5 challenges when servitizing your business

Adding engineering services to existing products has become imperative for many manufacturers to maintaining their competitive advantage. The resulting offerings, and integrated solution of a product and a service element, may reach from full-scope maintenance contracts, over pay-per-performance agreements, to performance guarantees. While this strategy promises high gains, its implementation is often challenging. Developing a new engineering service as an integrated solution with existing or new products is particularly pathed with various challenges that can cause the resulting offering to fail, or never to reach the market.

In our research, we have conducted a benchmark study with multiple international manufacturers to understand: What are the challenges when developing integrated solutions? We have identified five challenges of which to be aware when developing integrated solutions.
Analysis of Uncertainty in the Development of Integrated Solutions

Executive Summary

The aim of this report is to provide insights into the uncertainty faced by manufacturers when developing integrated solutions. Integrated solutions are compound offerings comprising of a physical artefact (the product) and supporting engineering services. An example of integrated solutions is the Rolls Royce concept “Power by the Hour”, charging the customer per hour of engine usage, not for the acquisition and maintenance of the engine itself. To provide these insights, this report describes the results of a benchmark study undertaken in the Nordic manufacturing industry. Six development cases of integrated solutions are compared and contrasted regarding the uncertainty encountered within five uncertainty types: Technical, environmental, resource, relational and organizational uncertainty. Moreover the six benchmark cases are analyzed regarding the criticality and latency of the uncertainty, as well as the uncertainty management practices applied. The benchmark study showed strong similarities as all uncertainty types were equally present:

• Technical uncertainty was encountered in modelling and forecasting of the machine performance, as well as the commercial scoping of the integrated solution.
• Environmental uncertainty was mostly characterized through uncertainty around country specific legal settings, challenges around the readiness of the customer for the offering, and the identification of the monetary value for the customer.
• Resource uncertainty centered strongly around human resources. Specifically the teams experienced uncertainty about the lack of project staffing, the availability of specialized skills (e.g. contracting, statistics), and the availability of staff to execute the integrated solution in the operational phase.
• Relational uncertainty emerged in the context of contracting through the identification of suitable terms and conditions for the integrated solution as well as the extent of risk included in the contract. Moreover, some companies engaged in co-creation processes and experienced relational uncertainty with the collaboration partners around hidden agendas, as well as quality and timing of the agree delivery.
• Organizational uncertainty emerged in the adaptation of the development process to the characteristics of the integrated solutions, the shift in culture towards appreciating the value of service, risk averseness of the organizations, the organizational change, and the impact of the integrated solution on the company’s business model. Successful management strategies for the uncertainty emerging during the development of integrated solutions comprised mainly of the application of agile management practices, a high focus on stakeholder management, the application of a pre-pilot before the actual development project, and a high percentage of employee staffing on the project (80% of their time or more). Moreover, the development of internal capabilities in the field of statistics, modelling and forecasting of machine performance and contracting have proven highly beneficial. Lastly, fast feedback iterations with the customer or even co-creation had strong impact on the project success through the assurance of the customer’s value. Concluding, all companies experienced all five uncertainty types. Depending on the type of offering developed they were present to a varying degree. Yet, the organizational uncertainty type was most present in each case.

General information

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Applicability of Agile and Scrum to Product-Service Systems

Developing Product-Service Systems (PSS) is uniquely challenging in terms of both the offering and the development process due to the combination of product and service components. This paper investigates the applicability of agile and scrum method, having originate in the software industry, to the development of PSS to address these challenges in practice. Based on a combination of agile and servitization literature, this paper offers a conceptual framework detailing the applicability of four agile elements (application, management, technical, personnel), and nine scrum elements in three groups (events, artefacts, roles). This research contributes to the servitization literature by extending the knowledge on PSS development and deriving suitable management practices.

General information

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Organisations: Innovation, Engineering Systems, Department of Technology, Management and Economics, University of Massachusetts
Contributors: Ramirez Hernandez, T., Kreye, M., Eppinger, S.
Customer-pulled and provider-pushed pathways for product-service system: The contingent effect of the business ecosystems

Purpose: The overarching aim of this paper is to investigate distinctive pathways for product-service system development. Moreover, it investigates the contingent effect of the business ecosystem in terms of being provider-pushed or customer-pulled.

Design/methodology/approach: The study adopted a case-based research, performed in the Brazilian and Danish healthcare industries in order to explore the subject.

Findings: The results reveal that the capital available for investments influence the pathway. The customer-pulled product-service system fast evolved to become result-oriented and connected to a complex resource-dependent network in the business ecosystem. The provider-pushed product-service system showed a slow evolutionary pathway, limited to product-oriented offerings with low dependence among actors in the business ecosystem.

Originality/value: The research offers various managerial implications for PSS providers, policymakers and customers of the healthcare industry.

General information

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Contributors: Veridiana, P., Kreye, M., Monteiro de Carvalho, M.
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Research output: Contribution to journal › Journal article – Annual report year: 2019 › Research › peer-review

Does a more complex service offering increase uncertainty in operations?

Purpose
The purpose of this paper is to investigate how the complexity of the service offering (service complexity) affects the uncertainty during service operations in engineering services. Specifically, the authors compare the existence of organisational, relational, environmental and technological uncertainty in maintenance services and performance-based services.

Design/methodology/approach
The authors present insights from four cases – two each for maintenance services and performance-based services. The in-depth data were based on 56 semi-structured interviews, multiple site visits, meeting notes, service contracts and other secondary data.

Findings
The case findings indicate that organisational and relational uncertainty were not linked to service complexity, while observations of environmental and technological uncertainty were higher and more varied for performance-based services. Based on these findings, the authors formulate four propositions regarding the relationship between service complexity and uncertainty in service operations.

Originality/value
This research contributes to the OM literature by suggesting that external sources of uncertainty increase with increasing service complexity, while internal sources of uncertainty remain unchanged.
The organizational dimension of servitizing your business

Market pressures urge manufacturers increasingly to add services to their existing product portfolio. While the addition of spare part provision and standard maintenance is by now a well mastered art, the market demands offerings, which go beyond this: integrated solutions. Instead of offering product and service as separate items, integrated solutions represent compound offerings of both. Examples include pay-per-output contracts or performance guarantees, in which the product remains in the ownership and responsibility of the provider.

Can you put too much on your plate? Uncertainty exposure in servitized triads

Purpose: Servitization increases the uncertainty exposure of provider firms due to the operational differences between services and production which is further increased when operations are set in triads. This paper analyses the uncertainty exposure in servitized triads and explores suitable organisational responses.

Design/methodology/approach: A conceptual frame is defined detailing three uncertainty types (environmental, organisational and relational uncertainty) and suitable organisational responses to these. This frame guided the analysis of indepth case evidence from a cross-national servitized triad in a European-North African set-up which was collected through 29 semi-structured interviews and secondary data.

Findings: The empirical study identified the existence of the three uncertainty types and directional knock-on effects between them. Specifically, environmental uncertainty created organisational uncertainty which in turn created relational uncertainty. The uncertainty types were reduced through targeted organisational responses where formal relational governance reduced environmental uncertainty, service capabilities reduced organisational uncertainty, and informal relational governance reduced relational uncertainty. The knock-on effects were reduced through organisational and relational responses.

Originality: This paper makes two contributions. First, a structured analysis of the uncertainty exposure in servitized triads
is presented which shows the existence of three individual uncertainty types and the knock-on effects between
them. Second, organisational responses to reduce the three uncertainty types individually and the knock-on effects
between them are presented.

Exploring Uncertainty Perception as a Driver of Design Activity
This paper investigates uncertainty perception as a general driver of individual design activity. An observation based
protocol study is used to explore the interaction between uncertainty perception and three core actions connected in
design activity: information action, knowledge sharing action, and representation action. We bring together prior works on
uncertainty perception in the design and management literatures to derive three contributions. First, we describe how
uncertainty perception is associated with activity progression, linking all three core actions. Second, we identify
characteristic patterns of interaction between uncertainty perception and activity. Third, we decompose uncertainty
perception to further explain its role in driving design activity. This extends prior research on design activity, and supports
a number of theoretical and empirical implications.
Interactions between perceived uncertainty types in service dyads

This paper investigates the dynamic interactions between uncertainty types in service dyads between servitized manufacturers and their customers. This is an important research area because servitized manufacturers face multi-source uncertainty and need to manage this uncertainty effectively to avoid business failure. A conceptual framework of four uncertainty types is investigated: environmental, technological, organisational, and relational uncertainty. We present insights from four empirical cases of service dyads collected via multiple sources of evidence including 54 semi-structured interviews, observations, and secondary data. The cases show seven interaction paths with direct knock-on effects between two uncertainty types and indirect knock-on effects between three or four uncertainty types. The findings suggest a causal chain from environmental, technological, organisational, to relational uncertainty. This research contributes to the servitization literature by (i) confirming the existence of uncertainty types, (ii) providing an in-depth characterisation of technological uncertainty, and (iii) showing the interaction paths between four uncertainty types in the form of a causal chain.

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Research output: Contribution to journal › Journal article – Annual report year: 2018 › Research › peer-review

Latency and Criticality of Uncertainties in the Development of Product-Service Systems

Servitization requires manufacturers to develop new business models - compound offerings between products and services often referred to as Product-Service Systems (PSS). The development of PSS goes beyond the traditional product-development practices, requiring new processes and capabilities due to the high levels of uncertainty caused by the novelty and complexity of developing the product and the service in parallel. Uncertainty is further increased through mostly long life cycles of PSS and organisational complexity caused by a high degree of stakeholder involvement (Wolfenstetter et al., 2015). The lack of managing these uncertainties often leads to large-scale losses for the provider, also known as the “servitization paradox”. Uncertainty has been characterised by a framework in product development literature in terms of its latency and criticality (O’Connor and Rice, 2013). Latency describes whether the uncertainty may be recognizable in time and distinguishes unanticipated and anticipated uncertainties. Criticality defines the influence on the project’s immediate progress and distinguishes routine (and thus foreseeable) and extraordinary (and thus unforeseeable) events. This research aims to apply this framework which stems from the product-development literature to PSS development to explore the phenomenon of uncertainty in this context.

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Research output: Chapter in Book/Report/Conference proceeding › Article in proceedings – Annual report year: 2018 › Research › peer-review
Performance assessment of BlueINNOship maritime innovation network
This report presents the findings of a study into the performance effects of BlueINNOship - a publicly funded innovation network in the Danish maritime industry. The study is based on a survey design of all BlueINNOship participants based on long-standing research on the innovation network. Based on the literature and the funding proposal of BlueINNOship, six performance factors were identified: dissemination, efficiency, networking capabilities, innovation capabilities, emission reduction, and growth. The study results show that BlueINNOship exceeded many of the promises regarding dissemination. Furthermore, the network had a high positive effect on efficiency where the time requirements of innovation activities could be reduced through participation in the network. Furthermore, activities achieved budget constraints. BlueINNOship furthermore had a high effect on networking capabilities. Specifically, the network enabled the participating organisation to build closer relationships with existing partners such as customers, consultants and organisations. However, the building of relationships with new partners was not part of the performance effect of the network.

The study further shows that BlueINNOship created small effects in terms of innovation capabilities. This observation may be linked to the traditional innovation models applied in the Danish maritime sector. Finally, BlueINNOship created small effects for reduction of emission targets and growth. This contradicts an explicit aim of the network which was to reduce emissions from the maritime technology and to further growth in the Danish maritime sector. The findings encourage changes to the Danish maritime sector which could further improve the positive effects of future innovation networks such as BlueINNOship. Based on this report, two changes in practice are proposed to ensure performance of future innovation networks in the Danish maritime sector. The first change in practice concerns more radical innovation approaches which include more risky projects including fundamentally new technologies. This could increase the effects on innovation capabilities and ultimately overall growth in the maritime sector. The second change in practice concerns to encouragement of the participation of new organisations in a future innovation network. This would enable the creation of new partnerships and new projects to further enhance the positive effect of a future innovation network. These proposed changes in practice could increase the performance effects of future innovation networks within the Danish maritime sector ensuring economic growth and competitiveness.

General information
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Organisations: Department of Management Engineering, Engineering Systems, DTU Executive School of Business
Contributors: Kreye, M., Perunovic, Z.
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Typology of Uncertainties in the Development Process of Product-Service Systems
This paper investigates uncertainty in the development of Product-Service Systems (PSS) – a complex combination of product and services. This research is important because practitioners struggle with managing the high uncertainties arising from the complexity of parallel product and service development in compound clusters of stakeholders. Yet, scholars have not analyzed these challenges extensively. Based on a combination of innovation management and servitization literature a conceptual framework is offered, detailing five uncertainty types relevant for PSS-development: environmental, technical, organizational, resource and relational uncertainty. This research contributes to the servitization literature by broadening the body of knowledge and deriving suitable management practices.

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Uncertainty perception in bidding for Product-Service Systems under competition

This research investigates what impact of uncertainty perception arising from the existence of competition has on the pricing decision for Product-Service Systems (PSS) under uncertainty. PSS provision is an increasingly important area for many businesses and competition increases cognitive pressures on providers even further. We present an experimental study with industrial costing and bidding experts from the defence and aerospace sector. The study consisted of an experimental set-up via two questionnaires which differed in the existence of competition in the bidding scenario. The findings showed that bidding decision makers changed their evaluation of the cost estimate due to the introduction of competition but kept their evaluations of the profit margin and price bids constant. Furthermore, the participants listed the relevant sources of uncertainty that influenced their decision-making process. This research contributes to the literature in two ways. First, our findings showed that predictions from current theory regarding decision-making of cost estimation and pricing are not confirmed when competitively bidding for PSS. Second, we show uncertainty sources that influenced the decision makers and identified p the importance of internal processes of the PSS provider and environmental uncertainty.

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Understanding The Diversity Of University Research Knowledge Structures And Their Development Over Time

Public research in universities is today under high pressure to contribute to society and economic development (D'Este & Patel 2007, Tijssen et al. 2009). Universities are seen as knowledge centres, which means they create new knowledge (Ankrah et al. 2013, Perkmann et al. 2013), provide expertise, and foster innovation (Etzkowitz & Leydesdorff 1997). Universities are knowledge centres and provide expertise, solutions or innovations and inventions (Etzkowitz & Leydesdorff 1997). Accordingly, a key function of universities is knowledge dissemination through different research output types, such as (journal) publications, patents, newspaper articles and so on. This dissemination is often measured through various proxy indicators. Two main approaches can be distinguished: one focusing on research output from academics for academics, such as (journal) publications (Tijssen et al. 2002, Waltman 2016), and the other investigating research output that fosters universityindustry exchange, including patents, license agreements and spin-outs (Drucker & Goldstein 2007). However, current methods and empirical studies often focus only on academic or nonacademic implications. This separation leads to the absence of recognition of the inter-relation between the different types of research output, resulting in an underassessment of the true impacts of research (Cohen et al. 2002).

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Contributors: Woltmann, S., Piccolo, S., Kreye, M.
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Relational uncertainty in service dyads

Purpose: Relational uncertainty determines how relationships develop because it enables the building of trust and commitment. However, relational uncertainty has not been explored in an inter-organisational setting. This paper investigates how organisations experience relational uncertainty in service dyads and how they resolve it through suitable organisational responses to increase the level of service quality.

Design/methodology/approach: We apply the overall logic of Organisational Information-Processing Theory (OIPT) and present empirical insights from two industrial case studies collected via semi-structured interviews and secondary data.

Findings: The findings suggest that relational uncertainty is caused by the partner’s unresolved organisational uncertainty, i.e. their lacking capabilities to deliver or receive (parts of) the service. Furthermore, we found that resolving the relational uncertainty increased the functional quality while resolving the partner’s organisational uncertainty increased the technical quality of the delivered service.

Originality: We make two contributions. First, we introduce relational uncertainty to the OM literature as the inability to predict and explain the actions of a partnering organisation due to a lack of knowledge about their abilities and intentions. Second, we present suitable organisational responses to relational uncertainty and their effect on service quality.

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Uncertainty Driven Action (UDA) model: A foundation for unifying perspectives on design activity

This paper proposes the Uncertainty Driven Action (UDA) model, which unifies the fragmented literature on design activity. The UDA model conceptualises design activity as a process consisting of three core actions: information action, knowledge-sharing action, and representation action, which are linked via uncertainty perception. The foundations of the UDA model in the design literature are elaborated in terms of the three core actions and their links to designer cognition and behaviour, utilising definitions and concepts from Activity Theory. The practical relevance and theoretical contributions of the UDA model are discussed. This paper contributes to the design literature by offering a comprehensive formalisation of design activity of individual designers, which connects cognition and action, to provide a foundation for understanding previously disparate descriptions of design activity.

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Contributors: Cash, P., Kreye, M.
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A model of designing as the intersection between uncertainty perception, information processing, and coevolution

A number of fundamental perspectives on designing have been described in the literature, in particular problem/solution coevolution and information use. However, these different perspectives have to-date been modelled separately, making holistic description of design activity difficult. This paper takes the first steps towards linking these disparate perspectives in a model of designing that synthesises coevolution and information processing. How designers act has been shown to play an important role in the process of New Product Development (NPD) (See e.g. Badke-Schaub and Frankenberger, 2012). Modelling design activity in NPD is typically done in one of three ways; object-, subject- or process oriented. First, it can be modelled by focusing on the object of design: the product. Second, it can be modelled by describing the social interaction and knowledge exchange between actors. Third, design activity can be modelled by describing the steps and phases that entails a specific design activity (Bedny & Harris, 2005). In all as aspects and stages of the NPD process, uncertainty plays a key role both within the project itself as well as in relation to the project environment (Huang, Liu & Ho, 2015). In order to resolve uncertainty, both individuals and teams need to engage in decision making. In the case of decision making in a team, there is also greater scope for uncertainty, since personality and cognitive style influence decision making (Dewberry, Juanchich & Narendran, 2013) and every person has a different perception of uncertainty. This difference can for example lead to a lack of agreement on the best solution. In NPD projects information is used to minimize the uncertainties inherent to innovation (Stockstrom & Herstatt, 2008; Huang, Liu & Ho, 2015), however, it is important to accept that there are uncertainties that can not be minimized and are inherent to the project itself (Ullman, 2009). Thus, in NPD, the designer's activity is impacted by a wide range of variables. First, uncertainty is significant both inside and outside the project (as in the market for example), and is perceived and acted upon by the designer. Uncertainty perception can be connected to personal characteristics and cultural background, as well as experience and domain specific knowledge. The designer may perceive uncertainty arising from the design of the artefact, from the market, from consumer use, from prototyping, and others. Second, the designer's perceived uncertainty is the motivation to start a process of collecting, exchanging, and integrating knowledge. This has been formalised in Information-Processing Theory and more generally described by authors such as Aurisicchio et al., (2013) who describe design as an information transformation process. Here the aim of the activity is to reduce the perceived uncertainty through identifying and integrating external information and knowledge within the design team. For example, when perceiving uncertainty the designer might seek new information online, process this information, and share with their team in order to assess e.g. opinion, after that they process this knowledge and information together with their interpretation, giving a context to it and finally analysing if the new knowledge is helpful. Third, the designer's perceived uncertainty might also be the motivation to start a process of synthesizing information and ideas into new design propositions through the process of simulation. That is, design work is characterised by an iterative process between problem and solution space, also termed design coevolution (Poon and Maher, 1997; Dorst and Cross, 2001). This describes how problem and solution coevolve over time and have a mutual effect on one another, helping the designer to resolve high levels of uncertainty (Christensen & Ball, 2013). Thus in resolving NPD projects two fundamental processes are the manipulation and evolution of the problem and solution spaces (Christensen & Ball, 2013), and the transformation of information (Aurisicchio et al., 2013). However, prior research has traditionally modelled these perspectives separately; making holistic description of designer activity difficult. Thus, the aim of this paper is to propose a model that links design coevolution and information processing via uncertainty perception. This brings us to the following question: How are coevolution, information processing, and perception of uncertainty connected? The paper is structured in the following way. First, it presents the definitions and literature review of Uncertainty Percepcion, Information Processing, and Coevolution highlighting connections between them. The proposed model is then presented and explained. The paper closes with conclusions, limitations, and suggestions for further studies, including testing of the model itself.

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Organisations: Department of Management Engineering, Technology and Innovation Management, Engineering Systems
Contributors: Lasso, S. V., Cash, P., Daalhuizen, J., Kreye, M.
Employee motivation in Product-Service-System providers
This research investigates how intrinsic and extrinsic motivation factors contribute to employee motivation in providers of Product-Service Systems (PSS). Employee motivation determines the quality of the delivered service and is thus an area of great importance for PSS providers. We present rich case-based data collected through semi-structured interviews, a survey and secondary sources. The analysis showed the particularly high importance of intrinsic and individual motivation factors such as the fulfilling nature of the work and skill development showing the ownership and pride service employees took in their work. Further, the organisation needs to set the context of high employee motivation by enabling flexibility and performance feedback. Our research contributes to the literature by providing a first empirical study of employee motivation in PSS providers and thus providing important insights on the implementation of a servitisation strategy.

Operation and maintenance service provision in uncertain times – the case of the FL Smidth Group during the Arab Spring

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Operation and maintenance service provision in uncertain times – the case of the FLSmidth Group during the Arab Spring

This case was written by Melanie E. Kreye. It was compiled based on primary data collection by the author such as interviews and observations and published secondary data by the case companies. The case was made possible through the generous co-operation of the FLSmidth Group. It is intended to be used as a basis for class discussion.

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Organisation Design for Servitized Manufacturers

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Uncertainty and Behaviour. Perceptions, Decisions and Actions in Business
Behavioural investigations into uncertainty perception in service exchanges: Lessons from dual-processing theory

Uncertainty perception is a core issue as it determines decision making and behaviour. Different organisations can perceive uncertainty differently based on contingencies in their environment and their capabilities. Uncertainty perception is also an individual characteristic as it is influenced by experience and knowledge. Based on dual-processing theory, this paper proposes an analysis method for assessing both explicit and implicit uncertainty perception depending on the individual’s use of tacit or explicit knowledge. Analysing two industrial case studies of service relationships, this paper investigates the perceptions of three uncertainty types: environmental, relational and organisational uncertainty. The findings suggest that implicit uncertainty perception is prevalent and that uncertainty types are inter-related meaning that one uncertainty type can give rise to another one. Thus, this paper contributes to the literature in three major areas: First, showing the relative importance of the three uncertainty types in inter-organisational relationships complements the literature as existing approaches tend to focus on one uncertainty type such as environmental uncertainty. Second, the different uncertainty types are interrelated in inter-organisational relationships showing that one company’s perception of one uncertainty type can cause the partner to perceive another uncertainty type. Finally, a novel method for assessing uncertainty perception is demonstrated.

Motivation and reward systems in service provision: exploring motivators for people providing engineering services

It is becoming a distinctive feature for manufacturing firms to compete strategically through service provision. In relation to reward systems the aim of this thesis is to investigate what motivates employees of servitized manufacturing firms when providing engineering services and why. Through quantitative and qualitative data collection with an international company within the European healthcare sector, the findings show that key motivating factors were to “delight” the customer and being able to take responsibility and accountability for ones work. Service employees were found to feel proud of providing a high-quality service and experienced their work as fulfilling and worthwhile.
Public acceptance of wind farm development: Developer practices and review of scientific literature: Wind2050 WP3 Deliverable 1

This report is the first deliverable of Work Package 3 of the Wind2050 project. The Wind2050 project is about the public perception of wind power in Denmark, its role in the planning and development of wind farms and, ultimately, the meaning it has for reaching the Danish government’s targets for wind power in 2050. Work Package 3 looks specifically at how private developers handle the public’s perception of wind power and what it means for their projects. This report firstly outlines the common stages found in wind farm development and then discusses what manner of interaction the developer commonly has with the public at each stage. The report then shifts focus to what scientific literature says about two important topics in this realm: public risk perception and the NIMBY concept. Finally, the report concludes with suggested topics for research questions and highlights the next steps necessary for WP3 to take.

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Research output: Book/Report › Report – Annual report year: 2015 › Research

Servitization and service recovery: Can you be too close for comfort?

What happens when ‘servitized’ operations and maintenance arrangements fail? Although we know that B2C service failures can lead customers to terminate the relationship, we know very little about failures in servitization. Exceptional external event such as the Arab Spring can cause unexpected disruptions in B2B settings. Presenting evidence from two industrial cases, we found that the closeness of the provider-customer relationship positively affects the ability to recover service failures. However, this relationship can also lead to higher escalation of the service failure. Thus, we contribute to the literature on service failure in the B2B context of servitization.

General information
Publication status: Published
Organisations: Department of Management Engineering, Production and Service Management, Engineering Systems Group, University of Bath
Contributors: Kreye, M., Lewis, M. A.
Number of pages: 10
Publication date: 2015

Host publication information
Title of host publication: Proceedings of 22nd EurOMA Conference
Publisher: European Operations Management Association
Electronic versions:
Servitization_and_service_recovery.pdf
Source: PublicationPreSubmission
Source-ID: 107113815
Research output: Chapter in Book/Report/Conference proceeding › Article in proceedings – Annual report year: 2015 › Research › peer-review
Servitizing manufacturers: The impact of service complexity and contractual and relational capabilities

Processes of servitization will lead providers to change their service delivery structures but they also need to transform broader organisational attributes including contractual and relational capabilities. Based on case studies in the European healthcare sector, we investigate the influence of increasing levels of service complexity on this transformation. Our findings are potentially counter-intuitive; suggesting that contractual capabilities do not increase with service complexity. Instead, we observed increased levels of relational capabilities; manifest in the visibility of the provider on the customer site, the number of ‘non-requested’ site visits and increasingly informal information exchange.

General information
Publication status: Published
Organisations: Department of Management Engineering, Production and Service Management, Engineering Systems Group, University of Bath
Contributors: Kreye, M., Roehrich, J. K., Lewis, M. A.
Number of pages: 14
Pages: 1233-1246
Publication date: 2015
Peer-reviewed: Yes

Uncertainty in project phases: A framework for organisational change management

Uncertainty is an integral challenge when managing organisational change projects (OCPs). Current literature highlights the importance of uncertainty; however, falls short of giving insights into the nature of uncertainty and suggestions for managing it. Specifically, no insights exist on how uncertainty develops over the different phases of OCPs. This paper presents case-based evidence on different sources of uncertainty in OCPs and how these develop over the different project phases. The results showed some surprising findings as the majority of the uncertainty did not manifest itself in the early stage of the change project but was delayed until later phases. Furthermore, the sources of uncertainty were found to be predominantly within the organisation that initiated the change project and connected to the project scope. Based on these findings, propositions for future research are defined to enable theory building in the field and resolve some of the contradictions in the literature.

General information
Publication status: Published
Organisations: Department of Management Engineering, Production and Service Management, Engineering Systems Group, Technical University of Denmark
Contributors: Kreye, M., Balangalibun, S.
Number of pages: 38
Publication date: 2015

Host publication information
Title of host publication: Proceedings of the 15th Annual EURAM Conference
Publisher: European Academy of Management, EURAM
Electronic versions:
Comparing LCC with LCA to assess PSS sustainability: the case of the eco-box

Product/Service-Systems strategies are increasingly proving to be a source of competitive advantage and environmental improvement for engineering companies, the main hypothesis being that PSS should allow to decouple functionality, user satisfaction and financial income on the one hand, from the total environmental impact of the function-delivering technology on the other. This paper describes an integration of Life Cycle Assessment (LCA) and Life Cycle Costing (LCC), in an attempt to see if the two life cycle elements are related.

General information
Publication status: Published
Organisations: Department of Mechanical Engineering, Engineering Design and Product Development, Department of Management Engineering, Quantitative Sustainability Assessment, Production and Service Management, Engineering Systems Group
Contributors: Chong, K., Dreijer, L., Howard, T. J., Birkved, M., Kreye, M., Bey, N., McAloone, T. C.
Pages: 783-790
Publication date: 2014

Information processing theory in the early design stages
Developing appropriate theory is one of the main challenges facing engineering design (Cross, 2007). Theory helps to both explain design activity but also support greater research impact in the domain. It is useful for gaining a more comprehensive understanding of design activity and developing suggestions for improvements and support. One theory that may be particularly applicable to the early design stages is Information Processing Theory (IPT) as it is linked to the design process with regard to the key concepts considered. IPT states that designers search for information if they perceive uncertainty with regard to the knowledge necessary to solve a design challenge. They then process this information and compare if the new knowledge they have gained covers the previous knowledge gap. In engineering design, uncertainty plays a key role, particularly in the early design stages which has been highlighted as the fuzzy front end. To solve this uncertainty, designers collect and exploit information to mitigate uncertainty in design decisions (Love and Roper, 2009). This is then turned into knowledge in order to make it applicable to the designer's and business' needs (Cousins et al., 2011). Finally, the new knowledge is shared between the design team to reduce ambiguity with regards to its meaning and to build a shared understanding – reducing perceived uncertainty. Thus, we propose that Information-Processing Theory is suitable to describe designer activity in the early design stages and a potentially useful theory to adopt in engineering design. The aim of this paper is to explore whether the predictions of IPT apply to empirical designer activity in the early design stages. Based on the literature on IPT, a mental framework is presented that depicts the theoretical predictions. This is applied to an experimental study with student engineers solving a product design task. The results show that IPT is indeed a useful theory and we discuss the implications for the field.

General information
Publication status: Published
Organisations: Department of Management Engineering, Technology and Innovation Management, Production and Service Management, Engineering Systems Group
Contributors: Cash, P., Kreye, M.
Number of pages: 10
Publication date: 2014

Host publication information
Title of host publication: 13th International Design Conference - Design 2014
Publisher: Design Society
Keywords: Life cycle costing (LCC), Life cycle assessment (LCA), Product/service-systems, Sustainable building, Life cycle design, Holistic sustainability assessment
Research output: Chapter in Book/Report/Conference proceeding > Article in proceedings – Annual report year: 2014 > Research > peer-review
**Key variables of organisation design in servitization**

Manufacturing companies offering additional service with their products need to change their organisation design to accommodate for the service business. Using the star model, this paper investigates organisation design in terms of strategy, structure, processes, rewards and people as a response to external environment to ensure performance. We present a case in the European renewable energy sector. The findings show three key variables: (i) processes need to enable information flow between business departments; (ii) servitization strategy needs to be translated into service-centred activities, and (iii) the parts of organisation design need to be aligned to prevent inconsistencies in service provision.

**Servitizing manufacturers: The impact of service complexity and contractual and relational capabilities**

Servitization drives manufacturing firms to develop service offerings characterised by increasing levels of complexity. This has also been termed service ladder or transformation staircase. Manufacturing companies need to adapt their organisational processes to the different stages of the service ladder to provide value to their customers. In particular, this paper focuses on contractual and relational capabilities for services of different complexities. Based on two case studies within the European Healthcare sector, we found that in a highly regulated business context, contractual capabilities only marginally differ depending on service complexity. In contrast, the importance of relational capability increases with higher levels of service complexity. Developing relational capabilities can function as a competitive advantage for manufactures moving into product-service system offerings.

**Uncertainty in competitive bidding – a framework for product–service systems**

Owing to servitisation, manufacturing companies are increasingly required to compete through the provision of services around their products. The contracts for these services are often allocated through competitive bidding where the potential suppliers submit a price bid to the customer. The pricing decision is influenced by various uncertainties. This article proposes a conceptual framework depicting these influencing uncertainties on the bidding strategy. This framework is based on three empirical studies with industry investigating different viewpoints on the decision-making process. The intention is to support the pricing decision when competitively bidding for a service contract. The framework can be applied to specific competitive bidding situations to identify the influencing uncertainties, model them and depict their influences on the pricing decision.
Information availability at the competitive bidding stage for service contracts

Purpose – The purpose of this paper is to explore the information that manufacturing companies have available when competitively bidding for service contracts.

Design/methodology/approach – A semi-structured interview study was undertaken with industrialists in various sectors, which are currently facing the issue of servitisation.

Findings – One of the main findings was that, despite the novelty of the process, the decision makers at the competitive bidding stage have an understanding of the involved uncertainties. In particular, the uncertainty arising from the customer as the user of the product and evaluator of the competitive bids in addition to the uncertainty connected to the competitors were identified as the main influences on the pricing decision.

Research limitations/implications – The research implications show the influences and considerations during the decision-making process at the competitive bidding stage for service contracts. These include the customer and the competitors.

Practical implications – Shortcomings in the current industrial practice were identified such as the approaches used to communicate the cost estimate for the service contract. The approaches currently used contradict research findings in the area of communicating uncertainty information, which means that further research is to be done to identify optimal approaches to displaying the uncertainty connected to the communicated information.

Originality/value – This paper offers a basis for research to understand the challenges industry faces when competitively bidding for service contracts. This can be used to develop novel approaches in supporting the decision maker such as a model that presents the probability of winning in comparison to the probability of making a profit.
Products or services? – Insights from a successful provider of Product-Service Systems

General information
Publication status: Published
Organisations: Department of Management Engineering, Production and Service Management, Implementation and Performance Management, University of Bath
Contributors: Kreye, M., Jensen, P. L.
Pages: 38-41
Publication date: 2013
Peer-reviewed: Unknown

Publication information
Journal: Effektivitet
Issue number: 4, 2013
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ISI indexed (2013): ISI indexed no
Original language: English
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Source: PublicationPreSubmission
Source-ID: 92776130
Research output: Contribution to journal › Journal article – Annual report year: 2014 › Communication

The Cost of Service

General information
Publication status: Published
Organisations: University of Bath, University of the West of England, Loughborough University
Contributors: Huang, X., Kreye, M., Parry, G., Goh, Y. M., Newnes, L. B.
Pages: 349-362
Publication date: 2013

Host publication information
Title of host publication: Cost analysis of electronic systems
Publisher: World Scientific
Editor: Sandborn, P.
ISBN (Print): 978-981-4383-34-9
(WSPC Series in Advanced Integration and Packaging, Vol. 1).
Source: PublicationPreSubmission
Source-ID: 92775695
Research output: Chapter in Book/Report/Conference proceeding › Book chapter – Annual report year: 2014 › Research › peer-review

Uncertainty awareness in support service contracts
Through servitization, manufacturing companies are faced with various uncertainties. These can be caused by different sources such as the changed relationship between service provider and customer. However, decision makers tend to only take appropriate actions when they perceive this uncertainty. This paper presents a conceptual framework for assessing this perceived uncertainty through the expressions used by decision makers. The usefulness of this framework is exemplified for a case study in servitization where actors of different levels within the provider and customer companies were interviewed. This study showed the main areas of uncertainty as perceived by the different actors.

General information
Publication status: Published
Organisations: University of Bath
Contributors: Kreye, M.
Approaches to displaying information to assist decisions under uncertainty

The estimation of the costs of a product or project and the decisions based on these forecasts are subject to much uncertainty relating to factors like unknown future developments. This has been addressed repeatedly in research studies focusing on different aspects of uncertainty; unfortunately, this interest has not yet been adopted in practice. One reason can be found in the inadequate representation of uncertainty. This paper introduces an experiment, which engages different approaches to displaying cost forecasting information to gauge the consideration of uncertainty in the subsequent decisionmaking process. Three different approaches of displaying cost-forecasting information including the uncertainty involved in the data were tested, namely a three point trend forecast, a bar chart, and a FAN-diagram. Furthermore, the effects of using different levels of contextual information about the decision problem were examined. The results show that decision makers tend to simplify the level of uncertainty from a possible range of future outcomes to the limited form of a point estimate. Furthermore, the contextual information made the participants more aware of uncertainty. In addition, the fan-diagram prompted 75.0% of the participants to consider uncertainty even if they had not used this type of diagram before; it was therefore identified as the most suitable method of graphical information display for encouraging decision makers to consider the uncertainty in cost forecasting. © 2011 Elsevier Ltd. All rights reserved.

Modelling Uncertainty in Competitive Bidding

Due to the current market development of servitisation, manufacturing companies are required to compete through the provision of services as opposed to just products. For such companies, the shift towards being a service provider often means they have to bid for service contracts, sometimes competitively. In the context of competitive bidding, the decision makers face various uncertainties that influence their decision. Ignoring these uncertainties or their influences can result in problems such as the generation of too little profit or even a loss or the exposure to financial risks. Raising the decision maker’s awareness of the uncertainties can provide valuable information to assist in the decision-making process. The research presented in this paper presents an approach to modeling the uncertainties at the competitive bidding stage for long-life, high-value service contracts. The aim of this research is to provide decision makers with a decision matrix which
illustrates the probability of winning the service contract and the probability of making a profit. The framework utilized for identifying the uncertainties and a layered approach for analyzing these uncertainties is described. These are then applied to a case study where the modeling approaches and data gathering methods are explained and the results are displayed via the decision matrix.

General information
Publication status: Published
Organisations: University of Bath, Loughborough University
Contributors: Kreye, M., Goh, Y. M., Newnes, L. B.
Number of pages: 11
Publication date: 2012

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Title of host publication: Proceedings of the ASME 2012 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference
Publisher: American Society of Mechanical Engineers
Article number: DETC2012-70841
Source-ID: 92776088
Research output: Chapter in Book/Report/Conference proceeding → Article in proceedings – Annual report year: 2012 → Research → peer-review

Uncertainty in Competitive Bidding – Using the cost forecast for pricing decisions

General information
Publication status: Published
Organisations: University of Bath, Loughborough University
Contributors: Kreye, M., Newnes, L., Goh, Y. M.
Pages: 5-6
Publication date: 2012
Peer-reviewed: Unknown

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Journal: SCAF Newsletter
Issue number: Summer 2012
Original language: English
Electronic versions:
Uncertainty_in_Competitive_Bidding.pdf
Source: PublicationPreSubmission
Source-ID: 92776139
Research output: Contribution to journal → Journal article – Annual report year: 2012 → Communication

Manifestation of Uncertainty - A Classification
Different approaches of uncertainty described in literature focus on different aspects and points of the design process and offer insights on different aspects. The aim of this paper is to propose a classification of the manifestation of uncertainty describing the different points of the design process which offers a basis for a shared understanding and characterization of uncertainty. The classification consists of context uncertainty arising from the situation circumstances, data uncertainty stemming from input information or data, model uncertainty resulting from the simplifications in models, and phenomenological uncertainty connected to the outcome of the process. Each of these categories is described in detail which offers the basis for positioning the research contributions published in previous ICED conferences. The classification allows an identification of the part of the design process which is most influenced by uncertainty and activities for improvement and uncertainty reduction can be focused at this aspect. Furthermore, techniques for modeling and managing this uncertainty can be identified.

General information
Publication status: Published
Organisations: University of Bath, Loughborough University
Contributors: Kreye, M., Goh, Y. M., Newnes, L. B.
Number of pages: 12
Publication date: 2011

Host publication information
Title of host publication: Proceedings - International Conference on Engineering Design, ICED11
Source: PublicationPreSubmission
Source-ID: 92776102
Uncertainty Analysis and its Application to Service Contracts

Because of the transformation of market structures into the direction of servitization, manufacturing companies are forced to compete through the supply of services as opposed to products. Competing for these service contracts, particularly during bidding, the decision makers face various uncertainties that influence their decisions. This paper presents a holistic approach for identifying, modeling and representing these uncertainties to enable a more informed decision. As current literature lacks a holistic approach to characterize uncertainty, this paper proposes such an approach by classifying uncertainty into five layers. It is described how they offer an integrated approach to describing the uncertainty inherent in a situation. This classification is then applied to the bidding situation for a service contract in the form of a conceptual framework. This framework depicts the influencing factors on a bidding decision, namely, the contract conditions, internal company perspective, competitors and customer. To demonstrate the use of the uncertainty classification in detail the influencing factor of the customer is used as an exemplar. The uncertainty connected to the customer is characterized and the techniques for modeling the uncertainty are described. It is explained how the can be included in a decision matrix representing the probability of winning the contract.

Information Display for Decisions under Uncertainty

To assure the success of a project or new product, the consideration of Through Life Costs (TLC) is an important factor. The process of forecasting and decision making is essential to produce accurate estimates. In this context, the information given to the decision maker and the time available for a decision are often limited, especially in early design stages. The estimation of TLC deals with the future of the considered product or project and the future is not known. That means uncertainty is inherent to the decision making process in forecasting and cost estimation. In an uncertain world good decisions can lead to bad consequences and vice versa [Radner 2000]. To support the decision making process taking into account the uncertainty in TLC, the research presented in this paper introduces an experiment undertaken to test the subjective processing of forecasting information in order to produce an estimate. First, the state-of-the-art of current research in forecasting and decision making are explained. Then, the set-up of the experiment, realisation and results will be described. Finally, conclusions drawn will be explained and the impact on future research will be illustrated.

Uncertainty in Through Life Costing Within the Concept of Product Service Systems: A Game Theoretic Approach

By 2028 Rolls-Royce predict a civil after sales market opportunity of USD 550 billion and for military engines of USD 300 billion. Naturally, with this anticipated business Product Service Systems (PSS) have experienced a growth in interest by both industry and research. To achieve effective and profitable PSS, the Through Life Costs (TLC) of products/systems
needs to be considered comprehensively. However, uncertainty in the estimation of future factors such as operation costs, level of maintenance and so on make this extremely challenging to estimate and model. The research introduced in this paper proposes that Game Theory might be of value for modeling the uncertainty in costs arising from conflict situations in the life cycle. Therewith, the decision making process can be modeled and so be made visible with its various implications. To introduce this proposed approach a review of the literature in PSS, TLC and uncertainty is summarized and then applied to this proposal. The results of preliminary and further work will be described.

General information
Publication status: Published
Organisations: University of Bath
Contributors: Kreye, M., Goh, Y. M., Newnes, L.
Number of pages: 12
Publication date: 2009

Host publication information
Title of host publication: Proceedings - International Conference on Engineering Design, ICED'09
Electronic versions:
UNCERTAINTY_THROUGH_LIFE_COSTING.pdf
Source: PublicationPreSubmission
Source-ID: 92776123
Research output: Chapter in Book/Report/Conference proceeding » Article in proceedings – Annual report year: 2009 » Research » peer-review

Projects:

Climate KIC: Uncertainty gaming
Kreye, M., Project Participant, Department of Management Engineering, Engineering Systems
01/10/2017 → 31/12/2018
Project: Research

BlueINNO: BlueINNOship
Kreye, M., Project Coordinator, Department of Management Engineering, Engineering Systems
01/01/2016 → 31/03/2019
Project: Research

Wind 2050: Controversies on wind power Wind2050
Kreye, M., Project Participant, Department of Management Engineering, Engineering Systems
01/01/2014 → 31/05/2017
Project: Research

Organisational Transition to Systems Thinking in Nordic Manufacturing
Pana, M., PhD Student, Department of Management Engineering
Kreye, M., Main Supervisor
Broberg, O., Supervisor
Technical University of Denmark
01/09/2018 → 31/08/2021
Award relations: Organisational Transition to Systems Thinking in Nordic Manufacturing
Project: PhD

Systems approach to the development of integrated solutions in the Nordic manufacturing industry
Ramirez Hernandez, T., PhD Student, Department of Management Engineering
Kreye, M., Main Supervisor
Pigosso, D. C. A., Supervisor
Technical University of Denmark
01/09/2017 → 31/08/2020
Award relations: Systems approach to the development of integrated solutions in the Nordic manufacturing industry
Project: PhD
A Model of Big Data Utilisation in the Danish Healthcare System
Ivan Rehfeld, C., PhD Student, Department of Management Engineering
Perunovic, Z., Main Supervisor, Department of Management Engineering
Kondo Steffensen, S., Supervisor
Kreye, M., Main Supervisor
Ansat eksternt
01/05/2017 → 30/04/2020
Award relations: A Model of Big Data Utilisation in the Danish Healthcare System
Project: PhD

Deciding under uncertainty: improving risk management practice in engineering projects
Stingl, V., PhD Student, Department of Management Engineering
Geraldi, J., Main Supervisor
Kreye, M., Supervisor
Rydén, P., Examiner
Oehmen, J., Supervisor
Hällgren, C. M., Examiner
Loock, M., Examiner
Samfinansierede - Virksomhed
15/10/2015 → 15/12/2018
Award relations: Deciding under uncertainty: improving risk management practice in engineering projects
Project: PhD

Uncertainty Perception in Product Innovation Projects
Lasso, S. V., PhD Student, Department of Management Engineering
Cash, P., Main Supervisor
Daalhuizen, J., Supervisor
Kreye, M., Supervisor
Borch, K., Examiner
Persson, M., Examiner
Storga, M., Examiner
Science Without Borders, Brasi
15/10/2015 → 14/03/2019
Award relations: Uncertainty Perception in Product Innovation Projects
Project: PhD

Activities:

International Journal of Operations and Production Management (Journal)
Period: 7 Jan 2019
Melanie Kreye (Reviewer)
Department of Management Engineering
Engineering Systems

Description
paper submitted to the regular issue of the journal

Related journal
International Journal of Operations and Production Management
0144-3577
Central database
Activity: Editorial work and peer review › Peer review of manuscripts › Research

26th Conference of the European Operations Management Association (Event)
Period: Jan 2019 → Feb 2019
Melanie Kreye (Reviewer)
Department of Management Engineering
Engineering Systems
Degree of recognition: International

Related event

26th Conference of the European Operations Management Association: Operations adding value to society
14/06/2019 → 19/06/2019
Helsinki, Finland
Activity: Editorial work and peer review › Peer review of manuscripts › Research

John P Walsh
Start date: 8 Oct 2018
Melanie Kreye (Host)
Department of Management Engineering
Engineering Systems

Description
Publication seminar series: Quality Research in Innovation Policy and Management: Lessons from Highly Cited Papers in Research Policy
Degree of recognition: National
Activity: Hosting a guest lecturer

Journal of Operations Management (Journal)
Period: 1 Sep 2018 → 31 Dec 2018
Melanie Kreye (Reviewer)
Department of Management Engineering
Engineering Systems

Description
Member of the reviewer board
Degree of recognition: International

Related journal

Journal of Operations Management
0272-6963
Central database
Activity: Editorial work and peer review › Peer review of manuscripts › Research

Jan Dul
Start date: 15 Mar 2018
Melanie Kreye (Host)
Department of Management Engineering
Engineering Systems

Description
Publication seminar series: From idea to paper
Degree of recognition: National
Activity: Hosting a guest lecturer

25th Annual EurOMA Conference (Event)
Period: Feb 2018 → Jun 2018
Melanie Kreye (Reviewer)
Department of Management Engineering
Related event

25th Annual EurOMA Conference
24/06/2018 → 26/06/2018
Budapest, Hungary
Activity: Editorial work and peer review › Peer review of manuscripts › Research

The 24th International Annual EurOMA Conference (Event)
Period: Jan 2017 → Jun 2017
Melanie Kreye (Reviewer)
Department of Management Engineering
Engineering Systems

Related event

23rd EurOMA conference (Event)
Period: Jan 2016 → Jun 2016
Melanie Kreye (Reviewer)
Department of Management Engineering
Engineering Systems

Related event

23rd EurOMA conference
17/06/2016 → 22/06/2016
Trondheim, Norway
Activity: Editorial work and peer review › Peer review of manuscripts › Research

22nd EurOMA Conference (Event)
Period: Jan 2015 → Jun 2015
Melanie Kreye (Reviewer)
Department of Management Engineering
Engineering Systems

Related event

22nd EurOMA Conference: Operations Management for Sustainable Competitiveness
26/06/2015 → 01/07/2015
Neuchâtel, Switzerland
Activity: Editorial work and peer review › Peer review of manuscripts › Research

International Journal of Operations and Production Management (Journal)
Period: 1 Nov 2014 → 18 Jan 2019
Melanie Kreye (Reviewer)
Department of Management Engineering
Engineering Systems
Degree of recognition: International

Related journal
IEEE Transactions on Engineering Management (Journal)

Period: Nov 2014 → Jan 2019
Melanie Kreye (Reviewer)
Department of Management Engineering
Engineering Systems
Degree of recognition: International

Related journal

International Journal of Operations & Production Management (Journal)

Period: Nov 2014 → 31 Dec 2018
Melanie Kreye (Reviewer)
Department of Management Engineering
Engineering Systems

Description
Member of Review Board
Degree of recognition: International

Related journal

International Journal of Operations & Production Management

0144-3577
Central database
Activity: Editorial work and peer review › Peer review of manuscripts › Research

21st EurOMA Conference: Operations Management in an Innovation Economy (Event)

Period: Jan 2014 → Jun 2014
Melanie Kreye (Reviewer)
Department of Management Engineering
Engineering Systems

Related event

21st EurOMA Conference: Operations Management in an Innovation Economy
20/06/2014 → 25/06/2014
Palermo, Italy
Activity: Editorial work and peer review › Peer review of manuscripts › Research

Key variables of organisation design in servitization
Period: 2014
Melanie Kreye (Lecturer)
Manufacturing companies offering additional service with their products need to change their organisation design to accommodate for the service business. Using the star model, this paper investigates organisation design in terms of strategy, structure, processes, rewards and people as a response to external environment to ensure performance. We present a case in the European renewable energy sector. The findings show three key variables: (i) processes need to enable information flow between business departments; (ii) servitization strategy needs to be translated into service-centred activities, and (iii) the parts of organisation design need to be aligned to prevent inconsistencies in service provision.

Related event

21st EurOMA Conference: Operations Management in an Innovation Economy
20/06/2014 → 25/06/2014
Palermo, Italy
Activity: Talks and presentations › Conference presentations

20th International EurOMA Conference (Event)
Period: Jan 2013 → Jun 2013
Melanie Kreye (Reviewer)
Department of Management Engineering
Engineering Systems

Related event

20th International EurOMA Conference
07/06/2013 → 12/06/2013
Dublin, Ireland
Activity: Editorial work and peer review › Peer review of manuscripts › Research

Prizes:

2018 Outstanding Reviewer for International Journal of Operations & Production Management
Melanie Kreye (Recipient)
Department of Management Engineering, Engineering Systems

Details
Awarded date: Jun 2018
Degree of recognition: International
event: 25th Annual EurOMA Conference
Prize: Prizes, scholarships, distinctions