Published in Lecture Notes in Computer Science, volume 8135, 2013, pp 94-103
which should be used for any reference to this work
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Putting the Customer Back in the Center of SOA with Service Design and User-Centered Design

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Abstract. This article introduces a methodology used for designing the online presence of a Swiss SME providing Cloud Services. The Web application used for the purchasing and administration, backed by a Service-Oriented Architecture (SOA), has been designed to be customer-centric using a combination of different techniques borrowed from the fields of ethnomethodology, service design and user-centered design. The tools employed include service blueprint design and affinity diagram analysis followed by prototyping and subsequent usability evaluation. This collaborative methodology explained with the help of the applied research project use case is seen to yield excellent results in terms of customer-orientation.

Keywords: Service Design, User-Centered Design, Service Oriented Architecture

1 Introduction

The concept of service has two distinct meanings [6]. On the business front, it represents the business service exposed to the customer. On the technological front, a (software) service represents a small software component encapsulating specific functionalities, and is the basis of a Service-Oriented Architecture (SOA).

SOA is the method of choice for structuring large software systems into discrete business components (i.e. individual services). It helps adapt software to changes in business processes and thus provides an excellent way to develop applications for supporting business processes [4, 17, 19]. However, use of this model alone does not ensure customer friendliness to an application developed with the help of the SOA. Indeed, the approaches for engineering an SOA and align the business with IT do not typically include the customers themselves. They start downstream after the definition of business services. Therefore the link between the customer needs and the individual software services is generally not explicit [6, 9].

To overcome this shortcoming, we propose to employ an interdisciplinary methodology combining user-centered design [12, 15] and service design [8]. Those approaches have been found to help manage the complexity of software [21], ease their use [7, 14] and improve the satisfaction of the customer [8]. Therefore our goal is to

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combine those methods to design an SOA-based application exposed to the final customer with explicit links between the customer needs and the related software services.

User-centric principles were already applied in the context of SOA by previous research [5, 18]. However, the intent was to facilitate the re-use of software services by the developer calling the services, and not to improve the quality of the service delivered to the final customer as in our case. Therefore, the originality of our work is the mix of user-centered design and service design to explicitly align the needs of the customer with the SOA.

This article presents our methodology in the context of a use case conducted with a Swiss Cloud Services provider. We start by presenting the situation at the beginning of the project and the goals. We present next the methodology, starting from the data collection, moving to the interpretation and recommendations for the design. Lastly, we discuss the methodology and results.

2 Initial Situation and Project Goal

Krios is a ten-year old Swiss company active in the Cloud Computing business. It offers mainly PaaS, DaaS and SaaS services to SMEs in Switzerland. As the products portfolio of Krios has grown organically along the years without a clear overall structure, it became extremely challenging to manage the settings of each particular product that was technically organized as an independent silo with an ad hoc administration interface. In case of changes, this leaded to problems like lack of traceability of processes, too many ad hoc administration consoles or increased risk of manual errors. To overcome those problems, an important redesign project was launched. The goal of this project was twofold: first, tackle the backend complexity by adopting a Service-Oriented Architectural framework to allow the integration of the different software silos; second, reduce the frontend complexity through the design of a web application, called INFOPLACE, that must be built on top of the SOA and presented to the final customer. The INFOPLACE will allow the customer to purchase and administrate the different services Krios offers. The focus of this paper is on the design of the INFOPLACE and its link to the SOA.

3 Methodology at a Glance

Consistent with previous research [11], the project team consisted of members belonging to a variety of backgrounds including service design, business process management, computer science and interaction design. The methodology chosen reflects those various backgrounds by borrowing mainly from the fields of service design and user-centered design. It consists of 9 steps distributed in 4 phases, as depicted in Fig.1. First, data gathering is done in three stages. Then the results are consolidated in the data interpretation phase that provides the material for the main phase "Design from insights". This phase introduces the service blueprint that links the SOA with the customer needs. The service blueprint then provides the basis for the wireframing and

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information architecture of the final application. The application is finally prototyped and evaluated in a last phase. In the following sections, we describe the methodology in greater details.

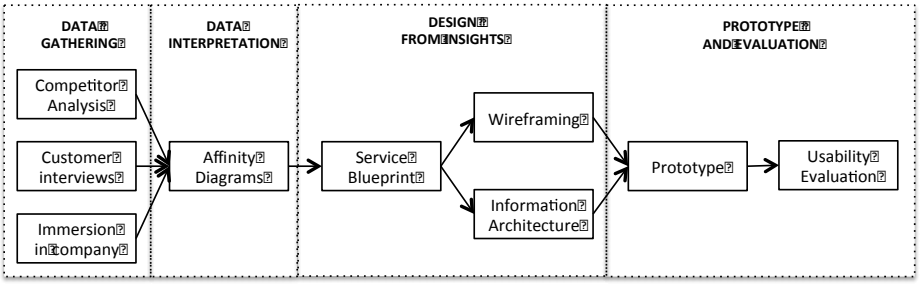

Fig. 1. Phases and steps of the methodology

4 Data gathering through Ethnomethodology

Considering services are based on human factors (expertise, experience, empathy and other non-quantifiable qualities), quantitative techniques are insufficient to study and evaluate the status of a service. Ethnomethodology is a powerful tool for studying contexts, behaviors and activities that the service environment is comprised of [13]. Ethnomethodology could be conducted "through site visits, immersion work, and contextual semi-directed interviews with service providers and service consumers in order to identify the salient attributes of a given service experience" [10]. In context of the current project, ethnomethodology was done in three phases:

4.1 Phase 1: Competitor Interface Analysis

An assessment of user interfaces of the competition faced by Krios was done first. The competitors chosen were Amazon, Office 365 due to their worldwide reputation, Swisscom, a Swiss IT services company and Infomaniak, a direct competitor of Krios. The goal was to gain understanding of how these competitors provided their services through their respective user interfaces. The assessment followed a simple protocol of visiting the home page, purchasing and customizing a service. This was supplemented with Heuristic Evaluation [16] to identify the usability strengths and weaknesses of three of the service vendor interfaces i.e. Swisscom, Office 365 and Amazon. For this evaluation, the evaluator spent around one hour with each of the interfaces. This phase provides us with a list of best practices in the domain.

4.2 Phase 2: Semi-Structured Interviews With Customers

Following a semi-structured interview protocol, a total of 8 participants, including 5 customers, 1 collaborator of Krios and the 2 managers of Krios were interviewed. All interviews were conducted contextually. Two to three members of the team would conduct the interviews. Field notes were made of observations and important user

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statements. The topics addressed were divided into mainly four parts, General context of work, Experience of Krios services, Quality of service and other category-relevant general questions. This phase provides us with the customer's expectations.

4.3 Phase 3: Immersion work at Krios

Three team members visited Krios during working days and focused on understanding the physical, organizational and technical environment to identify the underlying performance drivers. A detailed task analysis session [12, 20] was conducted to understand the existing system and the information flows that are important and need to be incorporated into INFOPLACE. It was videotaped and reviewed for interpretation. Moreover, Krios provided us with a detailed list of their current Information Systems and their dependencies to the business services. This phase provides us with the back office's constraints.

5 Data Interpretation

On retrospective analysis of the interview transcripts and videos, extensive notes were made about the key observations, user statements, breakdowns and design ideas. Notes made during this interpretation session were then used in doing a user-centric analysis using the Affinity diagram tool. An effective data consolidation technique [2], this helped map the issues and insights into a hierarchical diagram and summarize details, prioritize issues and find patterns and insights in interpreted data. The main outcomes of interpretation sessions were as follows:

1. Simplicity in design emerged as an important factor. By comparison to the former Krios administration interface and intelligent borrowing from competitor interface analysis, recommendations for design emerged.
2. The customer's main requests were identified as: changing user data, account creation or removal, permission change and service purchase.
3. Since INFOPLACE was intended to be an online customer service offered by Krios to assist in purchasing and consuming their services, it was considered post-interpretation sessions by the Krios management that assistance for purchase should be provided through implementation of wizards. Focus was given to design work on "service purchase" in accordance with Krios
4. The services provided by Krios can be roughly divided into three categories: hosting, SaaS and customer service. INFOPLACE belongs to the customer service category.
5. Based on the insights gained after interpretation, it was understood that as a service consumer, every user assumes at any given point one of the two roles on INFOPLACE defined as follows: (a) Master User (while performing enterprise transactions with Krios and managing employees and accounts, role imparted as the point of contact of an client enterprise of Krios); (b) Base User (while consuming service and using products, the role of end-users). Differing INFOPLACE needs were found to belong to two categories based on functions and tasks to be

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done. These roles help define a user's access on INFOPLACE so that appropriate features and components of service can be availed based on the roles.

6 Designing from Insights

6.1 Service Blueprint

The technique of Service Blueprint is particularly well suited to "capture the entire customer service experience from the customer's point of view". Its goal is to improve the perceived quality of service by identification of failure points in a service operation [3].

The technique helps in distinguishing visible activities (onstage) from support activities (backstage) from the customer's point of view. Five elements compose the Service Blueprint: Customer actions, Onstage/Visible Contact Employee Actions, Backstage/Invisible Contact Employee Actions, Support Processes and Physical Evidence. The Physical Evidence is the concrete result presented to the customer in response to their action. Based on this physical evidence, the customer evaluates the quality of service. The Support Processes indicate the role of the underlying IT systems, thus providing a direct link between the needs of the customer and the SOA. This is the main input of our interdisciplinary approach applying a combination of user-centered design and service design.

Different steps are needed to build a Service Blueprint: (1) clearly articulate service process, specify which segment of customers is the focus of the Blueprint, (2) delineate the actions of customers, (2) delineate the contact employee actions, both onstage and backstage, (3) delineate the support processes, (4) add links that connect the customer to contact employee activities and to needed support functions, (5) add the physical evidences [3].

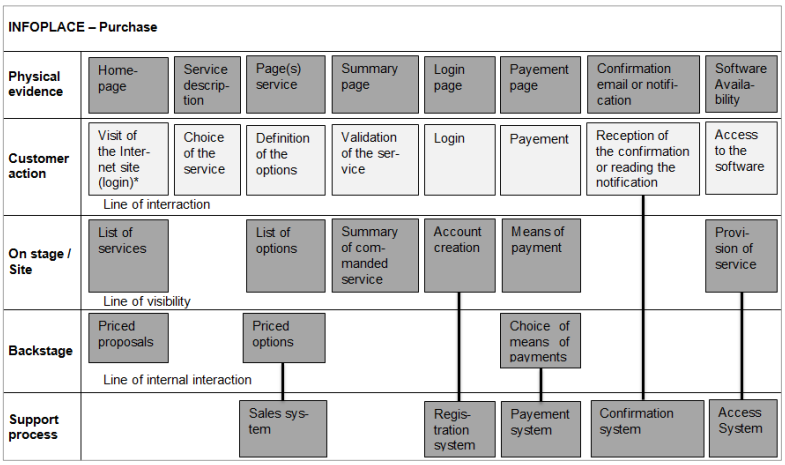

Fig. 2. Service blueprint for Purchase of service

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Fig.2 presents the Service Blueprint corresponding to the purchase of a service that was identified as a critical function of INFOPLACE. To build this Service Blueprint, we used the outcomes of the competitors' analysis (best practices) and of customer's interviews (customer expectations) consolidated in the affinity analysis phase. First, the customer's actions needed to buy a service were identified, and then the necessary steps needed by Krios (backstage). Those were then linked with the underlying SOA (support process). In parallel, the information that INFOPLACE must provide to the customer (onstage) was added. At the end, the physical evidence was included.

In this context, the Service Blueprinting technique helps outline the various processes that must take place onstage or backstage. Based on these processes, calls to the SOA for the respective service/business function is identified (Support Process shows the called systems) and directly related to the customer actions.

6.2 Wireframing

Based on the service blueprint designed for purchase of service, we designed wireframes for service purchase using the customer actions and on-stage features identified. Wireframing helps in designing the layout and positioning of features related to the task. Also, navigation from one screen to another for accomplishing the task is designed. The first two screen views of the "purchase service wizard" are shown in Fig.3.

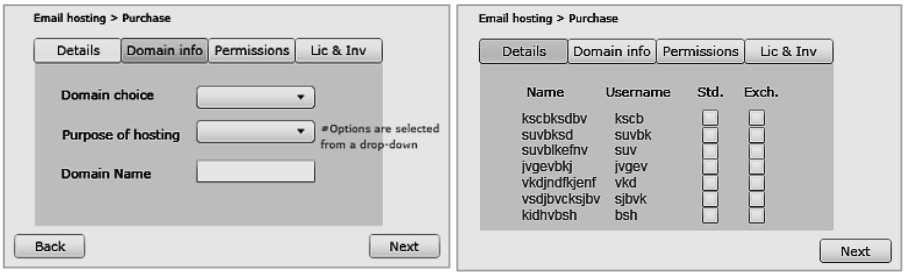

Fig. 3. Wireframes of the Purchase wizard for email-hosting service purchase

6.3 Information Architecture

In coherence with Service Blueprint and related task screens, the information architecture of Infoplace was built. Such architecture **decides the content and hierarchy** of screens, based on tasks (customer's actions of service blueprint) and functions (support process of service blueprint) to be performed, taking into consideration user's navigational paths (physical evidences of service blueprint) and **structures the information** to be delivered. **For example**, at the first level of architecture, the home screen would have an **option for purchasing a particular service**, say E-mail hosting. On clicking this, the user is displayed a screen with information about service **followed by a wizard of service purchase** in the third level. Post completion of this wizard, the user is displayed the relevant information of licensing, invoices and final-

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ly informed of purchase after which he returns back to level one of architecture, the home screen. In this way, the information architecture structures the information within the INFOPLACE.

Similar to the above described service purchase scenario, various features and functions were designed using service blueprint and wireframing techniques and incorporated into the architecture. Some of the features that materialized into design have been mentioned below in Table 1. Design implications for these features coming from domains of service design and user-centered design are mentioned. Second and third columns of the table ascertain how the features are implemented using knowledge from the corresponding domains. For example (see last row of Table 1), letting the customers give their feedback to the site administrators in case of problems was identified as a desirable feature of INFOPLACE. For helping customers who are facing problems, a complaint lodging system was designed. Complaints are then notified to the Admin who addresses the complaints and users are then notified about rectification of the problem. The Admin can also provide additional information to customers. These were the implications of user-centered design. For such complaint lodging and addressing to take place, the system of confirmation process enables notification of messages to the Admin and customers. This is the implication of Service design.

Features Desired	**Implications from Service Design**	**Implications from User-Centered Design**
Easier setting of permissions	Centralized functionality for setting permissions	Permissions categorized based on employees, products
Efficient management of purchase orders, invoices and licenses	Choice of mode of payment through System of payment process	Purchase wizard for easier and user friendly purchasing and invoicing
Information about problems faced, address complaints	System of confirmation process enables notification, reception of messages	Complaint lodging system, notifications sent about the problems and what is done

Table 1. Sample of the features desired and their design implications

7 Prototype Implementation and Usability Evaluation

Once the initial design was finalized, the visual design proposed was combined with the layout of Krios website in order to retain consistency. The final screens can be seen in Fig.4. In order to further improve the quality of the interface design, the INFOPLACE prototype was evaluated by five usability experts using Nielsen's heuristics [16]. Suggestions for solving the usability problems found were then given from perspectives of design as well as development. The most severe problems will be corrected prior to release of INFOPLACE.

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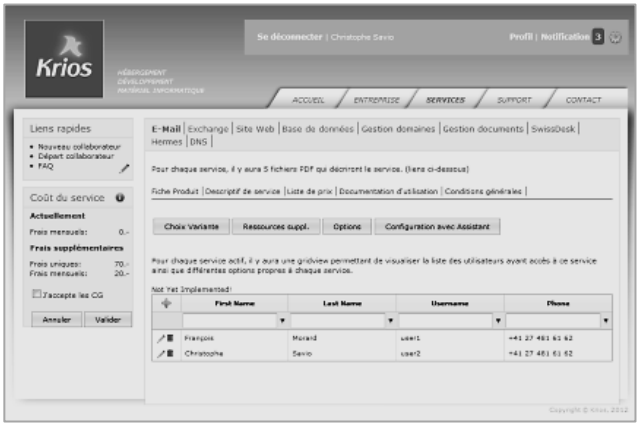

Fig. 4. A prototype screen of INFOPLACE

8 Discussion and Conclusions

The service-oriented architecture (SOA) facilitates scalability, availability and performance of service. However, along with this, it is necessary that service-orientation must be aware of the desires and needs of its users. User centered design (UCD) methods help in bridging this gap. We have proposed in this article an interdisciplinary methodology combining a customer-oriented focus given by the Ethnomethodology and the Service Design, with UCD methods from Interaction Design perspective. Needs and goals of customers and users were identified using a combination of competitor interface analysis and interviews as part of ethnomethodology. Service design blueprint increased the understanding of customer-oriented business processes and their links to the underlying systems. Such an interdisciplinary approach facilitated participation among team members and led to a dynamic process of work by drawing inputs from the different skills and expertise within the team. An important side effect of the project is that the findings have motivated Krios management in simplifying their products portfolio, for example, reducing their products list, providing preconfigured packages with appropriate pricing, hiding details of parameterization of services i.e. providing less complexity to the user. Also, a follow up study is planned to evaluate the acceptance of the new system amongst the customers. Thus, it can be said that, thanks to this project, Krios has progressed onto higher rungs of the usability maturity ladder, moving on from "Unrecognized" or ignorant to the "Implemented" or the enlightened stage [1]. In line with this, it was observed that commitment by top-level management of Krios proved to be a tremendous drive in the effective and timely realization of this project.

Lastly, the authors are convinced of the value of such collaborative work in gaining customer satisfaction by moving from workflows over SOA to customer experience focused design using collaboration between UCD and Service Design.

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