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*D14.3 – Report on Role Models in the
Integrated Service Life Cycle
Management Model
M15*

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DELIVERABLE PEER REVIEW SUMMARY

ID	Comments	Addressed (✓) Answered (A)
1	Include information about validation by Use Cases.	✓
2	Extend Role Model from VME to MSE dimension.	✓
3	Insert Concepts in SP1 INTEGRATED DEMO / Toolbox modeling section.	A
4		
5		
6		
7		

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1. Executive Summary

From a strategic management perspective, the implementation of Service business in manufacturing companies (Servitization) often is valued highly with respect to fulfilling customer needs, shaping an unique selling point against competitors, and guaranteeing for sustainable revenues even in difficult economic phases. However, **service-driven business differs fundamentally from product-driven business**: Work objectives, tasks, operative and organizational structure, even work philosophy as a whole have to be changed significantly, acting upon the maxim of total customer orientation. Even if a Service business organization is implemented successfully, the hybrid interaction between manufacturing and Service units has to be managed continuously. Together, the Servitization process adds up to a comprehensive change process with multiple stakeholders, and has to be managed professionally.

To ensure a sustainable development of Service business in manufacturing enterprises, the **Integrated Service Life Cycle Model** has been designed in D14.1 already. It provides a conceptual framework for systematic development and operation of new Services. To put it in practice successfully, multiple internal and external stakeholders of the company have to contribute to its implementation. This is to be facilitated by the role models designed in this Deliverable.

To support the Integrated Service Lifecycle implementation, two specific **role models for a) the Service Engineering and b) the Service Operations Management module** are presented. The different roles link together the pending Service Engineering and Service Operations tasks, the participating employees and supervisors, and the relevant processes. By assigning the tasks to relevant persons by means of the roles, an enterprise can define the contributions of its personnel to the Service Lifecycle Management specifically (Chapter 3).

Roles have to be designed suitable to the relevant work context. However, this context changes significantly during the Servitization process, when new Service organization elements emerge implicitly within the manufacturing units, and are formalized in separate Service units, explicitly. To take into account this complexity, the **Dynamic Pathway Model of Servitization** is provided to analyze the dynamic pathways of emerging Service-relevant tasks, persons, processes, and organizational structure in manufacturing enterprises. In addition, the **Typology of Servitization Strategies** conceptualizes a company's decision to execute its Servitization strategy by using either its Service Marketing or its Service Engineering competence, resulting in specific requirements for each of the seven developmental stages (Chapter 4).

As the Servitization process involves considerable changes of the work context for many stakeholders, barriers and opposition against these changes are probable. As Service business brings about a new working logic into manufacturing companies, conflicts of interests can arise easily, not only restricted to conflicts between manufacturing units and Service units. As a **methodology** to deal with this challenge, a **multi-level change management model for the Servitization process** is presented. By help of the model, specific fields of action for the Servitization change challenges can be defined and realized systematically. Based on strategic decisions made by a company while entering the MSEE context, capabilities as well as organizational structure, processes, rewards, people, and culture, can be aligned coherently to the chosen strategy (Chapter 5).

2. Introduction

2.1. Objectives of Deliverable D14.3

The main objective of Deliverable D14.3 is to support and facilitate the application of the Integrated Service Life Cycle Management Model, developed in D14.1. The model describes how new Services can be developed and operated in a systematic way, providing for substantial added-value, high quality service provision, and sustainable profitability of services delivered.

D14.3 focuses on three main approaches for supporting the successful implementation of the Integrated Service Life Cycle Management (SLM) Model in enterprises:

1. Role Models for Service Lifecycle Management
2. Typology of developmental Pathways of Service Organization in Manufacturing Companies
3. Strategies for Mastering the Change Challenges of the Servitization Process

First, the role models provide a classification for organizing work contributions from various internal and external stakeholders during the SLM-Modules of Service Ideation, Service Engineering, and Service Operations Management. Second, as roles are defined as the connecting link between tasks, persons, processes, and organizational structure, these elements are grouped into a typology, modeling the pathways of Service organization development in manufacturing enterprises. Third, the process of Service Life Cycle Management does not occur in an organizational vacuum, but mostly in an organization thriving to enhance the Service business share. Like every organizational change, the Servitization process brings about barriers and opposition against the new ways of (Service) work, also. For this reason, a model is adapted to map out an enterprise's fields of action for the Servitization change challenges.

2.2. Structure of Deliverable D14.3

Deliverable D14.3 consists of seven chapters. In chapter 1, an Executive Summary is given, summing up the most relevant results of the deliverable. In chapter 2, first the objectives of D14.3, then the text structure of the deliverable are recapitulated. Chapter 3 comprises an introduction into the state of the art of role models in the innovation context and two specifically designed role models, developed to systematize the work contributions for a) the "Service Engineering" module and b) the "Service Operations Management" module of the Service Lifecycle Management Model. Chapter 4 continues with a model to track pathways of the development of organizational elements in the Servitization process. In chapter 5, multiple change dimensions and fields of action are determined, to support manufacturing enterprises' efforts to integrate a greater ratio of Services into their business portfolio. In chapter 6, a summary and an outlook are provided. References are enlisted in the final chapter 7.

3. Design of Role Models for Service Lifecycle Management

3.1. Role Models in the Innovation Context: State of the Art

Enterprises moving towards the Manufacturing Service Enterprise Ecosystem context have to deal with innovation processes on multiple dimensions: Business models, coordination of business partners in the value added chain, information and production technology, work flow design, and others have to be re-modeled or even designed from scratch.

On the meta-level, three main change dimensions in the MSEE context are depicted in chapter 5.1 as Servitization, Business Model Alignment and Virtualization change challenges. On the Servitization dimension of these challenges, shifts in tasks, roles, enterprise functions, processes and organizational structure have to be performed efficiently (see chapter 4). As these changes deviate from the routine business established in companies and require not only new work processes, but even a new working philosophy, they often cause resistance at various stakeholder levels.

In practice of enterprise innovation processes, several roles have evolved to overcome typical barriers of innovation. Whereas, in his early approach, Schumpeter sees individual management personalities as the central drivers of innovation (Schumpeter 1911), numerous research projects in the intervening years have shown that different roles have to be filled for innovative processes to succeed (e.g. Schon 1963; Witte 1973; Roberts and Fusfeld 1981; Hauschildt and Gemünden 1999; Fichter 2009). Important findings of these projects were the concepts of Power, Specialist, and Process Promoters, which in their individual roles as well as in the way they network make important contributions to the success of innovation processes (Table 1).

Innovation Roles	Competences	Acts against barriers of...
Specialist Promoter	<ul style="list-style-type: none"> Expert knowledge Acquisition and transfer of knowledge 	<ul style="list-style-type: none"> Lack of knowledge and validation criteria
Power Promoter	<ul style="list-style-type: none"> Hierarchical position Authority to decide about projects and resources 	<ul style="list-style-type: none"> Lack of support and resources Opponents
Process Promoter	<ul style="list-style-type: none"> Knowledge of organization and stakeholders Communication abilities 	<ul style="list-style-type: none"> Lack of supporters Lack of communication Conflicts of interest

Table 1 Competences and Barriers relevant for Power, Specialist, and Process Promoters during the Innovation Process (modified from Folkerts 2001)

As the *Specialist* Promoter possesses the competence to acquire knowledge (e.g. about new technologies, customer needs, business models, methodologies) and to validate its relevance and feasibility for the company, he provides for the basic capability to deal with the new issues emerging from the market or technical environment of the enterprise.

Due to its hierarchical position within the organization, the *Power Promoter* has the authority to prioritize activities and to enforce projects and activities. He guards the Specialist Promoter against opponents and ensures that sufficient resources are provided for the project.

The role of the *Process Promoter* in literature is often seen as mediating between the Power and the Specialist Promoter (Folkerts 2001). The Process Promoter knows how to implement a project in the context of the company’s processes, rules and stakeholders. Based on his project management competences, he plans, structures and schedules the project. Besides, he knows how to motivate important key players to support the project with their knowledge and resources. Figure 1 illustrates the action the Process Promoter can take during the innovation process, accompanied by the Power and Specialist Promoters’ contributions.

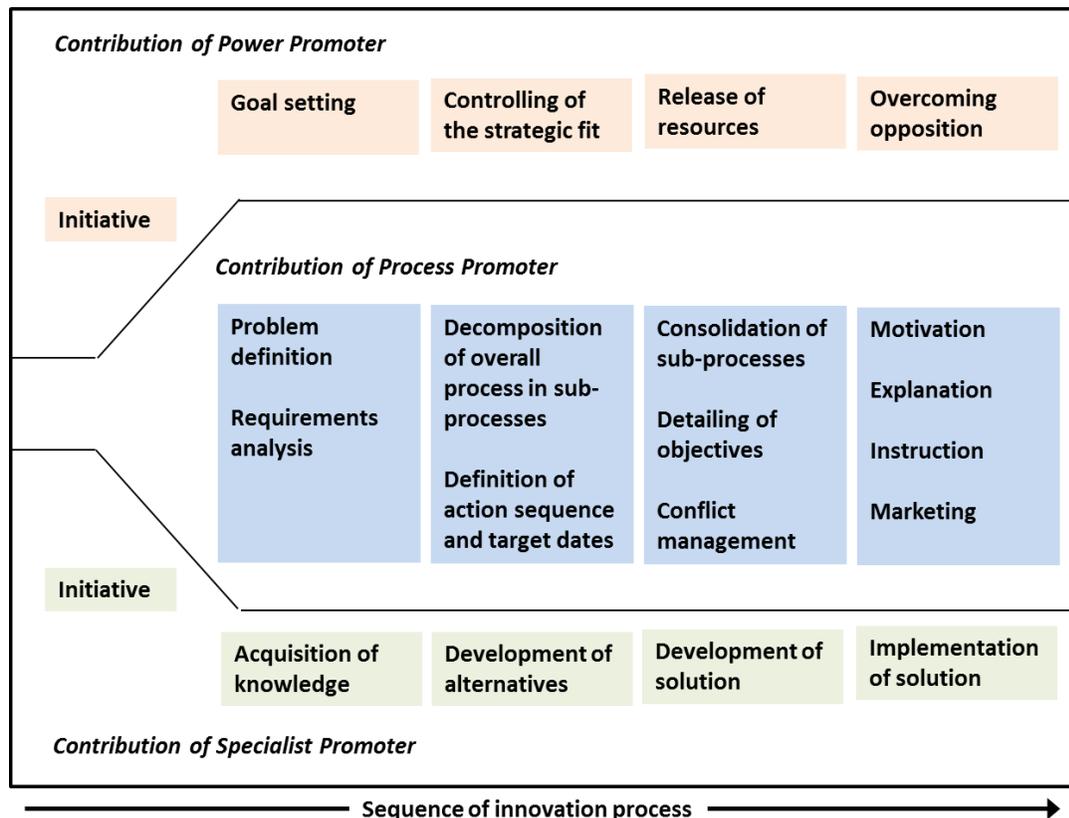


Figure 1 Contributions of Power, Specialist, and Process Promoter, during the Innovation Process (modified from Folkerts 2001)

A further role type has been derived from the observation that, frequently, it is only a small number of employees who undertake the tasks of supplying the research and development units with information from internal and external sources. As these persons act as a filter for the incoming information, the name of “Gatekeeper” has been coined for this role (Taylor 1975; Domsch, Gerpott und Gerpott 1989). The fact that Gatekeepers often operate in a way that spans internal and external organizational boundaries and are therefore key for networking between companies, has led to the development of the role concept “Boundary Spanner” (Tushman 1977; Aldrich and Herker 1997). Figure 2 depicts the roles of Boundary Spanner and Gate Keeper cooperating with each other at the fuzzy front end of technology innovation. Additionally, in this diagram Reid and de Brentani (2004) conceptualize the role of the Power Promoter in terms of decision-makers on corporate and project level.

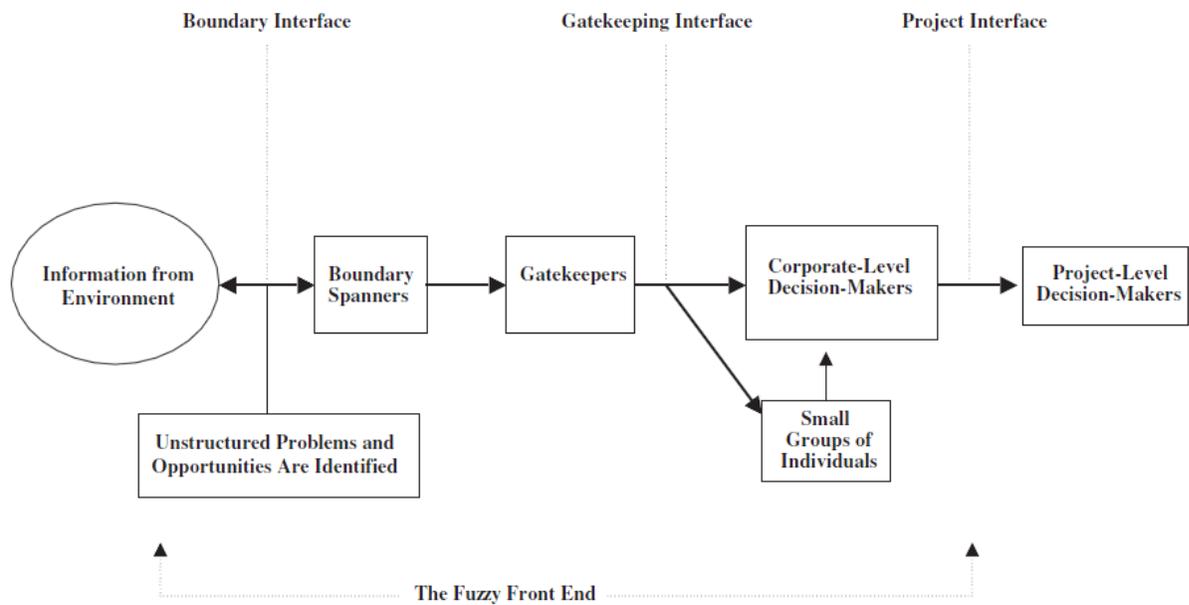


Figure 2 Role Concepts of Boundary Spanner and Gatekeeper, applied to the Fuzzy Front End of the Technology Innovation Process (Reid and de Brentani 2004)

A further approach on role concepts in innovation processes is the so-called Scrum Methodology, which is considered to be an important process model in the context of Agile Software Development (Beck 2001; Gloger 2011). Besides a differentiated set of values, concepts and methods for accelerated software development (Wolf and Bleek 2010), it offers a specific role concept which is to support the implementation and operation of Agile Software Programming projects (Table 2).

Roles in Scrum Framework	Description of Role Contributions
Internal Roles	
Product Owner	<ul style="list-style-type: none"> Strategic product development Scheduling and prioritization of product functionalities Approval of developed software functions Communication with customer Coordination of interal interests (e.g. marketing/IT/Sales...)
Development Team	<ul style="list-style-type: none"> Self-organization, voluntary self-commitment for deadlines Delivers product functionalities Responsible for meeting quality standards Interdisciplinary team cooperation, specialists & generalists
Scrum Master	<ul style="list-style-type: none"> Informal management function as Scrum-moderator Responsible for Scrum methodology and guidelines Manages problems with respect to role distribution, role performance, self-organization of the team etc. Responds to the team members' needs Attends Scrum implementation and diffusion in company
External Roles	
Management	<ul style="list-style-type: none"> Provides for supporting framework, infrastructure and resources Manages work requests from other units Adequate staffing of the development team
Customer	<ul style="list-style-type: none"> Intensiv exchange with Product Owner Frequent feedback
User	<ul style="list-style-type: none"> Feedback about developed functionalities from user perspective

Table 2 Description of Roles in the Scrum Framework (Ganz & Warschat 2012; Gloger 2011)

The roles of the Scrum Framework are designed to support the sustainable implementation of the Scrum developing principles with focus on

- Self-organization of teams
- Accepted rules based on shared values, allowing for common patterns of action
- High quantity and quality of feedback loops
- Moderation of relational aspects and conflicts of interest

Similar to Servitization within the MSEE context, Agile Project Management aims at acting more flexible in a more and more dynamic environment. It takes account of changed premises in the market by implementing a new working philosophy on the basis of self-organization principles.

3.2. Role Model for the “Service Engineering” Module of Service Lifecycle Management

Role models have shown to be useful for orchestrating the contributions of various stakeholders in innovation processes (Kremer and Leyh 2010). Consistent with the “Service Engineering” module elements of the MSEE SLM Reference Framework, the role model depicted in Figure 3 contains a set of roles, which can be assigned either to an internal pool of potential role owners (examples for possible functions and positions at the bottom of the figure) or to an external pool (indicated at the top of the figure). For a specific company, role assignment as well as task definition for roles should match the company’s parameters of processes, organizational structure, and competences of employees or organizational units, respectively.

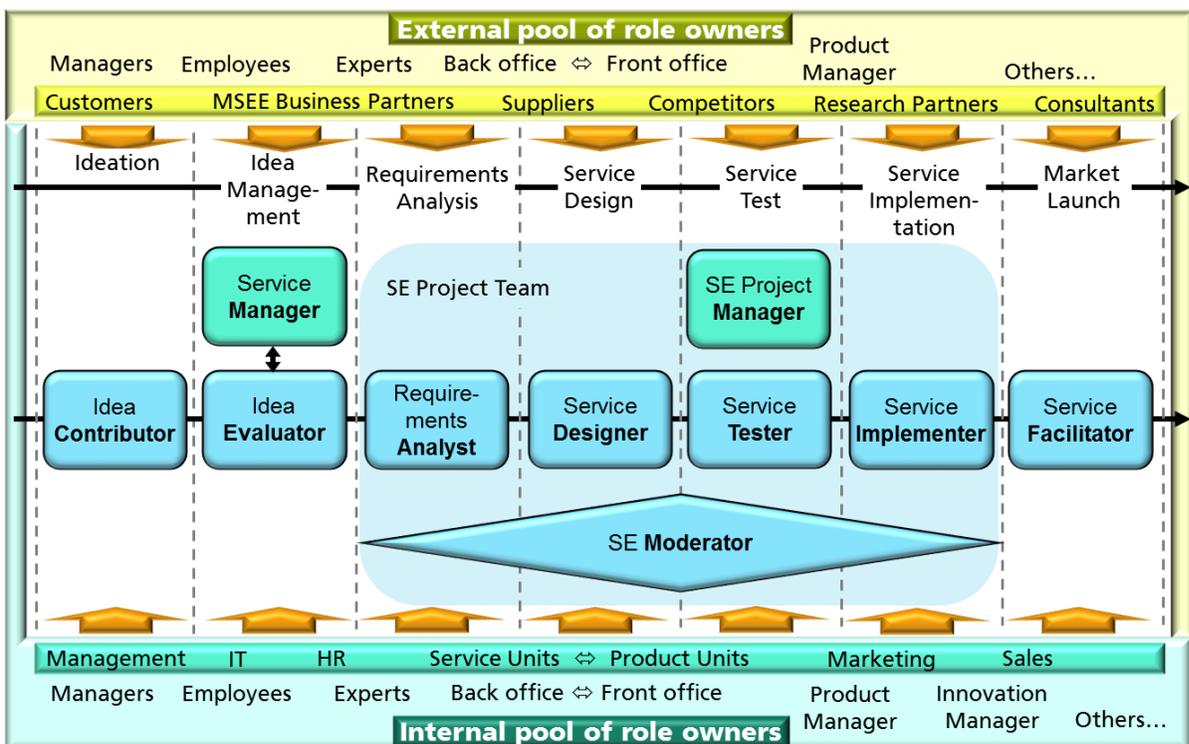


Figure 3 Role Model for the “Service Engineering” Module of MSEE SLM Reference Framework (Own figure, based on Kremer & Leyh 2010)

Roles help to define the division of work between employees or organizational units among one another. Roles bundle one or more tasks and can be assigned to one or more employees or

organizational units. For example, according to the role model illustrated in Figure 3, the owner of the role “Service Manager” is responsible for a set of tasks: He has to evaluate proposed service ideas on a strategic level, to come to a decision quickly, to allocate resources for the service development project, and to control if the decision is executed effectively. The role of the Service Manager can be assigned to a single person as well as to an organizational unit like a committee, an expert team, a board of directors, or others. Table 3 provides an overview of the specific role contributions shown earlier in Figure 3.

Roles in Service Engineering Module of SLM	Description of Role Contributions
Idea contributor	<ul style="list-style-type: none"> Feeding in ideas (by crossing the company boundary to the environment, if necessary)
Idea Evaluator	<ul style="list-style-type: none"> Collection, preliminary assessment, and forwarding of selected ideas to decision maker(s)
Service Manager	<ul style="list-style-type: none"> Strategic prioritization of ideas, approval of resources for trialing / implementing the idea concept, controlling of the Service Engineering results
Requirements Analyst	<ul style="list-style-type: none"> Identification and integration of customer and company requirements for the new service concept
Service Designer	<ul style="list-style-type: none"> Conceptualization of the new service process, information and decision flows, stakeholders, roles etc.
Service Tester	<ul style="list-style-type: none"> Checking the service process, e.g. by means of a pilot project
Service Implementer	<ul style="list-style-type: none"> Conducting the internal roll-out, feedback evaluation and optimization of service process
Service Engineering Project Manager	<ul style="list-style-type: none"> Supervision and controlling of the Service Engineering project
Service Engineering Moderator	<ul style="list-style-type: none"> Structuring the Service Engineering project on the levels of process barriers, requirements fulfillment, and management of stakeholders' interests
Service Facilitator	<ul style="list-style-type: none"> Conducting the market launch and marketing/sales activities

Table 3 Description of Role Contributions within the Service Engineering Module of the Service Lifecycle Management (SLM) Model (Own figure)

As shown in chapter 3.1, roles can be designed to overcome typical barriers of innovation processes. To master this role-specific challenge, role owners need to possess - or to develop, respectively - the appropriate competences. Table 4 specifies both competences and barriers relevant for the roles of the Service Engineering role model.

Roles in Service Engineering Module of SLM	Competences	Acts against Barriers of:
Idea contributor	<ul style="list-style-type: none"> Specialist knowledge operative / system knowledge Creativity Lateral thinking 	<ul style="list-style-type: none"> Lock-in-effects Dominance of day-to-day business Problem-focused view
Idea Evaluator	<ul style="list-style-type: none"> Generalist knowledge Definition of evaluation criteria Access to decision makers 	<ul style="list-style-type: none"> Unmanagable mass of ideas Unrealistic ideas Unclear evaluation criteria Lack of support for good ideas
Service Manager	<ul style="list-style-type: none"> Strategic knowledge Capable of making decisions under uncertainty Sustainable support for project 	<ul style="list-style-type: none"> Lack of decision and prioritization Lack of strategic alignment Lack of support for projects
Requirements Analyst	<ul style="list-style-type: none"> Knowledge about / access to market / customer requirements, technological / process requirements etc. 	<ul style="list-style-type: none"> Lack of knowledge about Service design criteria as critical success factors
Service Designer	<ul style="list-style-type: none"> Service design knowledge: approach and methods Knowledge about Service process interfaces 	<ul style="list-style-type: none"> Lack of systematic Service design Lack of process interface integration
Service Tester	<ul style="list-style-type: none"> Knowledge about testing procedures and KPIs for new Services 	<ul style="list-style-type: none"> Lack of experience with new Services
Service Implementer	<ul style="list-style-type: none"> Experience from Service implementation projects 	<ul style="list-style-type: none"> Persistence of established processes, structures and behaviour patterns against change
Service Engineering Project Manager	<ul style="list-style-type: none"> Supervising and coordination abilities Capable of decision making and prioritization 	<ul style="list-style-type: none"> Lack of coordination Lack of decision and prioritization
Service Engineering Moderator	<ul style="list-style-type: none"> Knowledge about relevant stakeholders / interfaces Knowledge about (potential) conflicts of interest Moderation capabilities 	<ul style="list-style-type: none"> Conflicts of interest, constricting the Service Engineering process Lack of communication between stakeholders
Service Facilitator	<ul style="list-style-type: none"> Ability to convince customers of the benefits of the new service Service sales knowledge: approaches and methods 	<ul style="list-style-type: none"> Lack of knowledge about the new service and it's benefits on the part of the customer

Table 4 Competences and Barriers relevant for the Roles of the Service Engineering Module within the Service Lifecycle Management (SLM) Model (Own figure)

The design of the Scrum roles described in chapter 3.1 can be used to extend and enrich the Service Engineering role model on (at least) the following levels:

- Service Engineering project manager: Comprehensive and frequent communication with customers about Service Engineering results; monitoring of the project's economy regarding development efforts and added value for customer / revenues

- Service Engineering project team: Shared aim of highly flexible reaction to short-term changes of customer demands, even in late development phases
- Service Engineering project moderator: Control of the group members meeting working standards; taking care of personal relations in an interdisciplinary team

In the upcoming Deliverable D14.4, the interdependence of roles, role contributions, role competences, and role barriers, will be used to develop a self-evaluation questionnaire for VMEs. The questionnaire will support the companies to detect their potentials of systematizing and professionalizing their Service Engineering activities, and to enhance the competences of relevant role contributors required for these activities. Additionally, based on the Service Engineering Role Model, the Role Contribution Analysis matrix is depicted here in chapter 3.4.

3.3. Role Model for the “Service Operations Management” Module of Service Lifecycle Management

The second role model presented here refers to the “Service Operations Management” model of the MSEE SLM Reference Framework, containing the modules “Service Sales & Marketing” and “Service Delivery”. The modules consist of four phases each, representing the process of planning, implementing and feedback analysis for each activity focus. Matching these premises, Figure 4 illustrates the elements of the role model, which allows for the tasks in each phase to be assigned to one or more individuals or groups of process participants.

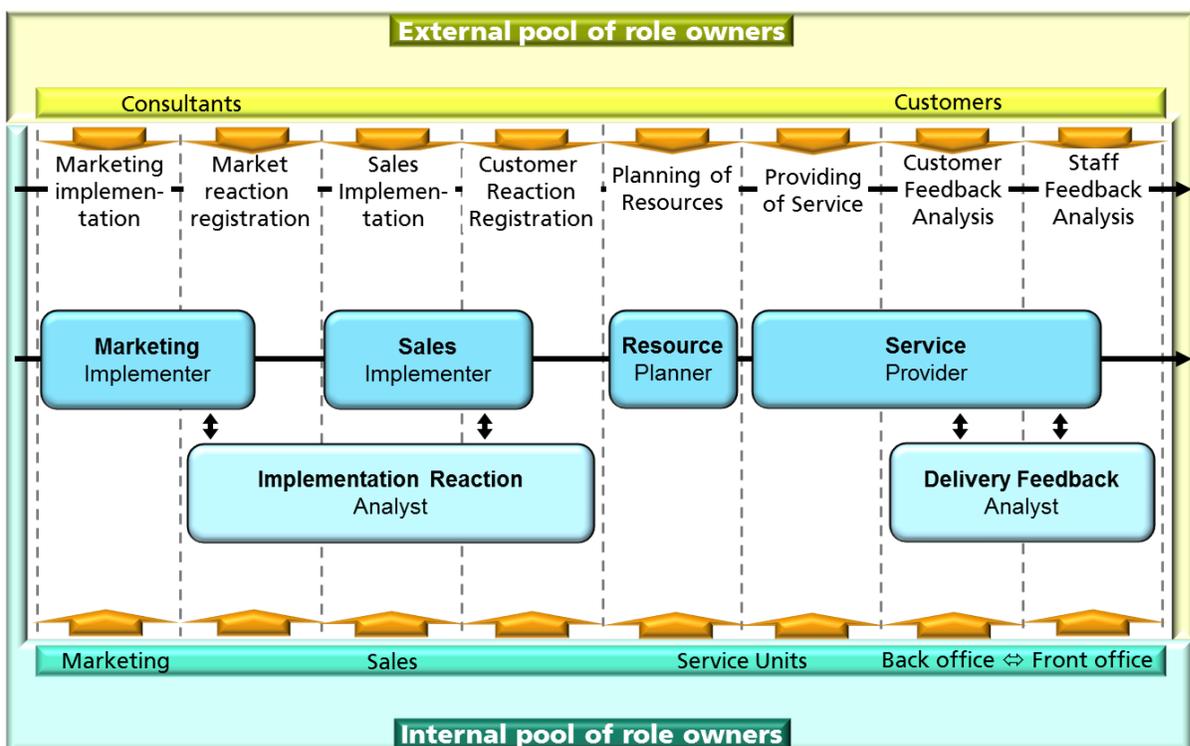


Figure 4 Role Model for the “Service Operations Management” Module of MSEE SLM Reference Framework (Own figure, based on Kremer & Leyh 2010)

In addition to the Marketing, Sales, Planning and Service Provision roles on the first level of the model, the second level comprises the roles needed for feedback analysis. Role owners are to collect customer responses both from internal and external recipients (or to some extent from external stakeholders, respectively) of Marketing, Sales and Service Provision activities. The relevant role contributions are detailed in Table 5.

Roles in Service Operations Management Module of SLM	Description of Role Contributions
Marketing Implementer	<ul style="list-style-type: none"> Based on the Market Launch-activities from the preceding role "Service Facilitator", here marketing activities for the new service or solution are initialized
Sales Implementer	<ul style="list-style-type: none"> Preparation and conduction of sales activities with respect to the new service/solution
Implementation Reaction Analyst	<ul style="list-style-type: none"> For both marketing and sales activities, feedback of the market (e.g., responses to advertising, development of sales performance figures) is collected, aggregated, and evaluated
Resource Planner	<ul style="list-style-type: none"> For successful service provision, the required resources (e.g., capacity, budget, infrastructure) have to be planned proactively
Service Provider	<ul style="list-style-type: none"> Service/solution provision is established and integrated in the day-to-day business of the company
Delivery Feedback Analyst	<ul style="list-style-type: none"> Corresponding to the marketing and sales phases, feedback from both external and internal stakeholders is collected and evaluated

Table 5 Description of Roles within the Service Operations Management Module of the Service Lifecycle Management (SLM) Model (Own figure)

Compared to the role model of the Service Engineering module, the assignment of role owners to the roles depicted here is more specific: as marketing, sales, and service provision are the genuine tasks of the correspondent enterprise departments, the pool of potential role owners should be transparent, although responsibilities for the new services or solutions have to be appropriately assigned to the role owners. Moreover, marketing and sales activities may to some extent be delegated to external consultants or external marketing/sales provider, and customers may play a substantial role in the analysis and feedback activities as well.

For the Service Operations Management role model, Table 6 contrasts competences with barriers relevant for owners of the particular roles.

Roles in Service Operations Management Module of SLM	Competences	Acts against Barriers of:
Marketing Implementer	<ul style="list-style-type: none"> • Experience from Service marketing implementation projects 	<ul style="list-style-type: none"> • Persistence of established processes, structures and behaviour patterns
Sales Implementer	<ul style="list-style-type: none"> • Experience from Service sales implementation projects 	<ul style="list-style-type: none"> • Persistence of established processes, structures and behaviour patterns
Implementation Reaction Analyst	<ul style="list-style-type: none"> • Access to internal and external stakeholders / recipients of Sales and Marketing activities • Knowledge about feedback analysis procedures and methods 	<ul style="list-style-type: none"> • Communication losses at internal and external organizational interfaces • Lack of knowledge about the customer’s point of view concerning the new service
Resource Planner	<ul style="list-style-type: none"> • Knowledge about resource planning procedures and methods 	<ul style="list-style-type: none"> • Lack of realistic effort estimation for operation of the new service
Service Provider	<ul style="list-style-type: none"> • Experience from Service operation 	<ul style="list-style-type: none"> • Capacity for operating the new service • Internal competition of established services with new services
Delivery Feedback Analyst	<ul style="list-style-type: none"> • Access to internal and external stakeholders / recipients of Service provision • Knowledge about feedback analysis procedures and methods 	<ul style="list-style-type: none"> • Communication losses at internal and external organizational interfaces • Lack of knowledge about the customer’s point of view concerning the new service

Table 6 Competences and Barriers relevant for the Roles of the Service Operations Management Module within the Service Lifecycle Management (SLM) Model (Own figure)

Depending on the company’s specific design of working tasks, work processes, and organizational structure, role concepts should be tailor-made solutions to be suitable to day-to-day business requirements. Moreover, the successful implementation of role models often requires a change of behavioral patterns, fields of responsibility, and cultural aspects. The underlying change process should be actively managed and monitored.

3.4. Use Case Validation of the Role Model for the “Service Engineering” Module of Service Lifecycle Management

Applying the Role Model for the “Service Engineering” Module of Service Lifecycle Management (according to Deliverable D14.1) to Use Cases, the design of an analysis template was required. The resulting Matrix for Role Contribution Analysis (RCA) consists of the nine role activities of the Service Engineering Role Model (see Figure 3 above) in the head row and an expendable blank list of possible role owners (individuals as well as teams, units, committees, or organizations) in the first column (Figure 5). Results of the RCA matrix application to a MSEE Use Case are illustrated in Figure 6. To ensure confidentiality for the internal information, relevant units, functions, and external business partners of the Use Case have been anonymized.

Who contributes what?	1. Contributing new Service Ideas	2. Evaluation of Service Ideas	3. Decision about Service Ideas	4. Design of new Service	5. Test of new Service	6. Implementation of new Service	7. Moderation of SE process	8. Management of SE project	9. Facilitation of new Service
A									
B									
C									
D									

Figure 5 Matrix for Role Contribution Analysis (RCA) for the “Service Engineering” Module of Service Lifecycle Management (Own figure)

Role Contributions to Service Engineering (SE) Activities: Use Case Application									
Who contributes what?	1. Contributing new Service Ideas	2. Evaluation of Service Ideas	3. Decision about Service Ideas	4. Design of new Service	Complementary test methods?		Moderation & communication support?		9. Facilitation of new Service
					5. Test of new Service	6. Implementation of new Service	7. Moderation of SE Process	8. Management of SE Project	
A RB-A internal (Role Bearer A)	High share (strategy driven; by meeting)	High share	High share						High share
B RB-B internal	Low share						(?)		
C RB-C internal	Low share (tech-driven)	Low share		Middle share, Specifications (req.)	Test projects	Low share			
D RB-D internal	Low share			Low share, usability					
E RB-E internal	Low share								
F RB-F external, in Ecosystem	Low share potential for implementation platform	Seed Funding for RB-F in Ecosystem?		Crowd sourcing: Self-management of ecosystem, e.g. linking complimentary competences		Low share, potential for crowd sourcing		High share, outside company	+diffusion of Service in Ecosystem
G RB-G internal		Low share, Feasability; Strategic							
H RB-H internal			Low share						
J RB-J internal	Low share		Low share						
K RB-K external, in Ecosystem				Low share		Low share			
L RB-L internal				Low share, product expertise	High share, a) technological, b) test with customers				
M RB-M external, in Ecosystem				Low share, expertise in product X		Low share			
N RB-N internal				Low share, expertise in products		Low share			
O RB-O internal								High share, inside company	
P RB-P internal	+ voice of customer								Low share

Figure 6 Results of the Role Contribution Analysis (RCA) with a Use Case (Anonymized, own figure)

The Role Contribution Analysis with a MSEE Use Case led to the identification of 15 role contributors from within and from outside the company, each administering activities to one or several roles. The quantitative degree of each role bearer’s contribution to the role tasks was estimated in percent, summing up to 100 percent in each column. For confidentiality reasons, in Figure 6 percentages have been categorized into “low / middle / high share”. Complimentary to the quantitative estimation, the qualitative kind of contribution was recorded, and efficacy, efficiency, and potential of additional contributions were discussed.

The cells of the matrix represent the combination between role contributor, contribution activity, and quantitative/qualitative extent of contribution. For example, in Figure 6 the first cell (column: role contribution 1 “New Service ideas”, row: role contributor A “RB-A internal”) can be read as follows: “The Role Bearer A (company-internal) contributes a middle share of overall new Service ideas. The idea generation is based on personal meetings and is mainly strategy-driven”.

Main results of the Role Contribution Analysis with the MSEE Use Case are the following issues:

- For the role “Idea Contributor”, altogether seven role bearers could be identified. However, customers did not appear to be directly engaged in idea generation activities. This result shows potential for open innovation measures, as well as enlarging the RB-P (internal) role as feeding in the “customer’s voice” into the company. Moreover, new Service ideas mainly originate from a top-down strategic perspective by the RB-A (internal), showing potential for bottom-up processes of idea generation.
- The analysis results of the “Service Testing” role contributions (Role 5) lead to the question, if the current test design could be extended by additional activities, to ensure a fast and accurate evaluation of new Service concepts.
- For the “Service Engineering Moderator” role, no role contributors could be identified. However, the role segmentation within the company suggests an integrating role. Coordination and moderation of the various activities seems to be expandable, e.g. activities of RB-C, RB-E, and RB-N (all internal).
- Great potential was identified for the support of RB-Fs (external) in the ecosystem as multiple role bearers. With currently only a low share of entire new Service idea contributions, low idea evaluation and testing capabilities, little contribution to the self-managed implementation, management and facilitation of new Services in the ecosystem, RB-Fs seem to have both great potential and great challenges for taking over Service Engineering activities.

The potential of external RB-Fs at the one hand, and their insufficient competences and resources for the Service Engineering process at the other hand, lead to the question of how to support this group most efficiently. Empowering them to handle tasks of the Service Engineering process together with complementary actors in the ecosystem in a self-coordinated way, could be a crowd-sourcing based answer to Service Engineering challenges. For this reason, the Use Case will examine the Seed Funding approach, searching for strategies of investing in groups of ecosystem role bearers, to enable them to perform selected tasks of the Service Engineering process in a self-coordinated way. This will include the application of Service Lifecycle Management role models and the management of referring role contributors, competences, and barriers. For the research activities, the Seed Funding approach for Service Engineering in ecosystems leads to the integration of the ecosystem perspective into the role models of the Service Lifecycle Management Framework.

4. Development of Service Organization Elements in Manufacturing Enterprises

4.1. The Dynamic Pathway Model: Implicit Emergence and Explicit Formalization of Service Organization Elements in Enterprises

The design of roles for Service Engineering and Service Operations Management activities in enterprises takes place in the context of the Servitization process. On the way from a Product-driven to a Service-driven organization, companies have to master challenges on multiple levels, which here are summarized as the “Servitization Threshold” (Figure 7).

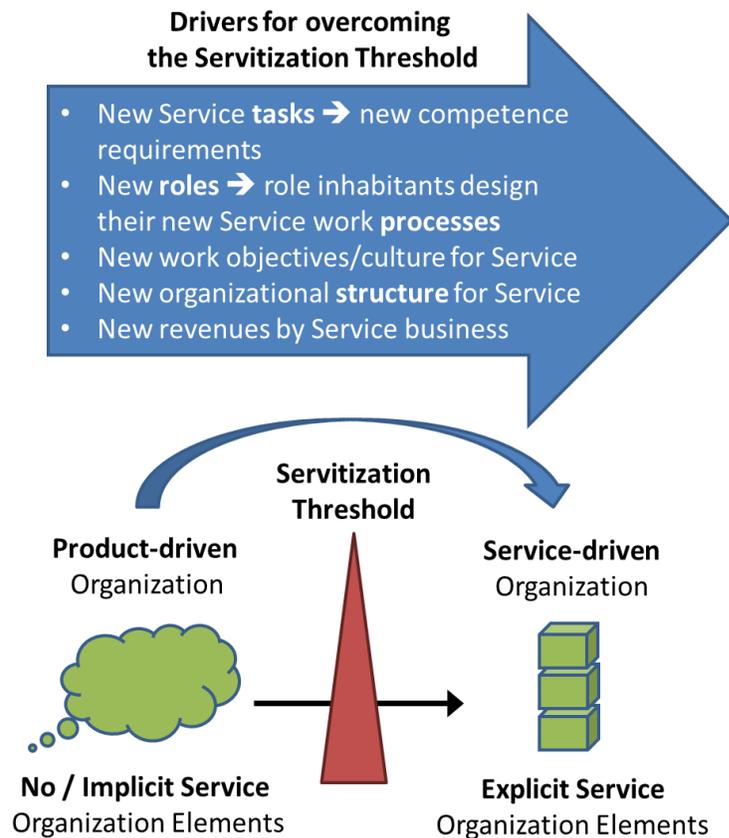


Figure 7 Drivers for Overcoming the Servitization Threshold on the Way from Implicit to Explicit Service Organization (Own figure)

Product-driven enterprises possess no or implicit Service organization elements only, e.g. sales employees who casually sell Service offers along with products, but are not instructed officially to promote Services. To establish explicit Service organization elements, enterprises do have to overcome the Servitization threshold. The motivation to develop more and more Service alignment within the organization is generated by multiple drivers: Gaining a critical mass on the levels of Service tasks, Service roles, Service processes, Service organization structure, and Service revenues, enterprises can overcome the Servitization threshold.

In contrast to the long-existing Product organization elements, the newly developing Service organization elements have to be built up stepwise. In a bottom-up process, Service tasks, functions/roles, processes, and organizational structure, are triggered by each other (Figure 8). E.g., an employee in a machine maintenance unit who engages implicitly in Service tasks, some day is asked to take over the role of maintenance Service provision for a customer. After the extent of his activities in Service provision has risen, he designs the process of Service provision for the first time explicitly. Later, after his company has achieved more

Service revenue, the employee is assigned to a newly created Service organization unit. Complementary to this bottom-up process, Service organization elements can be created top-down, for instance by management. For companies being in a Servitization process, a combination of both approaches is probable.

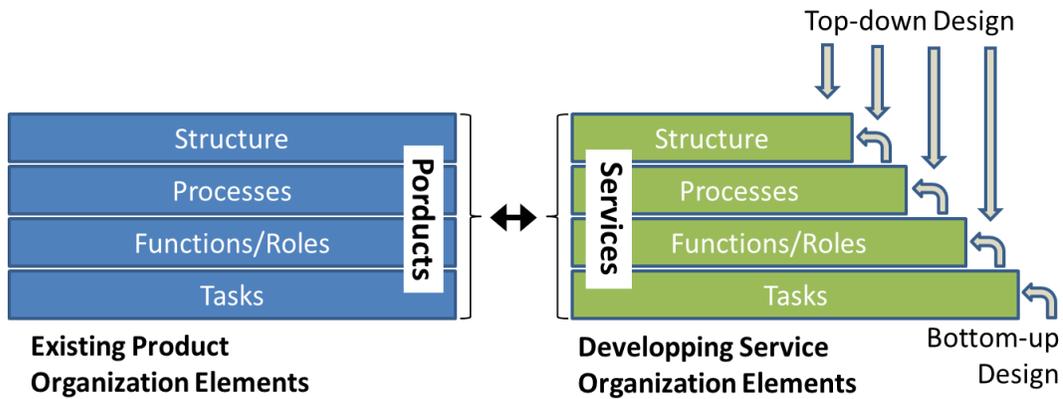


Figure 8 Stepwise Development of Service Organization Elements and Interaction with existing Product Organization Elements (Own figure)

When the Service organization elements do develop parallelly to the existing Product organization elements, the question arises how the interaction between both sides is shaped. Figure 9 conceptualizes the emergence and formalization process on the way to a Service-driven organization as a bottom-up approach.

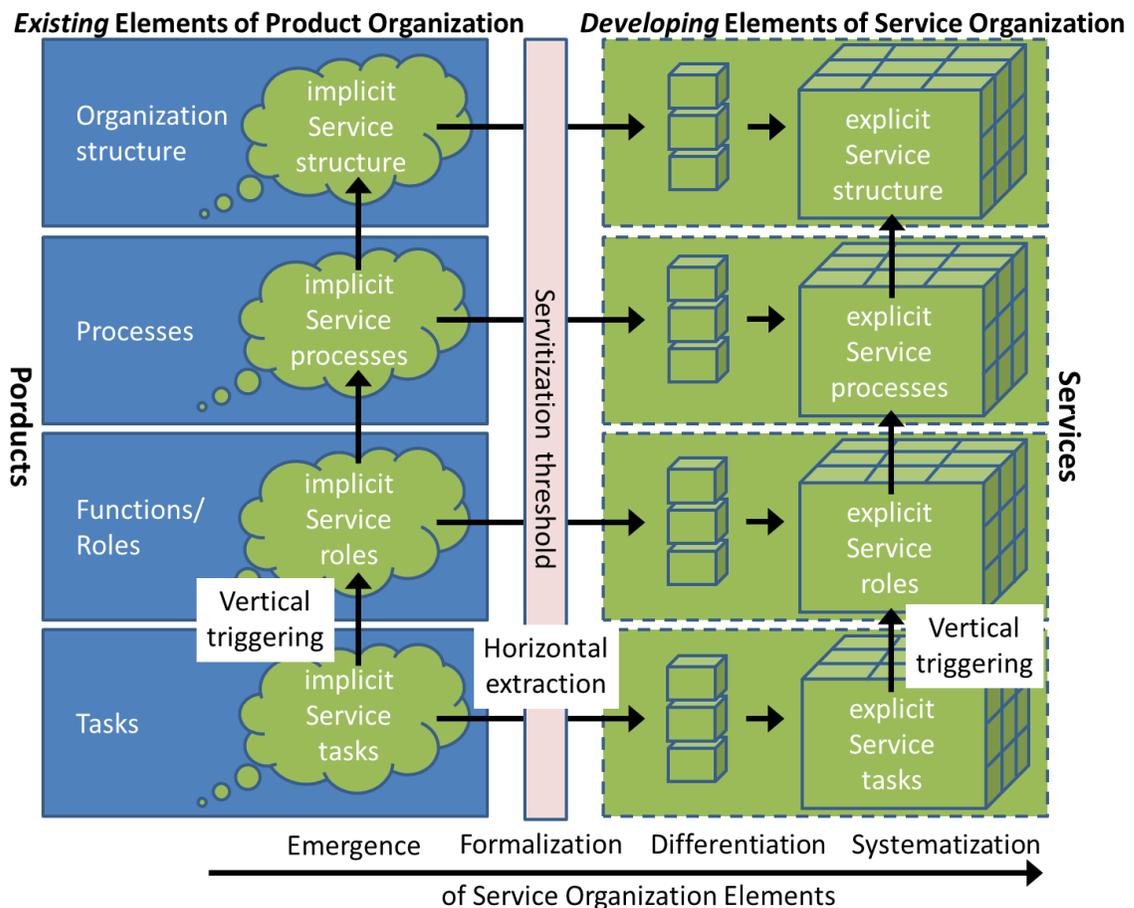


Figure 9 Dynamic Pathway Model of Servitization: Emergence, Vertical Triggering and Horizontal Formalization Pathways during Bottom-Up Development of Service Organization Elements (Own figure)

In this model, at first Service tasks emerge on an informal level within the existing Product-driven tasks. Afterwards, two combinable processes can take place: At the one hand, informal Service tasks may trigger informal Service roles, informal Service processes or even informal Service organizational structures (by vertical triggering). At the other hand, the implicit Service elements may be acknowledged as being sufficiently important to be given an explicit, formal design. This means that the Service elements are extracted from the Product-driven organization and are transferred into new Service-driven organization tasks, roles, processes, and organizational structure (by horizontal extraction).

In practice, the eliciting of vertical triggering and horizontal extraction may not be that linear as the model proposes. However, in general, the upper organization elements in each case are defined by their lower elements. This does not exclude that Service organization structures, processes, roles, and tasks, can be designed by a strategic top-down approach, as ideally both directions complement one another. In the upcoming Deliverable D14.4, an analysis template will be demonstrated, allowing for identification of informal Service organization elements and detection of potential as well as barriers of vertical triggering and horizontal formalization of new Service tasks, roles, processes, and organization structure.

4.2. Typology of Servitization Strategies

The typology of Servitization levels from Thoben (2001) provides for a phase-based differentiation between Product-driven and Service-driven enterprises (Figure 10, right column). The model on the left column of the figure conceptualizes the implicit or explicit strategies enterprises can pursue when evolving from one Servitization level to another.

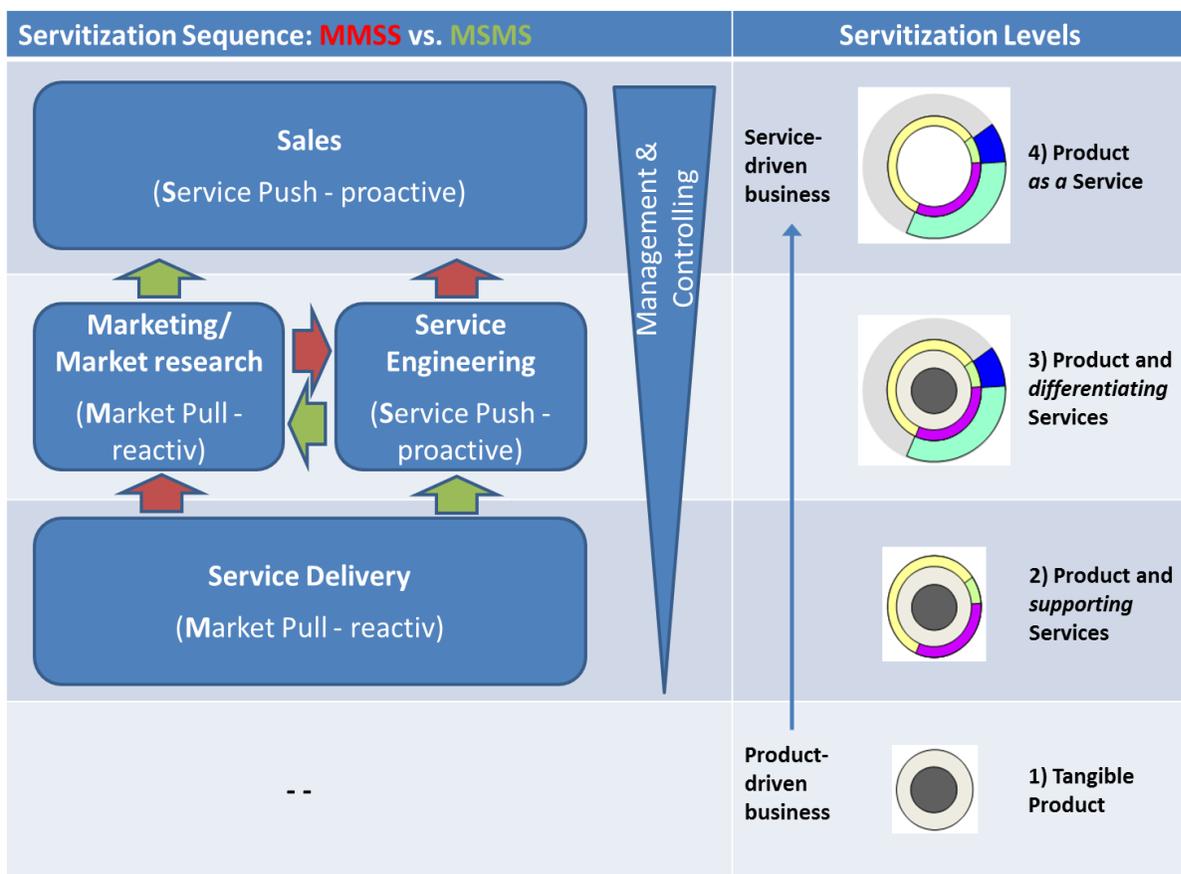


Figure 10 Alternative Strategies for Enterprises during the Servitization Process: Market-Pull or Service-Push Focus at the third (differentiating Services) Level of Servitization (Own figure, combined with Thoben 2001)

According to Thoben (2001), at the first Servitization level, no Service activities yet exist. At the second level, the customer's need for advanced Service offerings, or the competitor's Service portfolio respectively, lead to a pragmatically created Service delivery design. Whereas this strategy typically is based on a market-pull mechanism, the next level of Servitization contains two strategic options: Either the market-pull strategy is pursued further by accessing customer needs in a more systematic way, or the company chooses to rely on its capability to design new Services systematically, which here is called a *Service-Push strategy*.

The term Service-Push refers to the Technology Adaptation Model by Heubach et al. (2008). The model describes two basic strategies how to transfer new technology into innovative products: Customer demands lead to the Market-Pull strategy (i.e., looking for technical functions which can be realized by the new technology), whereas the availability of new technology leads to the Technology-Push (by considering new technological functions with added value for the customer). Both strategies are defined to complement each other, but can be shaped by companies individually. Thus, the term Service-Push in the Dynamic Pathway Model is used analogically to the Technology-Push term drawn from the Technology Adaptation Model.

Thus, Service-Push is conceptualized as a customer-oriented, systematic and strategic approach to use a manufacturing company's competence of Service Engineering. These objectives distinguish the Service-Push approach from creative over-engineering of new Services, neglecting the real customer requirements. The concept of Service-Push allows for an active launch of new Services, and generation of innovative, possibly revolutionary Services. The competence to do so is seen as complimentary to the competence of reactively responding to new customer requirements, and to improve Services evolutionary. An integrated model of Technology-Push, Market-pull and Service-Push will be demonstrated in Deliverable D14.4.

While the Market-Pull strategy typically is established by means of Marketing and Market Research activities, the Service-Push strategy is based on Service Engineering measures. With the Typology of Servitization Strategies it is assumed, that enterprises being in the Servitization level of differentiating Services (level 3), will a) develop Service Marketing activities (Market-Pull) in the first place, and after that Service Engineering (Service-Push) activities, or b) exactly the other way round. Only after this completion has taken place on Servitization level 3, level 4 can be entered, which allows the enterprise to handle service-driven business mainly. At this level, the role of Service Sales becomes vital, as no product has to be sold anymore, but only Services are developed and offered systematically (Service-Push).

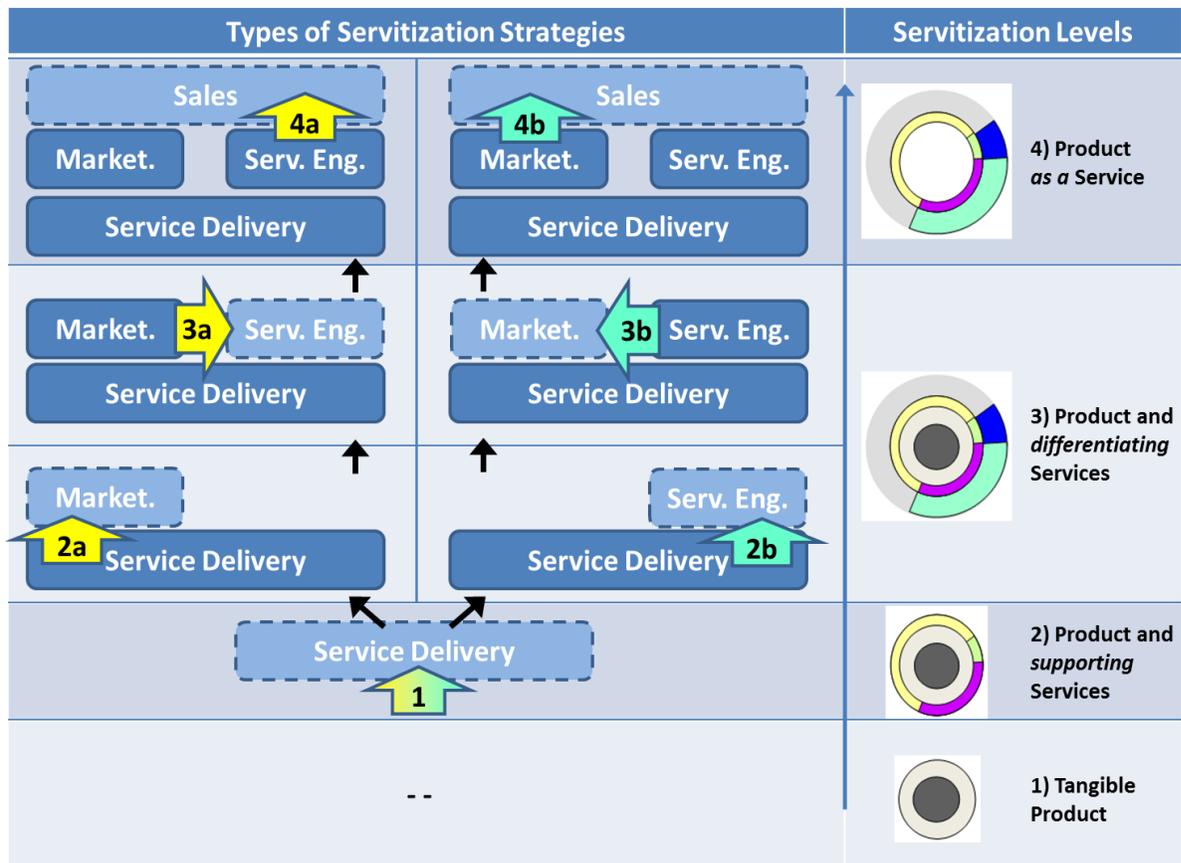


Figure 11 Typology of Servitization Strategies at specific Servitization levels (Own figure, combined with Thoben 2001)

Depending on the individual enterprise's Servitization strategy, two patterns originate from the Market-Pull and Service-Push sequence chosen on Servitization level 3: A focus on Market-Pull activities leads to the MMSS (Market-Pull/Market-Pull/Service-Push/Service-Push) strategy pattern, whereas Service-Push activities at this level lead to the MSMS pattern (Market-Pull/Service-Push/Market-Pull/Service-Push). However, with respect to the challenges which enterprises face at the specific Servitization levels, a more detailed typology can be derived from the model. Figure 11 breaks down the optional pathways into the resulting seven Servitization challenge types. For example, the first type (indicated by arrow number 1) arises when the delivery of supporting Services is implemented at Servitization level 2. At level 3, type 2a stands for an enterprise having established Service Delivery routines, and now implementing Marketing activities. The dashed lines of the box "Marketing" indicate that on this level, Marketing activities have to be established yet, based on the already implemented Service Delivery measures.

The seven Servitization challenge types are intended to help enterprises to define their position in the Servitization process, as well as to focus their relevant challenges on the way to extend their Service business. Combined with the organizational view of the Dynamic Pathway Model of Servitization, it can support Manufacturing Service Enterprises to identify needs for action on the levels of Service tasks, Service roles/functions, Service processes, and Service organizational structures. The achievable effects of the model application will be validated with Use Cases in the further research activities.

5. Change Strategies for the Servitization Process

5.1. Change Dimensions for Enterprises in the MSEE Context

Entering the MSEE context, companies have to meet specific change challenges (cf. Gebauer and Friedli 2005; Martinez et al. 2009). In Figure 12, three main change dimensions are conceptualized as: (1) the Servitization process, meaning to integrate products and Services into customer-oriented solutions, (2) the alignment of partners, work flows and business models within the ecosystem network, and (3) the Virtualization of products and Services by means of ICT.

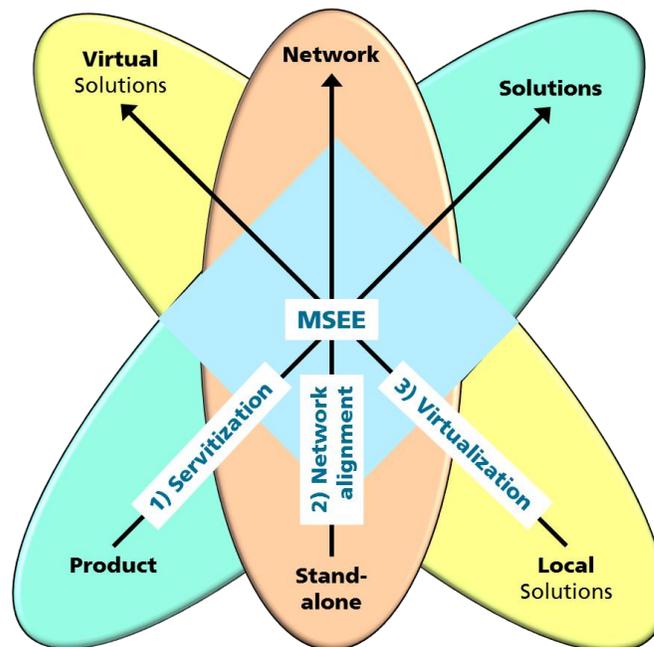


Figure 12 Three Change Dimensions for Enterprises Entering the MSEE Context (Own figure)

As the network (2) change aspects of MSEE are considered in SP2 of the MSEE project structure, and the virtualization (3) issues in SP3, here only the Servitization (1) dimension will be discussed in detail.

The Servitization process is defined here to represent the changes that a company has to accomplish in order to evolve from a product-driven towards a Service-driven company (cf. Foote et al. 2001; Galbraith 2002). Table 7 contrasts characteristic attributes of both types of enterprises. Understanding the differences between both types, allows for defining the substantial change objectives which a formerly product-centric company has to achieve when enlarging its Service business share. As the Service business requires employees to act much more from the customer’s point of view, it implies other knowledge, working routines, and interactions, than a product-centric way of business does. “This difference in orientation is a source of tension that must be overcome if the customer-centric solutions unit is to be integrated into an existing company” (Galbraith 2002).

	Product-Centric Company	Customer-Centric Company
Goal	Best product for customer	Best solution for customer
Value creation route	Cutting-edge products, useful features, new applications	Customizing for best total solution
Mental process	Divergent thinking: How many possible uses of this product?	Convergent thinking: What combination of products is best for this customer?
Organizational concept	Product profit center, product reviews, product teams	Customer segments, customer teams, customer P&Ls
Most important process	New product development	Customer relationship management
Measures	<ul style="list-style-type: none"> • Number of new products • Percentage of revenue from products less than two years old • Market share 	<ul style="list-style-type: none"> • Customer share of most valuable customers • Customer satisfaction • Lifetime value of a customer • Customer retention
Culture	New product culture: open to new ideas, experimentation	Relationship management culture: searching for more customer needs to satisfy
Most important customer	Most advanced customer	Most profitable, loyal customer
Priority-setting bias	Portfolio of products	Portfolio of customers – customer profitability
Main offering	Specific products	Personalized packages of service, support, education, consulting
Approach to personnel	Power to people who develop products <ul style="list-style-type: none"> • Highest reward is working on next most challenging product • Manage creative people through challenges with a deadline 	Power to people with in-depth knowledge of customer's business <ul style="list-style-type: none"> • Highest rewards to relationship managers who save the customer's business
Sales bias	On the side of the seller in a transaction	On the side of the buyer in a transaction

Table 7 Comparison of Product-driven vs. Service-driven Enterprises (Galbraith 2002)

The challenge of a company's Servitization change process becomes even more demanding as most manufacturing companies will not turn over into a complete Service-based company at once, but will establish a hybrid structure, integrating more and more Service business into the manufacturing core business gradually (cf. Thoben 2001).

5.2. Fields of Action for the Servitization Change Process

The enlargement of the Service business share in a formerly product-centric company requires substantial changes on multiple levels (Figure 13).

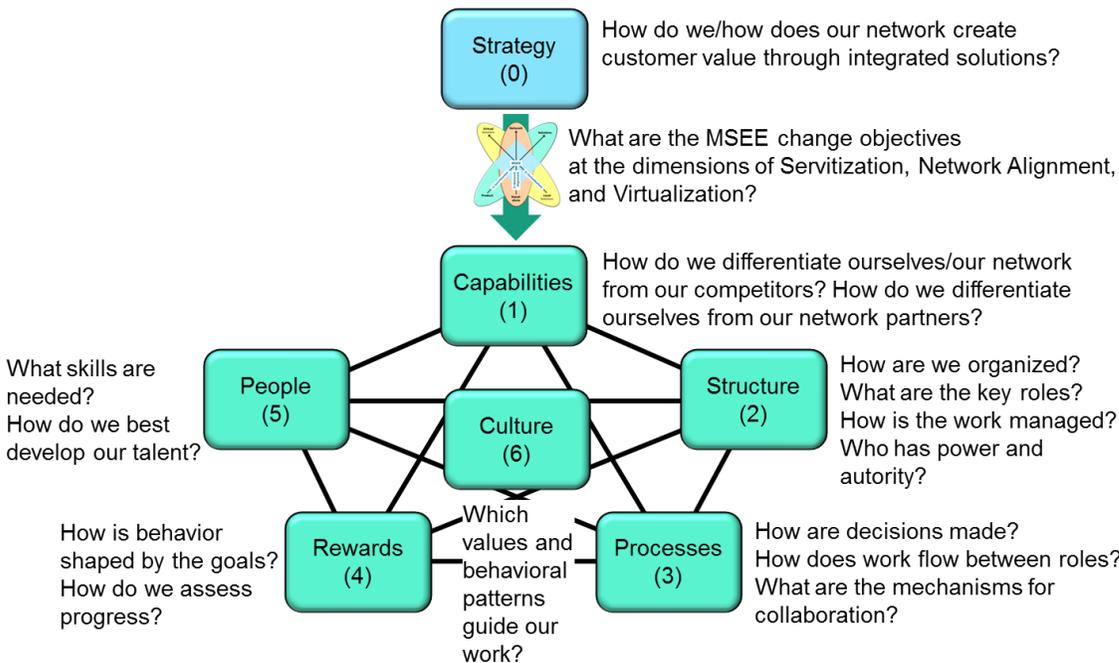


Figure 13 Servitization Change Model: Fields of Action for the Servitization Change Process (Adapted from Kates and Galbraith 2007)

Adapted from the “Star model” of Kates and Galbraith (2007), the model represented in Figure 13 contains six fields of action for mastering the transition from a product-centric to a customer-centric organization. First, strategy (0) is the constitutive signpost, setting the company’s way of what business to deal with and how to handle it successfully. In order to be supportive towards the management of Service business, the other five organizational parameters have to be aligned to the strategy.

A company’s strategy should match the objectives originating from the MSEE context: Requirements of Servitization, Network Alignment within the ecosystem, and Virtualization, should be integrated into a consistent strategic approach. Next, the capabilities (1) – or core competences – are to be synchronized with the strategy, differentiating the enterprise, or its ecosystem network respectively, from its competitors by providing unique combinations of skills, technologies, and processes.

Organizational structure (2) has to account for the different bias of product-centric and Service-centric business units, defining roles, division of work, and allocation of Power and authority. Similarly, the design of business processes (3) (equivalent: operational structure) should determine how collaboration – especially, but not only collaboration between product-centric and Service-centric units – is managed and how decisions are made.

By means of rewards (4), behavior can be guided into the desired direction, e.g. to acquire more Service-relevant knowledge in customer interactions by valuing this knowledge by supervisors. While capabilities (1) refer to competences on a collective level, the people (5) parameter addresses individual skills and talents of employees and managers. For example, it could become relevant if crucial customer knowledge can be developed on the base of the present workforce, or if experts having that knowledge should be hired from the external labor market, additionally. Last, culture (6) plays a decisive part for establishing Service business successfully, as Service-oriented values and behavioral patterns differ substantially from those of product-centric organizations, as shown earlier in Table 7.

Together, the adapted Servitization Change Model can be used to guide enterprises’ efforts to successfully implement Service-centric organizations and to manage the interaction of product-centric and Service-centric units. In the further research activities, the model will be used to identify useful activities for MSEE Use Cases, to manage and align their efforts of improving their position on the depicted change dimensions.

6. Summary and Outlook

Aimed at the support of the Integrated Service Life Cycle Management, three main results have been presented in this Deliverable. First, two specific role models have been designed in order to structure the work contributions within the Service Engineering and the Service Operations Management modules of Service Life Cycle Management. Enriched by elements of state-of-the-art innovation role models and highly customer-oriented Scrum role models, relevant competences and challenges for the individual roles have been systematized.

Second, as roles tie together Service tasks, Service personnel, Service processes and Service organizational structure, the developmental stages of these dimensions are classified in the Dynamic Pathway Model of Service organization development, describing dynamic pathways of emergence and formalization of Service organization elements in manufacturing enterprises. Seven types of developmental stages are derived from the model, to help companies define their current change profile of Servitization.

Third, the Servitization Change Model is presented to support the change activities which come along with the Servitization process. On seven dimensions, the model guides through the challenges of implementing and successfully maintaining Service business in manufacturing enterprises.

Future work will focus on the following issues of Service Life Cycle Management:

- Assignment of Service Engineering tools, methods, and templates, to Service Engineering Roles
- Application of integrated Role-Tool concept of Service Engineering to Use Case and validation of the concept
- Application and validation of the Dynamic Pathway Model of Servitization on Use Case
- Validation and differentiation of the Servitization Change Model along its seven change dimensions. Special attention will be given to the organizational structure aspects of newly implemented Service units in manufacturing companies

As a cross-sectional objective, the development of tools, templates and checklists will be pursued, aiding to transfer the presented models into practice of Integrated Service Life Cycle Management in manufacturing enterprises.

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