, although still generating the majority of revenue through the production and sale of the building, have the majority of their costs associated with non-production activities, for example consultancy costs and design development costs: "These firms outsource detailed design and manufacture to external suppliers and contract manufacturers while maintaining in-house the systems integration capabilities necessary to co-ordinate a network of external component and subsystem suppliers" (Davies 2004:731).

A systems integrator is therefore a business that tenders for work and uses their expertise to integrate consultants and supply chain members to develop the best product for that customer given the brief, then managing that team to deliver the product. Although value and margin are generated through design and procurement of sub-contract packages in addition to the building, the majority of revenue still comes from the production of the building. As with systems integrators, the majority of costs for a service manufacturer are also associated with the non-production activities, although these activities have now expanded into business consultancy, financing opportunities and engagement of third party experts. Therefore, the key difference for the service manufacturer is that revenue is generated not only from the construction activity, but also from financing opportunities and aftercare services, such as facilities maintenance and operation. Service manufacturers (solutions providers) are therefore businesses that service a client's business needs, not just their building needs, through the provision and maintenance of an asset that has been tailored to let the client deliver their business objectives. Within the case study company, this concept of solutions provision as described by Alderman et al. (2002) is articulated as, for example, a desire to provide education facilities, rather than just building schools, which are designed and operated such that pupils achieve the desired exam results; or to provide healthcare facilities that enable the trust to achieve target waiting times and patient care costs, rather than just building a hospital and handing over the keys. However, questions remain as to whether this approach is viable given that service-led construction projects are not necessarily more profitable (Lind & Borg 2010).

The case study company is currently aspiring to make the transition from product manufacturer/systems integrator to service manufacturer. It would be easy for a business to claim that it develops "solutions" for its clients and is therefore a "solutions provider" or "service manufacturer." However, although companies claim they are delivering solutions, the underpinning requirements of solutions provision are difficult to embed in practice. The case study company is striving to implement these characteristics fully as opposed to creating a veneer of solutions provision through their marketing and work-winning activities: a transition that they recognise will require fundamental shift in the ways in which they mobilise and integrate their collective capabilities.

RESEARCH METHODOLOGY

Since the research aim was to uncover the problems associated with embedding the characteristics of solutions provision, a qualitative approach was taken within a case

study organisation, allowing an in-depth view of life to emerge through observations and the opinions of those involved (Easterby-Smith et al. 2008; Fellows & Lui 2008).

The case study company is a national UK contractor. Originally founded as a local builder, the business now operates from a number of regional offices that are supported by central functions such as procurement, design, finance, information systems and marketing. The business is part of a group of business that, having historically worked independently, are now actively looking for opportunities where they can horizontally and vertically integrate their offering to provide a full service that ranges from financing, design, construction through systems integration, mechanical electrical services, off-site manufacture and facilities management.

A literature review identified the characteristics of solutions provision. Brady et al. (2005b:573) state that firms wishing to make the shift to integrated solutions need to develop capabilities that "coalesce around four areas: systems integration, operational service, business consulting and financing." These four areas have been used as an evaluative framework from which a set of semi-structured interview questions was derived and against which management and project team meetings have been observed and benchmarked.

Fifteen semi-structured interviews were carried out with people from work-winning and project delivery teams, information systems (IS) and senior managers within the case study company. Over the course of twelve months the researcher also attended project launch, post project review and bimonthly management meetings.

The problems uncovered have been considered with respect to a prior study that identified the organisational path dependencies that exist within the business. Path dependency refers to the idea that events and decisions that have taken place in the past continue to influence current decisions and ways of working such that an organisation becomes locked into paths from which it can't break free (David 2001).

THE PROBLEMS ENCOUNTERED IN PRACTICE

Using the characteristics identified by Brady et al. (2005b) as a framework, each of the four characteristics is discussed, along with the problems encountered when trying to implement them in practice. Comments in quotation marks that are not referenced have come from the interviews, visits and meetings observed, and remain unattributed to maintain participant confidentiality.

Systems Integration

Systems integration, deemed to be the core capability (Brady et al. 2005b), concerns the ability of the business to integrate and manage all parties involved, both internal and external, in the design, development and co-ordination of components and systems such that they come together as a functioning asset, i.e. a completed building.

From the 1980s, when the business grew through acquisition from a local, regional builder into a national contractor, it ostensibly became a systems integrator, managing sub-contractors, suppliers and consultants in the delivery of construction projects. More recently, the vertical integration of the construction, mechanical & electrical services and facilities management businesses within the group provided the opportunity for increased integration and whole life cycle offering to the client. Yet, despite, arguably, years of experience in systems integration, there remain challenges in embedding the characteristic to a repeatable standard.

Systems integrators need to maintain relationships with customers and ensure the integration of all parties throughout the project. However, "due to busyness of work-winning teams and time taken to convert projects, work-winning team involvement often ends at handover," i.e. on contract award the team who won the contract hands it over to a new team who are responsible for building it. Project managers, tasked with the construction phase of the contract, speak of feeling "vulnerable as they don't understand the history (of the project to date) whilst others around the table (the client and consultants) do." Clients are therefore presented with a new set of faces at handover, resulting in deterioration of the customer relationship as the delivery team feel they "don't know what they are building" and that "someone else has sold something we can't deliver." In addition, there is duplication of effort as the delivery team re-work activities that have already been done by the work-winning team, but which haven't been communicated to them. Similarly, project delivery personnel are often unavailable to support work-winning teams as they are busy completing their current projects: one senior manager noted that "requests for resources are often made and sometimes given."

Systems integration fundamentally requires continual co-ordination of all parties involved: client, sub-contractors, suppliers, consultants, etc. This disconnect between work-winning and project delivery teams, the "front end" and "back end" business units described by Foote et al, (2001), is therefore an anathema to achievement of systems integration. Inadequate resource planning, lack of resources and transient project delivery teams determined by geography rather than project requirements are all underlying issues which result in inadequate handover and therefore a severing of the flows (Koskela 2000) (of, for example design information) that are critical to systems integration. These issues in turn are reinforced by commercial and accounting practices. For example staff costs have to be recovered to live projects, driving the behaviour of keeping the amount of time spent on work-winning activities to a minimum. Further, in the case study company, the disconnect between work-winning teams, which includes head office staff, and regional project delivery teams, is a path dependency rooted in historical events.

Systems integration with other group businesses is similarly influenced by history and continually reinforced by each business operating its own processes in isolation, having their own project teams that duplicate responsibilities, and having to meet individual company profit and loss targets that drive competitiveness rather than collaboration. There are examples of commercial teams sending letters regarding variations and additional charges to their counterparts at another group business when they are working on the same project, essentially moving money around the group rather than taking an overall project perspective.

Supply chain integration is inhibited by clients influencing forms of tendering, i.e. competitive, which often lead to "solutions" becoming value engineering alternatives that are driven by bid competitiveness rather than client needs. The case study company also reverts to its "builder" mentality: another ingrained path dependency. Intention to collaborate with supply chain members through sharing of future opportunities, open book costing and design development to achieve best solution often resorts to "scoping" of quotes at the last minute in order to ensure a competitive bid, i.e. reducing a sub-contractors quote by a certain percentage without their knowledge at tender stage with the intention to let the work to another sub-contractor/state they have to meet that price to retain the contract.

Business Consultancy

The transition to solutions provision necessitates a subtle but drastic shift in the understanding of what "solution" means. Presently, in the main, the case study company receives a tender enquiry and will work to develop alternative designs and solutions to the specification and drawings developed to date by the client and their team of consultants. Submitting a non-compliant bid, i.e. a building design that is outside the tender specification, is a gamble that may or may not pay off.

However, an organisation that is a solutions provider is not just looking to offer alternative building designs and specifications. Business consultancy capabilities should enable a deep understanding of the customer's business, not just their proposed building specification and use. Business consultancy skills should be used to understand the client's business objectives and fundamentally assess how they might meet these business needs - a new building may or may not be a requirement. Solution refers to business solution, not building solution.

In the first instance, finding clients at this early stage is rare as traditionally they approach contractors at a later stage in the process and then choose forms of tender and contract that require competitive bidding. Much work is needed to enable earlier engagement with clients, along with likeminded clients who are prepared to embrace the aspects of business consultancy required to ultimately enable solutions provision.

Senior managers in the business acknowledge that the ability to resource work-winning teams is an issue as operational pressures take precedence. Despite a core of work-winning staff, additional staff supplement these teams as and when they are released from on-site roles. Work-winning teams therefore become 'jack of all trades and master of none,' with their focus being on design alternatives rather than client business solutions.

This situation is exacerbated by a lack of information and poor feedback and learning loops. Information relating to all aspects of previous projects, including post occupancy data, should be available to all in the group so they can use that intelligence and technical information to shape future solutions. In reality, there are "no real feedback loops, arrogance and availability of previous information is scant" and "post occupancy surveys currently not on the agenda." In addition, the in-house developed IS enterprise management system (used for example for managing project information, customer details and invoicing) is seen as not being user friendly, and since it cannot be accessed by other businesses in the group is a barrier to information capture, sharing and analysis.

The departmental silos, family business heritage and IS infrastructure are organisational path dependencies, uncovered in a previous study (Morrey et al. 2012), that can be seen to be influencing the transition to solutions provision. Historical decisions lead to the creation of separate businesses and regions within businesses that still do not share information. The family business heritage is evidenced in the insular approach and unwillingness to learn, hence the "arrogance" regarding collecting feedback, exacerbated by systems that people are reluctant to use.

Operational service capabilities

One of the group businesses is a facilities management (FM) and interiors refurbishment business. This business has the capabilities to maintain, update and manage the operation of a building and its systems throughout its lifecycle.

The challenges associated with this characteristic of solutions provision are concerned with the ability of the group of businesses to overcome their organisational silos. Presently, information is not shared across the businesses in the group as each has separate systems and processes, and teams are not shared across projects. Involvement of the FM business is thought about as projects delivered by the case study company are coming to completion on site, rather than at the start of the relationship with the client when there is opportunity to use the FM business' expertise to inform the solution. This ineffective "handover" from the team in the case study company to the team in the FM business is the same as that discussed previously where the work-winning team hands over to the project delivery team. The client suffers at this pinch point where information flows are interrupted due to the arrival of new people with no prior experience of the project and a lack of process/mechanisms to enable them to quickly gain the knowledge they require.

Financing

Finally, the capability to "provide customers with assistance in purchasing new systems and in managing their installed asset base" (Brady et al. 2005b: 573) is a characteristic of solutions provision. PFI, a means of procuring public infrastructure developments, are probably the most well-known means of private businesses providing funding for construction activities and the basis of the service manufacturer examples in the construction sector (Johnstone 2008; Leiringer 2009). The challenge within the case study company is finding a willingness to commit resource, and therefore find those with the skills, to proactively look for opportunities for manufacturing service. The wide range of funding opportunities, for example providing loans for construction phase, supporting the client's cash flow or making much longer term investments, on one hand provides plenty of options but on the other can seem daunting. With the business currently winning the majority of its work competitively and therefore reactively, encouraging people to spend more time up front in investment considerations is proving difficult: imminent work takes priority. The subsequent challenge having identified an opportunity is gaining approval from the Group Board and shareholders to provide funding to the client, which requires being able to evidence robust processes that are fully complied with, thereby proving there is appropriate governance and risk management protecting their investment. In an organisation that has grown through regional acquisitions and has regional silos that have led to local ways of working, satisfying the Group Board that there is appropriate governance is challenging.

Summary of findings

The problems encountered touch many aspects of the organisation: people, rewards, accounting practices, organisational design/structure, resource planning, processes and systems. At present, these are primarily designed to support production activities and, as such, associated measures and targets continue to drive the product manufacturer/systems integrator agendas rather than the new strategy for solutions provision and its inherent focus on customer needs.

In addition, the imbalance in focus - in terms of resources, capability, targets - between the front end and back end teams needs to be evened so that there is a mutually supportive arrangement. Front end teams need to have the business consultancy and financing time and skills to negotiate and develop opportunities, receiving the same recognition and incentives as the back end teams who need to

continually develop their capabilities and improve the offering that the front end teams can sell.

A strong centre (Foote et al. 2001) that sets a clear strategy and mediates between teams across the business is therefore required in order to connect these aspects of solutions provision and ensure they are working towards the same goal. Similarly, feedback loops that prompt reflection and learning will also enable teams working in different phases of the project life cycle to connect their activities with the wider goal of developing and delivering solutions.

PRACTICAL MECHANISMS TO MAKE CHANGE

Despite the problems outlined in the previous section, the business has had some success in solutions provision, although there remains much more work to be done before it could be considered that it is able to do this repeatedly. As suggested by Brady et al (2005b), the learning gained from projects where the business has specifically focused on delivering solutions has been captured and is being used to develop company-wide processes and capabilities.

During the last three years, founded on lean philosophy, the business has involved its people in the development of standard processes that are aimed at ensuring consistency across all the business and repeatable systems integration. These standard processes, which include lean construction techniques such as Last Planner (Ballard & Howell 2003), have been implemented through in-house delivered training, compliance audits and management checks. Changing the business' operating routines has been shown to help overcome some of the path dependencies (Morrey et al. 2012) and has also helped develop new capabilities as well as improve performance. These now need to be developed further, paying attention to ensuring there is a flow of common understanding (Pasquire 2012) across all parties involved in the project thereby enabling the co-creation (Vargo et al. 2008) and delivery of value.

More recently, the business has restructured its professional support services - IS, business systems, finance, marketing and human resources - so there is one team for each function that works across all group businesses. It is anticipated that aligning the strategies of these service departments to the group strategy of service manufacture will support the transition. For example, part of the IS strategy is an enterprise content management system that will provide the platform for shared processes and shared information, all of which can ultimately be extended to third parties to ensure full collaboration. Also, the Building Information Modelling agenda, being led by the UK government and some clients, and therefore arguably an accepted reason for change, is being used as a mechanism to improve information collection, encourage innovation and manage knowledge. This will support the business consultancy and systems integration characteristics of service manufacture.

CONCLUSIONS

This paper contributes to the growing construction related products-service literature by providing an insight into the practical problems faced by a contracting organisation that has a vision to become a service manufacturer, providing solutions to its clients. With the majority of literature primarily based in the manufacturing and goods sectors, and also consisting largely of theoretical models and generalisations in terms of what needs to change, for example, 'develop capabilities' and 'restructure' that make the transition seem simple (Johnstone et al. 2008), by contrast this study describes the day to day complexities associated with making these changes.

Using the characteristics outlined in Brady et al. (2005) as a framework to examine where the problems lie offers a way of exploring readiness to provide integrated solutions, in addition to showing the relevance of these characteristics to the construction sector. What remains unclear are the relative importance of each of the characteristics to making the transition to service manufacturer, and the priority of addressing these in a business that is concurrently delivering a number of projects, not all of which demand an integrated solutions approach.

Having operated for over a century, for the majority of the time as a product manufacturer, the business is struggling to overcome its path dependencies, existing routines and organisational structure that have all hitherto been aligned to meeting internal performance targets. Realigning all these aspects of the organisation to attend to the new strategy of service manufacture, the purpose of which is adding value to the customer by "providing products and services that create unique benefits for each customer," (Brady et al. 2005a:362) has been shown here to be challenging.

Repeatable systems integration, arguably yet to be proven to be the core characteristic, remains problematic even in a well-established contracting business. The opportunity for deterioration in the understanding of customer value at specific "handover" points in the project jeopardises not only the customer relationship but also the chances of the team delivering the desired outcomes. Organisational structures, accounting practices and reward mechanisms, along with outdated processes, all serve to reinforce the old strategy.

Similarly, integration across the group of businesses is also problematic in practice. Historical decisions taken to ensure each business could operate independently now inhibit collaboration. The creation of Professional Services teams that serve all of the businesses is aimed at developing human resources, information systems, finance, marketing and business systems strategies that will reach across the divides.

The problems discussed here are actively being addressed by the business which is currently juggling the implementation of a new strategy whilst also having to continue to deliver product in a traditional way. In particular, practical mechanisms are being developed that will bring operating routines in line with the new strategy, actively encouraging people to work differently and thereby develop new capabilities.

Finally, the paradox of developing bespoke solutions for each client versus creating standardised offerings that can be picked to create a client specific package has yet to be solved. In the relatively new and immature marketplace for integrated solutions in the construction sector, the company is currently pursuing a variety of opportunities in which it can engage with clients, focusing on their individual needs, rather than creating standard services and/or products that it tries to fit to customer needs. Whether economies of scale and learning from delivering solutions will drive the business down a certain route is yet to be seen, but will undoubtedly be considered in future work.

REFERENCES

- Alderman, N, Ivory, C J, Vaughan, R, Thwaites, A and McLoughlin, I P (2002) The project management implications of new service-led projects. British Academy of Management Conference, London, 9-11.
- Baines, T S, Lighfoot, H W, Benedetti, O and Kay, J M (2009) The servitisation of manufacturing. "Journal of Manufacturing Technology Management", 20(5), 547-67.

- Ballard, G and Howell, G (2003) Lean project management. "Building Research and Information", 31(2), 119-33.
- Brady, T, Davies, A and Gann, D (2005a) Creating value by delivering integrated solutions. "International Journal of Project Management", 23(5), 360-5
- Brady, T, Davies, A and Gann, D (2005b) Can integrated solutions business models work in construction? "Building Research and Information", 33(6), 571-79.
- David, P A (2001) Path dependence, its critics and the quest for "historical economics". In P. Garrouste and S. Ionanides (eds.) "Evolution and Path Dependence in Economic Ideas: Past and Present." 15-40. Cheltenham: Edward Elgar.
- Davies, A (2004) Moving base into high-value integrated solutions: a value stream approach. "Industrial and Corporate Change", 13(5), 727-56.
- Easterby-Smith, M, Thorpe, R and Jackson, P R (2008) "Management Research". 3ed. London: Sage.
- Fellows, R and Liu, A (2008) "Research Methods for Construction". 3ed. Oxford: Wiley-Blackwell.
- Foote, N W, Galbraith, J, Hope, Q and Miller, D (2001) Making solutions the answer. "The McKinsey Quarterly", 3, 84-93.
- Galbraith, J (2002) Organizing to deliver solutions. Prepared for Special Issue of Organizational Dynamics.
- Gebauer, H and Friedli, T (2005) Behavioural implications of the transition process from products to services. "Journal of Business & Industrial Marketing", 20(2), 70-8.
- Johnstone, S, Dainty, A R J and Wilkinson, A (2008) In search of "product-service": evidence from aerospace, construction, and engineering. "The Service Industries Journal", 28(6), 861-75.
- Johnstone, S, Dainty, A R J and Wilkinson, A (2009) Integrating products and services through life: an aerospace experience. "International Journal of Operations and Production Management", 29(5), 520-38.
- Koskela, L (2000) "An exploration towards a production theory and its application to construction." Espoo, VTT Building Technology. 296 p. VTT Publications; 408. [www:http://inf.vtt.fi/pdf/publications/2000/P408.pdf](http://inf.vtt.fi/pdf/publications/2000/P408.pdf).
- Leiringer, R, Green, S D and Raja, J Z (2009) Living up to the value agenda: the empirical realities of through-life value creation in construction. "Construction Management and Economics", 27(3), 271-85.
- Lind, H and Borg, L (2010) Service-led construction: is it really the future? "Construction Management and Economics", 28, 1145-53.
- Livesey, F (2006) "Defining High Value Manufacturing." University of Cambridge Institute for Manufacturing.
- Morrey, N, Pasquire, C.L, Dainty, A.R.J and Thompson, D.S (2012) Path dependency to path creation: enabling strategic lean implementation. In: Tommelein, I.D and Pasquire, C.L (Eds.) "20th Annual International Group for Lean Construction Conference", 17th-20th July 2012, San Diego State University, USA. Vol. 1, 241-50.
- Oliva, R and Kallenberg, R (2003) Managing the transition from products to services. "International Journal of Service Industry Management", 14(2), 160-72.
- Pasquire, C (2012) The 8th flow - common understanding. In: Tommelein, I.D and Pasquire, C.L (Eds.) "20th Annual International Group for Lean Construction Conference", 17th-20th July 2012, San Diego State University, USA. Vol.1, 21-9.

Vargo, S L, Maglio, P P and Akaka, M A (2008) On value and value co-creation: A service systems and service logic perspective. "European Management Journal", 26, 145-52.