敏捷服务工程标准
Criteria for an Agile Service Engineering

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Abstract: Similar to the software industry there are different models for the development, testing and management of services described in literature. The authors of this paper discuss the term of agility, show the boundaries of the Service Engineering proceedings described in literature, show how organizations are in permanent change and development and how this will influence the Service Engineering processes. Furthermore a theoretical design of an agile method for Service Engineering is presented.
Key words: agile service engineering; process orientation; smart services

1   Introduction

Companies and organizations have the urge to invest in innovative and competitive products and services. Especially the service sector is an emerging market due to tertiarization which can be observed in nearly every economy on the world.

The European Committee for Normalization since 2004 conducts a workshop which is dealing on the challenges of tertiarization. In this workshop services are defined as[1]: "*[a] set of predetermined actions taken to satisfy the individual, corporate or communal needs and/ or expectations of others on a commercial, charitable or not-for-profit basis.*"

The Fraunhofer Institute for Industrial Engineering[2] started in 1995 with the research in the field of the designing of actions cited above. The research area was defined as Service Engineering [3]:"*Service Engineering can be understood as a technical discipline concerned with the systematic development and design of services using suitable procedures, methods and tools.*"

Service Engineering became a technical engineering discipline and many case studies related on the procedures, methods and different management as well Information and Communication Tools (ICT) which are used to create a specific service for companies and organizations.

Service Engineering (SE) offers a so called toolbox collection of proceedings, methods and tools which can be used to develop services in an efficient and documented way with high quality [4].

Scanning the literature about service engineering it was noticed that some critical comments should be made.

2   Critical Comments

Service Engineering methods and proceedings are presented without an organizational context. The question of how these methods or proceedings shall be implemented in the operational structuring of the organization is not yet resolved.

• System oriented design models like [5] are very comprehensive. They show Service Engineering as "system-world" in different aspects (so called layers) and try to represent management aspects as well as operational aspects. Again the operational structuring of the organization is not considered.

• Organizations are subject to a permanent change: The Company's organizational structure changes due to the cause of growing[6].A change of

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organisational structure also often causes a change in strategy (cf. Structure follows strategy follows structure) [7]. Service Engineering does not take care of changes in organiza- tional structure as well in the environment.

Fig. 1　Design model by [5]

3　Agile Behavior

The term "agility" is used in different engineering areas:

・Agile software development-is a radical new approach in developing software. Aspects as "*Responding to change over following a plan, Working software over comprehensive documentation, Customer collaboration over contract negotiation and Responding to change over following a plan*" are focusing especially on interaction with customer needs [8].

Processes and tools are also considered due to the fact every product creation process needs a framework. The issue of interaction and responsiveness with the customer are in special interest in agile software development.

・Agile product development - is characterized by being nimble, dexterous, swift and adaptive. It is able to response to new, sometimes unexpected, information that becomes available during product development and it is opposite on to the traditional belief in engineering design

that requirements and design solutions be frozen as early as possible [9].

The adaptiveness and the ability for a quick response on customers reaction is the major point of the production process.

・Scrum-is an agile software development frame-work where the work is structured in cycles of work (sprints), iterations of work (two to four weeks in duration). During each phase of development (the so called sprint), teams pull from a prioritized list of customer requirements (user stories).Doing so features which are of the highest priority for the customer are developed first. At the end of each sprint, a potentially shippable product is delivered [10].

The short development cycles and the strictly orientation on the customers requirements (needs) which are deduced by highly efficient interaction with the customer(user stories)are in foreground. All these approaches are aiming on a common goal: An intelligent interaction possibility with the customer.

This goal is achieved by using ICT supporting the communication between the company that offers products/services and the customer.

To guarantee a strategically oriented design of services a process orientation in the company that offers products/services is needed.

To avoid negative feedback loops on the strategy and the processes in using ICT tools a so called "business systems engineering" proceeding must be ensured.

4　Business Systems Engineering

Relying on [11-13]shows that ICT is not always able to enable a mapping to the supported processes. One reason therefore is the fact that the ICT in charge is not mature enough or the processes are too complex to be supported by ICT.

The effects on this situation are causing problems: ICT influences the processes by adapting it (changing them). The adapted processes in turn influence the strategy. This results in a behavior triggered by feedback loops (see Fig. 2).

Business Systems Engineering serves as a management approach which is aware of this feedback
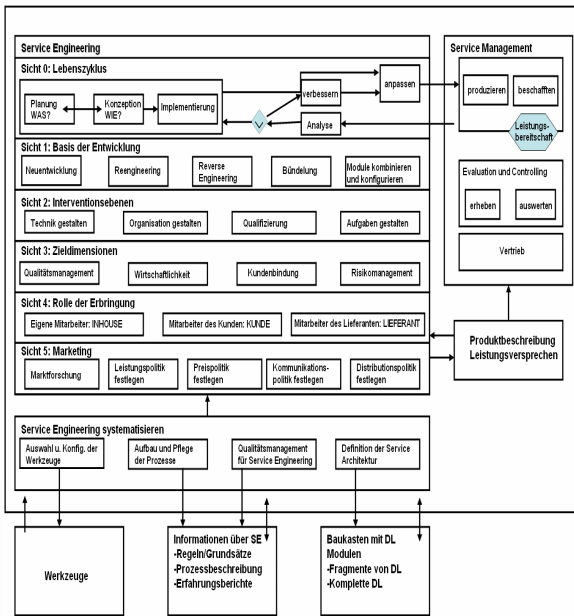
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effect. It focuses on strategy, processes and, ICT to avoid this problem. When dealing with ICT as key enabler for service development and service execution a strictly process-by-strategy-driven development must be followed.
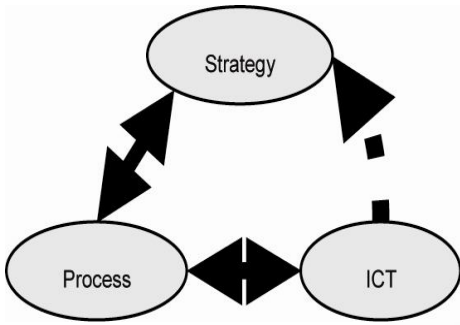

Fig. 2   Influenced strategy through inapplicable ICT[11]

Business systems engineering supports agile behaviour by using real-time and process-focused IT infrastructure to link business strategy change to infrastructure change. In making the three components of strategy, process and ICT more flexible the system shows an improved overall agile behaviour [11].

5   Agile Service Engineering

The approach in defining a proceeding for agile Service Engineering contains on one hand the use of interactivity tools provided by ICT and on the other hand process-oriented engineering methods (see Fig. 3).
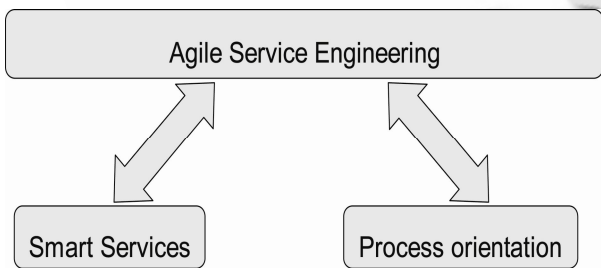

Fig.3   Agile service engineering as combination of smart services approach and (agile Engineering) processes

5.1 Smart services

The traditional way of offering services to customers is adding the services to the product(See Fig.4). Customer needs can be deduced before, during and after the use of the product. These services are often called "must-be" services or Value-added-Services [14]. These services are not in focus of this paper because the development and the execution of these services (consulting, installation, maintenance e.g.) is best described in marketing literature.
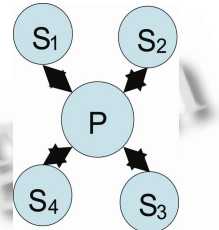

Fig.4   Traditional bundling of services around the product

When using an agile approach organizations must be aware of using so called "Smart Services" [15]: "*Smart services go beyond the kinds of upkeep and upgrades you may be bundling with your product, both in their value to customers and in their cost efficiency to you. To provide them, you must build intelligence – that is, awareness and connectivity – into the products themselves. And you must be prepared to act on what the products then reveal about their use.*"

Smart Services are service components that are built into the product itself (see Fig. 5). This does change the view of perspective for the designer of services.
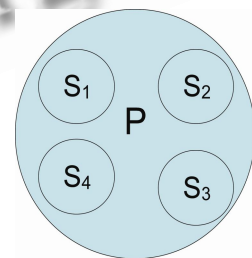

Fig.5   Smart services are included in the product

Smart Services can be seen as connected components that offer at least on of the following ad-ons [15]:

• Status: This application is able to report on the operation, performance and usage of the product or the service.

• Diagnostics: This application enables a device to self-optimize and allow troubleshooting, monitoring and repair.

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•Upgrades: With this application the performance of a given device is optimized.

• Control and Automation: Coordination of the sequenced activity of several devices.

• Profiling and Behavior Tracking: This application monitors variations in the location, culture, performance, usage and sales of the device.

• Replenishment and Commerce: This application monitors consumption of a device and buying patterns of the user. The application can initiate purchase orders or other transactions.

• Location Mapping and Logistics: The service support system can be optimized with this application.

The connected devices are a powerful tool which on the one hand provides special service features to the customer (self-optimizing of the product, upgrades e.g.) and that on the other hand provides data regarding the usage (status, diagnostics, profiling and behavior tracking e.g.) of the product to the service provider.

Two different goals can be reached:

•Goal 1(customer-based):To offer preemptive servi-cees（"the company's actions are based upon hard field intelligence"）: Service before the customer knows or even expects that he is being serviced.

• Goal 2 (company-based): Using the collected data a service provider has the opportunity to support the customer in his business, is able to customize the products and does have statistical material for the business intelligence proceedings.

Important Aspects when dealing with Smart Services:

•Security aspect: The approach in using these Smart Services demands a trust in the provider of the Smart Services due to the fact that user data is computed.

With clear, offensive and transparent information about what data will be collected and how this will benefit the customers business efforts these problems can be avoided(even offering the source code of the imple-mented Smart Service in the field of high security

products can be a trust building factor).

• Visualization of the services to the customer: Due to the fact that the Smart Services are operated "hidden" (in the background) the benefits of the Smart Services which are offered by the company shall be visualized.

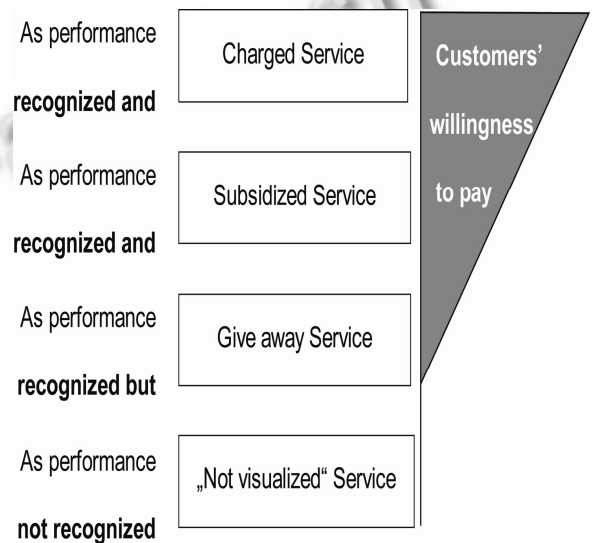Only services which can be noticed by the customer can be charged (See Fig. 6)[16].

Fig.6　Willingness to pay for a service [16]

5.2 Process orientation

In general there can be made a subdivision into four different kinds of processes in a business environment [17](See Fig. 7):

• Management Processes: Strategic considerations by the company's management; Alignment of all resources to guarantee the successful implementation of products or services;

• Service Processes: All support activities to help generate value; Offering all information and materials needed to generate the product or the service;

• Value Defining Processes: Task of the operational Management to convert the strategic goals into process steps;Offering tools (machines, instruments, proceed-ings)for the implementation value creating process); and

• Value Creating Processes: The process of the

creation of the product or service. It needs all other three processes to be generated.

The goal of every business process is to generate customer satisfaction by focusing on the customer needs.

Using Smart Services and process orientation an agile behavior can be ensured: As the customer needs changes (noticed via Smart Services business intelligence analysis e.g.) the service provider changes the strategy and that results in a change of the underlying processes.

The interconnection between strategy and processes support the exchange of the product/service elements to fit the new customer needs. ICT is a key enabler of changes: With the help of the data gained from Smart Services the key for the development of highly efficient services is given.
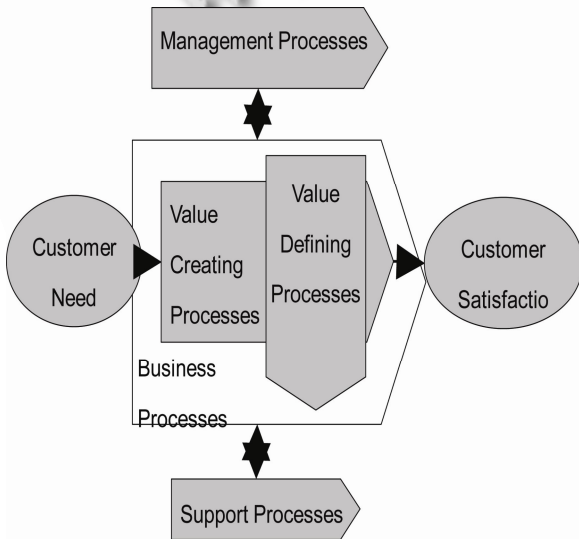

Fig. 7　Processes in process oriented organizations [17]

ICT in form of Smart Service supports here in every process:

　• It helps in identification the customers needs;

　• It offers statistic material for the strategic management;

The sharper identification of the customer needs with ICT helps in developing the Value-Defining Processes which offers the tools for the new service and

　• offers better understanding for the service processes which have to support the Value-Creating Process with information and/or materials.

Service Engineering methods, tools and proceedings which are described in literature or which are described in case studies are with the help of Business Systems Engineering easy to implement: The company identifies the tools and proceedings in Service Engineering literature and builds on this basis and on the basis of the organisations characteristics its customized Service Engineering Management Processes and Service Engineering Value-Defining Processes.

ICT using Smart Service philosophy and business-process driven approach is the key to agility. One will get

　• a closer contact to the customers with a better insight in the customers behavior and needs and faster changes in the organizations processes when the customer needs are changing.

6　Summary

In this paper the criteria for agile Service Engineering were discussed:

　• The use of Smart Service ideology and technology (connectivity)

　• The use of process-driven proceedings which are able to respond to changes in organizational structures and are easily adapted on the changes in strategy

Agile Service Engineering proceeding is aiming on a closer contact to customers, a sharper identification of customers service needs and on a faster time to market for developed services. This can be obtained by transforming the organization into a process oriented system.

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