**Value Co-creation through Early Warning Signs in a Project Setting**

**ABSTRACT**

Value co-creation as a joint process between actors to extract benefits is becoming established as one the most significant shifts in contemporary business thinking. Value co-creation provides an opportunity for a balanced and enriched realisation of value amongst stakeholders such as clients, contractors and end users in complex projects. The success of complex projects, due to the large number of stakeholders and high uncertainty level, is highly dependent on the joint processes among clients and suppliers as the key creators of value. In particular, the management of communication, associated learning and conflict management are the main determinants of value co-creation. Although research studies have been conducted extensively to investigate ways to enhance performance of projects, little emphasis has been put on the importance of the value co-creation process for realising project benefits and impact. There has been scant attention paid to weak signals in theory and practice to defend value creation and encourage the conditions for co-creation early in the project lifecycle. Based on the theory of "weak signals", challenging situations and discontinuities do not emerge without warning. With hindsight, the most likely factors leading to undesired events are often signalled. The identification, evaluation and utilisation of these signals potentially improve learning and communication in the value co-creation process. This research aims to conceptually define weak signals of potential challenges in value co-creation processes, address the way they are identified and evaluated, and examine their use in improving value co-creation. In particular, we look at the processes jointly owned by contractors and clients in complex projects.

*Keywords: Value co-creation, Early warning signs*

# **Introduction**

In today's rapidly changing world, the search for solutions to societal and environmental challenges has become ever more complex. The customers make more demands which can lead to perceptions of service shortfalls, supply side managers have more strategic options which can lead to greater or less potential value. According to Prahalad and Ramaswamy (2004), the role of the customer has changed from isolated to connected and from passive to active within the industrial system. The overall result of the changing role of the customers or clients is that companies can no more propose value with little or no intervention from the demand side. This was always the case for specific assets, such project provision, because sales come ahead of production and delivery through a contract. The sophistication of demands and contextual factors increase complexity and sometimes uncertainty, which intensifies the value required and thus expected among customers or clients.

One important paradigm and research stream that considers value to be always co-created by customers is Service Dominant Logic (SDL) as introduced by Vargo and Lusch (2004; 2008). SDL points out the combination of resources of providers and customers as inputs to service systems in order to achieve more effective resource applications for more effective results. It is worth mentioning that *service* here is different from services as a term for non-goods products (Gummesson, 2007) the application of resources by the provider to deliver value propositions to beneficiaries. Prahalad and Ramaswamy (2004) offer a parallel and related research stream which is more conceptually normative and prescriptive for practice. This view acknowledges the opportunities for actors when working collaboratively to gain an effective output, in particular through direct interaction. The tendency here is for the customer to exercise their influence in every part of the system, calling for value co-creation among the customers and the providers (Prahalad and Ramaswamy, 2004). This has some resonance with the early warning focus of this paper.

Furthermore, a project is a temporary organization of resources aiming to achieve a specific goal (Turner and Muller, 2003). Value co-creation has appeared as a way for project-based firms to respond to the uncertainty and complexity of projects (Razmdoost and Mills, 2016). In fact, moving away from individually managing risks and benefits to mutually creating joint-processes and sharing risks and benefits, leads to more opportunities for solving problems a project faces.

However, there is a dark side to value co-creation too. High customer involvement in service delivery results in more contact points between customers and service providers. This increases service complexity and, ultimately, the probability of service failures (Parasuraman 2006). According to Smyth et al. (2016), in practice there are incidents where deepening the relationship can lead to self-interest seeking actions and opportunistic behaviour. In this case, the value co-creation may lead to ineffective results. In the extreme this can be manifested as the co-destruction of value (Mills and Razmdoost, 2016).

Nevertheless, based on the theory of "weak signals" developed by Ansoff (1975), and later supported by Nikander (2002). He developed the concept of weak signals in terms of Early Warning (EW), which encompasses prior sensing as well as direct signalling. It addresses challenging situations and discontinuities that do not emerge without warning. With hindsight, the most likely factors leading to undesired events are often signalled. EW predominantly arises and weak signals are presented through interactions at the customer-contractor interface, from the service network and sometimes from the wider service system. Interactions are the raw material for co-creating value.

This article deals with the procedure for identification, evaluation, communication and responding to the signals which can indicate that the value co-creation process is likely to lead to more effective or ineffective results. In particular, we suggest that EW signals are read from a process of interactions. In this sense they are a type of interaction presenting opportunities to defend and co-create value propositions. We develop a conceptual framework that shows managing EW signals are achieved through improved learning and communication for and in the value co-creation process. The main aim of this research is to apply an early warning (EW) system in order to manage to value co-creation risks in project based firms.

The remainder of the paper is organized as follows: Section 2 discusses the conceptual foundations of the framework including an elaboration on the concepts of value co-creation and the EW system. The research approach is also presented in this section. Section 3 presents the conceptual framework using the concepts introduced in section 2. Section 4 illustrates an example which demonstrates the possible practical implications of the conceptual framework discussed in section 3. Finally, the theoretical and practical implications of the framework, suggestions for future research and managerial implications are presented in section 5.

# **Theoretical basis**

## **The theory of weak signals and early warning systems**

A central premise of this study is the theory of weak signals, first introduced by Ansoff (1975). Ansoff's idea was to seek an improvement to the strategic planning method, as it did not function satisfactorily when sudden changes or unanticipated discontinuities occurred in a business environment. Ansoff also uses the term "strategic surprise" to describe these discontinuities. In these cases, according to Ansoff (1975), the usual approaches for trend monitoring and planning based on them was insufficient. Ansoff indicates that strategic surprises do not appear overnight; there are always signals or symptoms of surprises to come. This theory has been strongly criticized by other researchers. As brought together in the work of Nikander (2002), Makridakis and Heau (1987) stated that this theory has remained an academic idea and Webb (1987) indicated that it is crucial to investigate whether these signals actually exist. However, other researchers have confirmed the existence of these signals (Betts, 1982; Mintzberg, 1994) and how they can be applied further (e.g. Zheng et al., 2012; WHO, 2014; Koivisto et al., 2016).

This study is based on the evidence that weak signals /early warning signs do exist. With hindsight it is often possible to point out the most likely factors leading to a future development, either of positive or negative nature. It is worth mentioning that the early warning phenomenon is closely linked to the risk management concept via the concept of "risk symptoms" (Nikander, 2002). According to Niwa (1989), the information provided by an Early Warning (EW) about the time available before the risky event becomes real, is different to the probability of materialization of a risk. These two concepts are not substitutes yet are not opposing factors. They supplement the total knowledge and can be complementary. Based on these definitions an EW sign is defined as follows (Hajikazemi, 2015, p.12):

“*a specific element, happening or event which shows that the risk event will actually realize. The EW sign does not provide information on the exact time of the materialization of [positive and negative]* *risk; neither does it reveal its expected magnitude. Rather it acts as an alarm which triggers action in order to either prevent the realization of the potential problem or possibly lessen the undesired consequences.”*

Figure 1 presents the interconnectedness of the concepts; risk factor, potential risk, EW and response.

Figure 1. Interconnectedness of concepts (Hajikazemi, 2015)

In case of strategic surprises and where discontinuities of service provision arises, an Early Warning System (EWS) allows organizations to react strategically ahead of time by detecting EW signs. The EW information, at this point guides and empowers people to take actions when a critical event is close to happening. In line with risk theory, which conceives of risks to include opportunities (e.g. Chapman and Ward, 2003) EW signals the option to mobilize resources for joint problem-solving and seeking other joint activities to co-create value. Effective EWS embrace all aspects of emergency management, such as: risk assessment analysis, which is one of early warning system’s design requirements; monitoring and predicting the intensity of the development about to happen; communicating alerts to authorities and to potentially affect; and responding to the situation (Grasso and Singh, 2011).

Hajikazemi (2015) has also developed a model which illustrates a detailed EW procedure. The initial idea for development of the model stems from Nikander‘s (2002) decision support model. The main stages within the procedure are presented in Figure 2.

Figure 2. The EW procedure (adapted from Hajikazemi (2015))

In this article, the main negative risks under study are the self-interest seeking actions and opportunistic behavior from any side of the value co-creation process which leads to ineffective results, hence the need to defend potential value realization. On the positive side, types of interactions provide the raw materials for co-creating value.

It is proposed that the EWS represent activities that can be used as part of the strategic planning method that the project managers can use to make flexible long-term plans. This can be done through scenario planning, which is applicable in the SDL context which focuses upon outcomes as opposed to defining value in terms of inputs (cf. Vargo and Lusch, 2016). According to Ringland and Owen (2007) "Scenarios do not predict the future, but they do illuminate the drivers of change: understanding them can only help managers to take greater control of their situation."

A series of touchpoints between EW and SDL have been identified above. Therefore, a brief exposition of the key SDL concept of co-creating value is set out next.

## **Value co-creation in projects**

The concept of value co-creation is not only critical to the allocation and enhancement of value among multi-stakeholders in project environment, but also of practical importance to the creation of mutual value between both clients and contractors in projects, as a key to enhance project success (Liu et al., 2014). The concept of value co-creation is still in its infancy (Ostrom et al., 2015) but could be regarded as a next practice in project business (Smyth 2015). In the emerging and refined conceptualization of SDL (Vargo & Lusch, 2008; 2016), the focus is on the interactions among suppliers, customers and network partners as they co-create value through their collaborations. In the process of ‘value co-creation’, parties integrate resources and combine their capabilities to generate that which is of value for them (Lusch and Vargo, 2014).

According to Fuentes and Smyth (2016), value co-creation has implications in both execution and the operations phase, where value could be considered as a unique benefit and is enabled, in different contexts, during usage (cf. Vargo and Lusch 2016). In that vein, value co-creation could be defined as a joint and unique process to improve both the condition of actors (Grönroos 2011) and the project outcome as an ultimate goal. Although SDL provides an alternative angle to analyse the benefits' delivery and effectiveness for the long-term, some of its principles might not work in a project context (Hartmann et al., 2014). This is due to the fact that much of the SDL research is around high volume products/services, contrary to projects where uniqueness is a major characteristic (Smyth et al., 2016).

Fuentes and Smyth (2016) argue that a project organisation should pass a collaboration level and integration level before it reaches a value-driven approach. The implication is that the time dimension in projects and the temporal nature of the project team have a significant role as to the way that interactions take place and value propositions are shaped and delivered. This has received little attention in the SDL literature. This calls for the management at the front-end to support interaction and dialogue between the actors both for and as part of co-creation. They also state that value-in-use has two phases for projects (see Figure 3): (1) value-in-use which emerges during the execution and delivery, and (2) value-in-use which emerges beyond completion.

Figure 3. The value co-creation process in a project setting (adapted from Fuentes and Smyth, 2016)

Another model which clearly describes the different phases within a value co-creation process is the model developed by Razmdoost and Smyth (2015) (See figure 4). This model suggests that the value co-creation process is divided in two phases; value imagination and value actualization. During the value imagination phase, customers (clients) communicate their potential value and influence the provider (contractor) to shape the same value. Providers (contractors) also communicate their value proposition and aim to affect the customer (client) to align potential value with the value proposition. Value communication can be direct, through identifying the resources and processes a client expects to be integrated, or it can be indirect, through identifying criteria, such as cost and time, which carry information about potential value. Resource exchanges are used as a mechanism by clients to influence contractors to align their value proposition to the clients’ potential value. In fact in a resource exchange, the contractor promises to integrate resources, processes and outcomes that are expected by the client. If the value is well communicated and aligned, project stakeholders (i.e., actors inside and outside of the businesses) base their value actualization processes on the integration of the same resources, processes and outcomes that are expected.

Figure 4. Value co-creation in project exchange (Razmdoost and Smyth, 2015)

All in all, SDL, although laden with contradictions and struggles, is a radical framework which challenges neoclassical economics and offers fresh thinking that could improve project delivery and effectiveness for the value-in-use and context. However, caution should be taken with value co- creation as it might lead to undesirable outcomes (Fuentes and Smyth, 2016) and co-destruction (Mills and Razmdoost, 2016). This can be due to incidents where deepening the relationship can lead to self-interest seeking actions and opportunistic behaviour. Möller (2012) also indicates that there is uneven power distribution. This is necessary to account for customer perceptions of value. Yet, it can lead to an imbalance of decision power between customer and firm where opportunistic behaviour may undermine the effectiveness of outcomes. These are in fact identified as the main risks of value co-creation.

According to Möller (2012), suppliers and their chains own a higher amount of expertise in offering particular value propositions in comparison to customer. However, co-creation stresses the integration of resources of both the firm and the customer in the value creation. Therefore, the customer of a service-centred firm will integrate its resources in the process despite of lower expertise regarding the demanded benefit. In addition, the customer holds more decision power than the firm in the co-creation process. This imbalance becomes apparent in two stages of the customer and firm engagement. Before a co-creation process takes place a customer can usually choose from a selection of firms’ value propositions. In construction projects, interactions may lead to degrees of co-creating the propositions. In the stage of the co-creation process the final decision competence regarding the co-created result should again be with the customer. Thus, the result of the firm’s input in the co-creation-process is always dependent on the decision of the customer. If a customer votes against a firm’s propositions in the co-creation process the effectiveness of the co-created result will be reduced.

In the following section, a conceptual framework which illustrates the advantage of applying an EW system in order for the customer-provider interface to drive an effective value co-creation process taking account of the broader influences from the project network.

# **Applicability of EWS for efficient value co-creation in projects**

We have briefly conceptualized EW and SDL’s co-created value in the project context. The next step is to clearly delineate the way these two elements can be brought together in a framework. We have argued that EW as being mobilized through a system, ESW. It requires resources and interactions to achieve effective outcomes. This is precisely where SDL interfaces. Interactions, organized systematically, are the means whereby value propositions are identified and delivered.

The model shows that in case the risk factors are detected and monitored, effectively communicated and responded to, the co-creation process will result in "value co-enhancing" or "value co-defending". Under conditions where the risk factors remain unseen, the co-creation process will result to "value co-destruction".

Figure 5. A conceptual model for EW and SDL’s co-created value in the project context

Enhancement of value can be done differently in different contexts. For example, Haddadi et al. (2016) indicate that applying methods for identifying and understanding the owner’s and user’s strategic objectives and using this knowledge to optimize the design of buildings, in the front end phase, will enhance the value creation of construction projects. Aapaoja (2014) states that early stakeholder involvement and integration can significantly contribute to enhancement of value creation in construction projects.

In situations where the enhancement of co-created value seems too optimistic, defending the existing co-created value and neutralizing the undesired consequences of possible risk factors will help sustaining the created value.

Although a fundamental tenet of SDL is the co‐creation of value‐in‐use, there are possibilities that the interactions between service systems cannot only co‐create value, but also have adverse consequences leading to actual value co‐destruction (Ple and Caceres, 2010).

According to Ple and Caceres (2010), value can be co‐destroyed through the interactions between different systems, resulting in value destruction‐through‐misuse. Value co‐destruction occurs when a service system accidentally or intentionally misuses resources (its own resources and/or those of another service system) by acting in an inappropriate or unexpected manner.

In the following section, an illustration of the three mentioned value proposition types and its connection to the EW concept is presented.

# **Illustrations**

*Wembley Stadium; a case of value co-destruction*

Wembley stadium is the home of English football and was rebuilt in the 2000s replacing the original structure from 1923. Australian builder, Multiplex won the Guaranteed Maximum Price (GMP) contract to design and construct the new, 90,000 seat stadium. The project took 5 years longer than first estimated and costs were more than double initial estimates. The Wembley project lurched from crisis to crisis. The huge increase in costs was mainly explained by the fact that the existing Wembley had still not been demolished, and was costing the Football Association a small fortune in maintenance fees (Chaudhary, 2001). According to Quinn (2008), Multiplex, which itself has been criticised for the project's problems, suggests that the real blame lies with one of the UK's biggest consultants, Mott MacDonald.

In order to illustrate the case of value co-destruction, we consider the two main value proposition parties are Multiplex (client) and Mott MacDonald (contractor).

Multiplex, took a separate action against its former steelwork contractor at Wembley and outlined the case it intended to take against Mott MacDonald. It contended that Mott MacDonald's design for the Wembley steelwork "was not fit for purpose" and that initial designs were "not correct, constructible, co-ordinated and/or consistent". They stated that the 'services provided by Mott MacDonald throughout the project were unsatisfactory' and that 'Mott MacDonald's deficient design, failure to warn and/or take action is shown in many thousands of individual acts or omissions'. Multiplex claimed that it had sustained significant losses as a result of a 'multitude of breaches of contract and/or acts of negligence' by the consultant, which had 'far-reaching effects' for Wembley (Quinn, 2008).

In this case, ignoring the EW signs regarding issues related to design, resulted to value co-destruction by the two value proposing parties.

*Terminal 5, London Heathrow: a case of value co-defending*

The T5 project started in 2002, when British Airport Authorities (BAA) owned and operated seven large airports in the United Kingdom. The new terminal was built to be the home of all of BA's domestic and international passengers at Heathrow Airport with an annual capacity of 30 million passengers. The T5 complex is on a 260-ha site between the northern and southern runways at the western end of Heathrow. It is comprised of a large four-story terminal building (Concourse A), a satellite building (Concourse B) connected to the main building by an underground people mover transit system, and 62 aircraft stands. A second satellite building was completed in 2011. Additional airfield infrastructure, including a 4,000 space multi-story car park, a large hotel, and an 87-meter (95 yards) high air traffic control tower has been constructed on the site. T5 is connected by road links to the neighbouring M25 motorway. An underground railway station with branches of both the Heathrow Express and the London Underground's Piccadilly Line provides transportation to and from London (Davis et al., 2016). T5 was a significant risk for BAA. As BAA's former CEO put it: “in facing up to this project we knew that any major overrun in cost or time could very easily bankrupt the company. So it was a very high risk project” (BAA interview, 2009 in Davies et al., 2016).

During the project, an agreement was written (T5 Agreement) which included the systematic, relatively predictable procedures and structured principles that BAA intended to use on T5 and subsequent major airport infrastructure projects. Davies et al. (2016) performed a case study which described the processes involved in the creation and application of the T5 Agreement. The first phase, which is relevant to our study included the learning phase when BAA recognized the need to change its current practices and engaged in a search to discover and assess alternative ways required to cope with uncertainty associated with the T5 project.

An example of "value co-defending", is where a team led by the main contractor Laing O'Rourke (LOR), Mott MacDonald (an engineering consultancy) had fallen behind schedule in delivering design drawings. When LOR turned to the client for advice, BAA instructed the team to find a resolution “within the spirit of the T5 Agreement” (LOR interview, 2005 in Davies et al., 2016). After some initial resistance, LOR and Mott MacDonald learned how to work collaboratively and succeeded in finding an improvised solution using 3D modelling to produce digital prototype designs. In this case, the EW signs regarding the delay in delivery of design drawings were identified timely enough to redirect the path towards mitigating possible undesired consequences.

*Terminal 2 London Heathrow: a case of value co-enhancing*

London Heathrow Terminal 2 was a major airport infrastructure project which was delivered successfully. The Terminal began operating on 4 June 2014. Passenger experience and environmental sustainability are claimed as the key distinguishing features of the airport. More specifically, some of the distinctive features include the common multi-airline check-in area, self-boarding gates, as well as a number of innovative solutions in architectural, structural, and process design (Zerjave et al., 2015).

T2 was designed to across a footprint of 40,000 square meters, to accommodate around 22 million passengers annually, or around 43,000 passengers over 324 flights per day. T2 comprises two major buildings: T2A and T2B. T2A was designed by Luis Vidal and Architects and built by a joint venture of Ferrovial and Laing O'Rourke.T2B was designed by Grimshaw Architects and constructed by Balfour Beatty. Early design commenced in 2006 with the first on site construction in 2010 having started after the old T2 building was demolished in 2009 (Zerjave et al., 2015).

In this case, the client organization had previous experience with operational delivery of Terminal 5, a major project with the same size, which had significant issues when it opened (Brady and Davies 2010). The result of this previous experience was a strong motivation for designing a dedicated organisation to assure a smooth transition towards a seamless operational delivery of the new Terminal 2. For example, taking on board the lessons learned from previous operational delivery the client organisation put an operational team in place two years before the opening date with a strategic focus on passenger experience once the terminal goes live.

In this case, the EW signs of possible risks which were experienced during the T5 opening were identified, communicated and proactively managed in order to mitigate undesired consequences and improve the outcomes. Examples are: 1) breaking propositions into more meaningful chunks, to build up the knowledge, in the case of T2, in contrast to T5, where there was one big proposition in with rehearsal beforehand and 2) soft opening of “soft” opening with sufficient buffers in the airport capacity to accommodate any unforeseen events, in contrast to a rather "big bang" strategy in case of T5.

In this case, monitoring, communicating and responding to EW sign of potential risks, resulted to value co-enhancing by the value proposition parties.

In the following section, we will discuss the implications of the conceptual framework for the mentioned cases and address the research questions designed earlier in the paper.

# **Discussion and conclusions**

The purpose of this paper is to scrutinize the effectiveness of application of EW systems as a means for value co-creation. We developed a conceptual framework which indicates that in case the EW signs of potential developments in the future, are monitored, communicated and responded, timely enough, can lead to productive value co-creation processes. The three illustrative cases included in the paper consist of positive, negative and defending aspects of value co-creation; Wembley Stadium illustrates negative value co-creation; value co-destruction, Terminal 2, London Heathrow reveals positive co-creation; value co-enhancing and Terminal 5, London Heathrow illustrates the co-defending aspect of value co-creation; value co-defending. Table 1 shows the different aspects of the conceptual framework for each of the illustrated cases.

Table 1. Different aspects of the conceptual framework for each case

The authors believe in cases where the value proposition has resulted in value co-enhancing and value co-defending, the management at the front-end has been proactively done in order to support interaction and dialogue between the actors both for and as part of co-creation. This has resulted to efficient value-in-use both during the execution and delivery, and beyond completion (See Figure 3). However, as mentioned earlier, there is a dark side to value co-creation as well, where there can also be incidents where deepening the relationship between client and contractor can lead to self-interest seeking actions and opportunistic behaviour. This is according to Möller (2012) due to uneven power distribution which can lead to an imbalance of decision power between customer and firm where opportunistic behaviour may undermine the effectiveness of outcomes. These are in fact identified as the main risks of value co-creation. In case of the Wembley Stadium, the power imbalance between the two parties mentioned in the previous section, resulted in the destruction of the value proposition.

As mentioned earlier, SDL points out the combination of resources of providers and customers as inputs to service systems in order to achieve more effective resource applications for more effective results. This view acknowledges the opportunities for actors when working collaboratively to gain an effective output. This article suggests that application of an effective EW system as one of the operational aspects of the value co-creation process, can lead to more effective results.

Further studies that investigate more thoroughly different approaches for identifying EW signs within various value co-creation processes alongside real case studies which illustrate the application of EW procedures within value co-creation contexts are likely to be of great interest in the near future.

# **References**

Aapaoja, Aki. 2014. Enhancing value creation of construction projects through early stakeholder involvement and Integration, Doctoral dissertation, University of Oulu, Finland

Ansoff, Igor. 1975. "Managing strategic surprise by response to weak signals." California Management Review, XVII(2): 21–23.

Betts, Martin.1999. Strategic management of IT in construction, Blackwell Science, UK.

Chaudhary, Vivek. 2001. "Crisis-ridden project that turned proud stadium into national joke". available online at: <https://www.theguardian.com/uk/2001/dec/20/wembleystadium.football>, retrieved on 01.01.2017.

Davies, A., Mark Dodgson and David Gann. 2016. "Dynamic Capabilities in Complex Projects: The Case of London Heathrow Terminal 5". Project Management Journal, Special Issue: Project and Innovation Management: Bridging Contemporary Trends in Theory and Practice, 47(2): 26–46.

Egan, John. 1998. "Rethinking construction". The report of the Construction Task Force to the Deputy Prime minister, John Prescott, on the scope for improving the quality and efficiency of UK construction.

Fuentes, Marcos and Hedley Smyth. 2016. "Value Co-Creation in a Project Setting: A Service-Dominant Logic

Perspective". In: P W Chan and C J Neilson (Eds.) Proceedings of the 32nd Annual ARCOM Conference, 5-7 September 2016, Manchester, UK, Association of Researchers in Construction Management, 2:1107-1116.

Grasso, Veronica and , Ashbindu Singh. 2011. "Early warning systems: State-of-art analysis and future directions".United Nations Environment Programme, 2011.

Grönroos, Christian. 2011. "Value co-creation in service logic: A critical analysis". Marketing theory, 11(3): 279-301.

Gummesson, Evert. 2007. "Exit Services Marketing - Enter Service Marketing". Journal of Customer Behaviour, 6(2): 113-141.

Haddadi, Amin, Agnar Johansen and Bjørn Andersen. 2016."A Conceptual Framework to Enhance Value Creation in Construction Projects". Procedia Computer Science 100 (2016): 565 – 573.

Hajikazemi, Sara. 2015. Early Warning Procedure in Projects; Foundations, Approaches and Challenges, Doctoral dissertation, Norwegian University of Science and Technology, Trondheim, Norway.

Hartmann, Andreas, Jens Roehrich, Lars Frederiksen and Andrew Davies. 2014. "Procuring complex performance, the transition process in public infrastructure". International Journal of Operations and Production Management, 34(2): 174-194.

Koivisto, Raija, Kulmala Ilpo and , Gotcheva Nadezhda. 2016. "Weak signals and damage scenarios Systematics to identify weak signals and their sources related to mass transport attacks". In: Technological Forecasting and Social Change. 104: 180-190.

Liu, A.M.M., Fellows, R. and Chan, I.Y.S. 2014. "Fostering value co-creation in construction: a case study of an airport in India". International Journal of Architecture, Engineering and Construction, 3(2): 120–30.

Lusch, Robert F. and Stephen Vargo. 2014. Service-Dominant Logic, Premises, Perspectives,

Possibilities. Cambridge: Cambridge University Press.

Makridakis S and Heáu D. 1987.The evolution of strategic planning and management, in King, W. , Cleland, D. (editors), Strategic planning and management handbook, Van Nostrand Reinhold, New York.

Mills, G. and Kamran Razmdoost. 2016. "[Managing value co-creation/destruction: a longitudinal education capital programme/project case study](https://scholar.google.com/citations?view_op=view_citation&hl=no&user=CnhXF1MAAAAJ&citation_for_view=CnhXF1MAAAAJ:Y0pCki6q_DkC)".Construction Management and Economics, 1-16

Mintzberg, Henry.1994. "The fall and rise of strategic planning". Harvard Business Review, January–February 1994: 107–114.

Nikander, Ilmari O. 2002. Early warnings: A phenomenon in project management, Doctoral dissertation. Helsinki University of Technology, Espoo, Finland.

Niwa, Kiyoshi. 1989. Knowledge-based risk management in engineering, Wiley, New York.

Ostrom, Amy.L., A. Parasuraman, David E. Bowen, Lia Patricio and Christopher A. Voss. 2015. "Service research priorities in a rapidly changing context". Journal of Service Research, 18(2): 127–59.

Parasuraman, A. 2006. "Modeling opportunities in service recovery and customer-managed interactions". Marketing Science, 25(6): 590–593.

[Plé](http://www.emeraldinsight.com/author/Pl%C3%A9%2C+Lo%C3%AFc), Loic and [Rubén Chumpitaz Cáceres](http://www.emeraldinsight.com/author/Chumpitaz+C%C3%A1ceres%2C+Rub%C3%A9n). 2010. "Not always co‐creation: introducing interactional co‐destruction of value in service‐dominant logic". Journal of Services Marketing. 24(6):430 – 437.

[Prahalad](http://www.emeraldinsight.com/author/Prahalad%2C+CK), C.K. and  [Venkat Ramaswamy](http://www.emeraldinsight.com/author/Ramaswamy%2C+Venkat). 2004. "Co‐creating unique value with customers". Strategy & Leadership, 32(3): 4 – 9.

Quinn, Ben. 2008. "£253m legal battle over Wembley delays". available online at : <https://www.theguardian.com/business/2008/mar/16/construction.wembleystadium>, retrieved on 01.01.2017

Razmdoost, Kamran and Hedley Smyth. 2015. "Rediscovering the essentiality of marketing", Developments in Marketing Science: Proceedings of the Academy of Marketing Science, 53-54.

Razmdoost K. and Grant Mills. 2016. "[Towards a service-led relationship in project-based firms](https://scholar.google.com/citations?view_op=view_citation&hl=no&user=CnhXF1MAAAAJ&citation_for_view=CnhXF1MAAAAJ:W7OEmFMy1HYC)".

Construction Management and Economics 34 (4-5): 317-334.

Ringland, Gill and Michael Owen. 2007. "Scenario as a Tool in Management Development". Organisations & People, 4(1): 11-18.

Smyth, Hedley, Richard Fellows, Anita Liu and Wilco Tijhuis. 2016. Editorial for the Special Issue on Business Development and Marketing in Construction, Construction Management and Economics, 34(4-5): 205-217.

Turner, J. Rodney and Ralf and Muller. 2003. "On the nature of the project as a temporary Organization". International Journal of Project Management, 21: 1–8.

Vargo, Stephen L., and Robert F. Lusch. 2004. "Evolving to a new dominant logic for marketing". Journal of Marketing, 68(1): 1-17.

Vargo, Stephen L. and Robert F. Lusch. 2008. "Service-dominant logic: continuing the evolution". Journal of the Academy of Marketing Science, 36: 1–10.

Vargo, Stephen L. and Robert F. Lusch. 2016. " Institutions and axioms, an extension and update of

Service-dominant logic". Journal of the Academy of Marketing Science, 44(1): 5-23.

Ward, Stephen and Chris Chapman. 2003. "Transforming project risk management into project uncertainty management", International Journal of Project Management, 21 (2003): 97–105.

World Health Organization, 2014. "Child maltreatment". Available online: http://www.who.int/mediacentre/factsheets/fs150/en/, Retrieved 20 January 2014.

Zerjave, Verdran, Andrew Edkins, Andrew Davies and Philip Jones. 2015."Painting the picture of performance and success in the operational delivery of Heathrow Airport Terminal 2". Proceedings of the Engineering Project Organization Conference, The University of Edinburgh, Scotland, UK. June 24-26, 2015.

Zheng, Guozhong, Neng Zhu, Zhe Tian, Ying Chen and Binhui Sun. 2012. "Application of a trapezoidal fuzzy AHP method for work safety evaluation and early warning rating of hot and humid environments". Safety Science, 50: 228–239.

Figure 1. Interconnectedness of concepts (Hajikazemi, 2015)

Information

Information

Information

Moment of Observation of early warning

Moment of Observation of early warning

Moment of Observation of early warning

Time

**Potential Risk**

Risk factor 2

Risk factor 1

Risk factor 3

Risk factor 4

Processing

Processing

Processing

Response/Action

Response / Action

Time

Deciding on the information which is allowed to influence the decision making process

Evaluation of transferred information

Transfer of information to the decision maker

Making the final decision on the required actions

Evaluation of information based on the observations by the observer

Response

Observations

**Potential**

**problem**

**Project events**

Information

Figure 2. The EW procedure (adapted from Hajikazemi (2015))

Phase 0:

Co-creation of value propositions

Phase 1:

Delivery of propositions and service experience

This phase might not end at the start of phase 1 but fades away over time

Extended periods of transaction derived from the service experience

Phase 2:

Value in use emerges

Front end of project

t

Execution of project

Use of project

Figure 3. The value co-creation process in a project setting (adapted from Fuentes and Smyth, 2016)

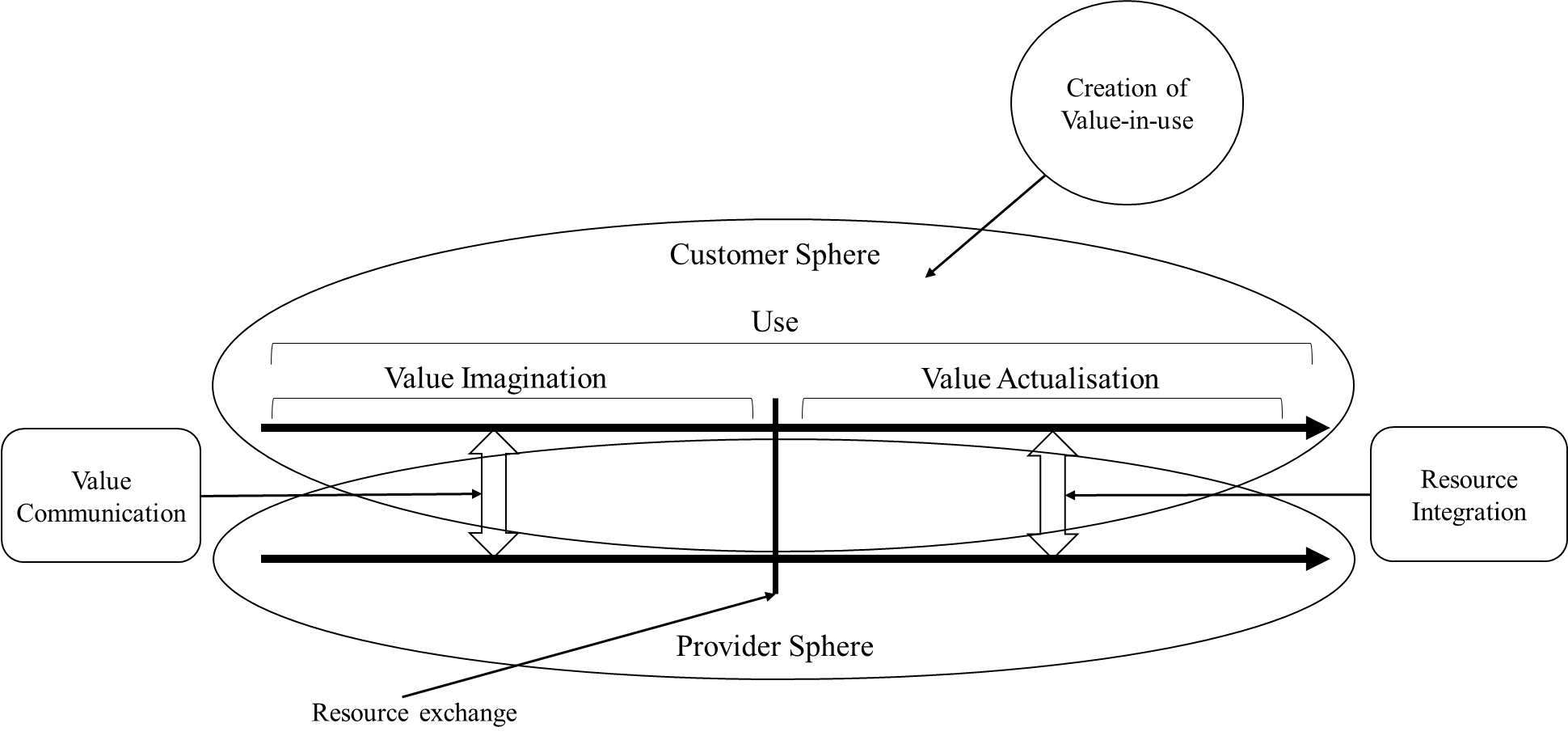


Figure 4. Value co-creation in project exchange (Razmdoost and Smyth, 2015)

Risk factor

Risk factor

Time

Value imagination

Value actualization

Value co-enhancing /

Value co-defending

*EW signs identified, communicated and responded to*

Value co-destruction

*EW signs ignored*

Figure 5. A conceptual model for EW and SDL’s co-created value in the project context

Table 1. Different aspects of the conceptual framework for each case

|  |  |  |  |
| --- | --- | --- | --- |
| Project | EW signs | Reaction to EW signs | Value co-creation aspect |
| Wembley Stadium | EW signs regarding deficient design by the steel contractor | Ignored | Co-destruction |
| T5 London Heathrow | EW signs regarding the delay in delivery of design drawings | Identified and responded actively in order to compensate for the occurred incidents | Co-defending |
| T2 London Heathrow | EW signs regarding possible risks similar to the case of T5 | Identified and responded proactively in order to mitigate possible undesired consequences | Co-enhancing |