

## A Methodology of Persona-centric Service Design

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### Abstract

In order to clarify the customer's inclination and provide them with better services, the persona-scenario method has been accepted in Requirements Engineering. A CAD tool proposed in Service Engineering also adopts persona-scenario and focuses on denoting and visualizing the quality factors in service receivers. However, the process of service development with persona has not been fully discussed yet. This paper proposes a methodology to identify the boundary of a whole service system with role and user personas, and formalize the procedure of service development with them. The methodology in service development is exemplified through e-learning services.

### Keywords:

User centric design; Requirements Engineering; Service Engineering; CAD

## 1 INTRODUCTION

Transformation from product business to service business is a trend in the manufacturing industry. In order to meet the needs of the time, research has been done on the Product-Service System (PSS) [1] and more specifically the Industrial Product-Service System (IPS<sup>2</sup>) [2]. This research will contribute to reducing environment load and realizing a sustainable society, though these discussions mainly argue for alternating functions which are offered by products into services conceptually so far. The transformation will be realized through reconfiguring the conventional value space in the business model and rebundling it by promoting density of opportunities in the system [3]. Aimed at realizing the transformation and facilitating the trend toward a service economy, there is a need to establish a methodology to systemize and industrialize the process of servicing.

To realize this, it is necessary to have the following procedures: (1) to disintegrate notionally conventional products and services into functions that have been offered to users, (2) systemize a mechanism to reorganize the functions. Establishing a method modelling the structure of a service system which provider and receiver take part in will enable us to realize the procedures. From this standpoint, our current research can be classified into two categories:

### *Service Design*

Service Engineering [4] [5] [6] [7] studies the mechanism of the service, and provides denotations and expressions which PCs can handle. A CAD tool, Service Explorer aims to reuse service knowledge for designing and evaluating a service. It focuses on human acts that possess and consume products and services – subjective view of people and organizations. It enables us to draw interactions between a service provider and a receiver in a flow diagram, and depict state changes in receivers using parameters.

### *User Centric Design*

User Centric Design (UCD) makes product planning user-oriented. As human-centred design has been recognized and established, (e.g. ISO13407: human-centred design processes for interactive systems), product planning has been to put more emphasis on a needs-based development approach which starts from knowing customers' preferences and behaviour than the seeds-based approach which is technology-oriented product development [8].

The Persona Method [9] [10] is a branch of the UCD method. It is a method which proceeds with product development by designing virtual users in detail and assuming that they use them. The method enables the design of a virtual user which reflects family lifestyle, motivation for work, or demands to achieve his/her goals. Companies are expected to adopt the method hereafter.

UCD has also been discussed in Requirements Engineering [11] - a field of Software Engineering. User-Centred Requirements Engineering has been proposed to manage users who have various goals. Persona-scenario-goal methodology integrates Goal Orientation with the Persona Method to negotiate conflicting purposes [12].

In the two research categories, persona is effectively applied to the early phase of service design. However, comprehensive supply for customer's expectation is still difficult to realize. Being different from products, the service has unique features: 'intangibility', 'simultaneity', 'heterogeneity', 'perishability'. These features show that introduction and aftercare of a service are important factors for customer satisfaction. Although conventional persona methods mainly focus on the phase, a viewpoint of phases in advance or afterward of service experiences must be considered.

However, these phases of service encounters include several service functions, such as promotion or follow-up aftercare, which multiple people with roles on the vendor side provide. Therefore, the service system seems to expand greatly, and it is hard to ascertain the boundary of the service system comprehensively, and optimize the system.

Solving these issues and frameworking the procedures to design services are the urgent tasks. The next chapter explains the procedure of designing services.

## 2 METHODOLOGY OF PERSONA-CENTRIC SERVICE DESIGN

We propose a persona-centric service design methodology. The methodology models a service system with stakeholders and their interactions in terms of service function. It minimizes disparities between quality levels designed by service providers and the level of expected among service receivers.

Persona-centric service design methodology denotes all stakeholders involved in a service system as personas. Persona is defined in two types. One is 'User Persona' who will be the final user of the service, and the rest of the stakeholders are denoted as 'Role Persona'. Figure 1 shows the architecture of the persona-centric service design system. A user persona has 'important value list' and 'use case list divided by each phase'. A use case divided by each phase of service encounter is a combination of 'scenario' and 'degree of importance'. A role persona has a 'function list' which denotes each function provided to other personas.

The next section explains the procedures of developing personas, identifying a service system boundary and minimizing quality disparities among service providers and receivers.

### 2.1 System Modelling with Personas

System modelling with personas designs a target user at first and then models service functions which are provided by role personas in the provider. Figure 2 shows the steps.

1. Collect a mass of individual information on services - how much importance they put on quality - through questionnaires to target a user group.
2. Cluster these collected data and choose an arbitrary group that has characteristics suitable to the target based on business decision-making.
3. Extract important value data among information on important quality degree by methods such as multivariate analysis. Then, list the extracted results as an important value list.
4. Interview some individuals who are in the group mentioned above and make a list of important values.
5. Calculate a degree of similarities with the important values, and identify a person who has the highest similarity. Then, complete user persona information by using the use case as supplementary information of user persona.
6. Nominate stakeholders in service providers and receivers, and nominate functions that each persona gives to other persona. Then, make role personas. With interview results, put importance on each function and complete role persona information.

These steps enable us to find service functions and depict the service system broadly. The following procedures clarify the functions and the boundary.

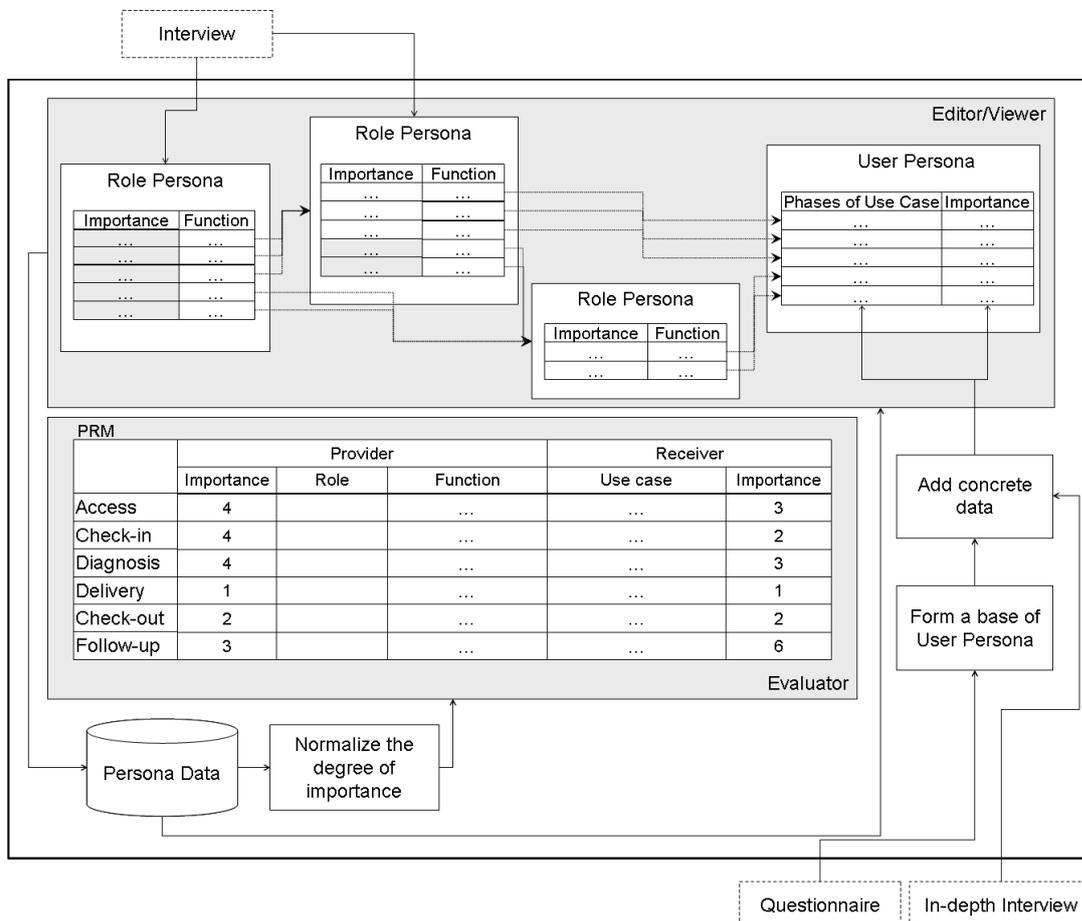


Figure 1: Persona-centric Service Design System

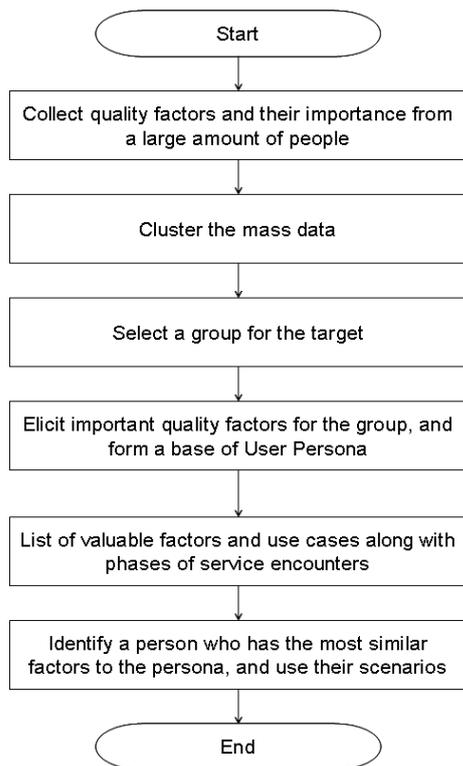


Figure 2: Flow chart of designing User Persona

## 2.2 Identifying Service Boundary

After nominating personas with functions, the boundary of service system will be specified. The Provider-Receiver Map (PRM) retains the correspondence relation between consumers' phases of use case and service functions from provider. By having importance rates for both use cases and functions, the difference of service quality levels between provider and receiver is clearly observable. The first half of figure 3 shows the steps.

7. Correspond between each use case and a function in role persona one-to-one. In the persona-centric service system (fig.1), this step is to connect them on the editor.
8. Confirm whether each of use case based on the process of user persona is all related to either function of role persona. When there is no corresponding function in role persona, analyzing and extracting role persona would be inappropriate. In this case, extract functions in provider again until they correspond to both sides perfectly.

It is difficult for the service developers to confirm how many stakeholders they should consider. However, with these steps, necessary and sufficient stakeholders with functions will be extracted. As a result, the service system boundary will be identified in a user-oriented way.

## 2.3 Optimizing Service Functional Quality

After determining the service system, the design of quality level of service functions can be optimized. The latter part of figure 3 shows the steps.

9. When the correspondence is clarified, persona information can be processed in a comparative way, by normalizing each value on the user persona importance

and role persona importance respectively. Complete the PRM table with them.

10. Find disparities by comparing relative importance
11. According to the above disparities, providers redesign the function of service providers

The next chapter verifies the methodology and evaluates the effectiveness by applying these procedures to actual services.

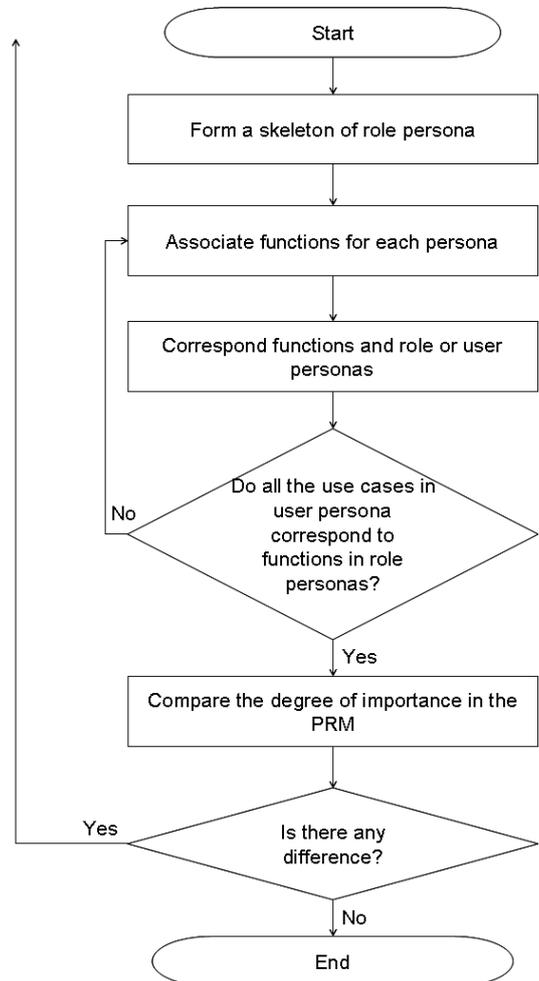


Figure 3: Flow chart of designing Role Persona and optimizing the quality of functions

## 3 CASE STUDY

E-Learning services have spread rapidly in Japan since 2000. The market continues to grow 10% annually. The BtoB segment accounts for 83% of the market and BtoG or BtoA segment 13%. However, the BtoC segment (business to individual customers) is only 4%. Therefore, there is a potential for business opportunities in the BtoC area. The following shows a case study of developing a new e-learning service for individual customers.

### 3.1 System Modelling with Persona

#### User Persona

1, 2. Firstly, items and structure of questionnaires were designed. In order to provide comprehensive quality factors, 'words lists', a part of Service Templates based on a standard list of quality factors, defined in Service Explorer were used. Then a survey was conducted on around 10,000 men and women on the net. Figure 4 shows segmentations of surveyed people by personality

(specifically according to level of self-motivation) and by experience in e-learning. From a marketing point of view, the group accounts for only 3.7%, however people who are self-motivated and inexperienced in e-learning are the most promising customers.

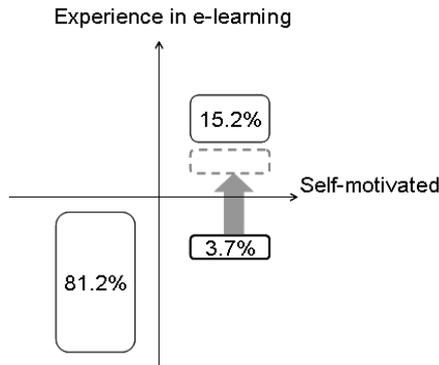


Figure 4: Segmentations

3. Secondly, we extracted data of people who are self-motivated and inexperienced in e-learning, and analyzed it. Table 1 shows the customers' attitude towards quality factors and how important they think those factors are, and how much they expect from those quality factors. Some factors, such as 'credibility', 'appeal' and 'low price', show relatively large gaps between their importance and expectation. Focusing on these factors is significant to stimulate expected customers to start to use e-learning services.

How customers access services differs from person to person, so, it is difficult to depict the concrete lifestyle of a person from the statistical data. To draw realistic scenarios, the most suitable person was selected from the survey, and his/her scenarios were used.

Table 1: Quality factors of e-learning for target customers

	importance					expectation				
	high	4	3	2	low	high	4	3	2	low
ease	32%	41%	20%	3%	3%	15%	43%	33%	7%	2%
credibility	20%	49%	24%	4%	2%	5%	35%	47%	10%	3%
quickness	21%	42%	31%	3%	3%	10%	36%	45%	8%	2%
appeal	22%	41%	29%	5%	2%	7%	30%	48%	12%	3%
intellectuality	16%	39%	41%	2%	2%	5%	33%	54%	6%	2%
low price	27%	38%	28%	4%	3%	6%	29%	48%	12%	5%
certainty	14%	45%	34%	4%	2%	5%	27%	54%	12%	3%
sincerity	15%	41%	36%	6%	2%	4%	27%	53%	13%	3%
trend	17%	39%	35%	6%	2%	8%	30%	53%	6%	3%
gainfulness	14%	36%	43%	5%	2%	5%	27%	59%	7%	3%

4, 5. In-depth interviews were conducted on 10 business men and women. Five people (A, B, C, G and H) were chosen who are in the target segment. Then, their factors were compared and the one whose factors are the most similar to the patterns in step 1 was identified. Person A in table 2 was the most similar to the persona, therefore his scenarios will be used to depict the lifestyle.

The user persona finally identified is shown in figure 5 and table 3. The persona name is *Toru Mori*, aged thirty-six. He has a wife and a daughter. He is a section manager at a manufacturing company. He studies a lot to keep up with the changes in his business environment. He likes to watch human documentary films. In his everyday life, he values: 'fun and enjoyment in life', 'sense of accomplishment', and 'warm relationships with others'.

Table 2: Quality factors and their importance

quality factors	true / false					weigh	similarity				
	A	B	C	G	H		A	B	C	G	H
ease	1	0	0	0	0	0.54	0.54	0.00	0.00	0.00	0.00
credibility	0	0	0	0	0	0.70	0.00	0.00	0.00	0.00	0.00
quickness	1	1	0	0	1	0.46	0.46	0.46	0.00	0.00	0.00
appeal	1	0	0	0	0	0.66	0.66	0.00	0.00	0.00	0.00
intellectuality	1	0	0	0	0	0.64	0.64	0.00	0.00	0.00	0.00
low price	0	1	0	1	0	0.56	0.00	0.56	0.00	0.56	0.00
certainty	0	1	0	1	0	0.63	0.00	0.63	0.00	0.63	0.00
sincerity	1	0	0	0	0	0.65	0.65	0.00	0.00	0.00	0.00
trend	0	0	0	0	0	0.57	0.00	0.00	0.00	0.00	0.00
gainfulness	0	0	1	0	0	0.53	0.00	0.00	0.53	0.00	0.00
total							2.69	1.65	0.53	1.19	0.46

Name: Toru Mori	Picture: 	Basic List of Values <input type="checkbox"/> Sense of belonging <input type="checkbox"/> Self-respect <input checked="" type="checkbox"/> Fun and enjoyment in life <input type="checkbox"/> Excitement <input type="checkbox"/> Security <input type="checkbox"/> Being well respected <input type="checkbox"/> Self-fulfillment <input checked="" type="checkbox"/> Sense of accomplishment <input checked="" type="checkbox"/> Warm relationships with others
Age: 36		
Gender: male		
Family: wife, daughter		
Daily Life: <ul style="list-style-type: none"> <li>• read internet news, newspapers, business magazines</li> <li>• watch TV news programs</li> <li>• study new technologies, and read books actively to meet business opportunities</li> </ul>	Personality: <ul style="list-style-type: none"> <li>• like to watch human documentary films</li> </ul>	
Career: <ul style="list-style-type: none"> <li>• BA, Engineering</li> <li>• manufacturing A co. (-2003)</li> <li>• manufacturing B co. (2003-)</li> <li>• Worked in R&amp;D departments in both companies. Transferred to the sales division.</li> </ul>	Memo: <ul style="list-style-type: none"> <li>• Section Manager in 2006</li> <li>• started to take an MOT (Management of Technologies) course in 2007</li> <li>• took compulsory in-house e-learning courses</li> </ul>	

Figure 5: User Persona

Table 3: Quality factors

Activity	Requirement	Quality Factor
Advertisement	Get the latest course information	Appeal
Participation	Select a hands-on course	Reasonable fees
Content	Select a hands-on course	Trend
Search	Ease of finding the best course	Ease of finding course
Course Information	Select a hands-on course	Sincerity, Reliability, Intellectuality
Provider	Select a reliable provider	Reliability
Business results	Expect favourable outcome	Sincerity, Reliability, Intellectuality
Required environment	Get the IT environment information	Comprehensiveness
Placement	Take a suitable course	Convenience, Certainty

Application procedure	Certainly apply for a course	Ease of applying
Business hours	Have flexible timetable	Ease of use, Reasonable fees
Materials	Get practical knowledge, skills	Interest, Intellectuality
Payment	Pay tuition fee easily and safely	Convenience
Accomplishment	Get a sense of achievement	Superiority
Customer service	Maintain motivation	Sincerity
Skill improvement	Develop potential ability	Course line up

6. Then role personas are modelled. Through five vendor hearings, five role personas are nominated:

#### Course Administrator

The course administrator supervises the content developer, system administrator, help desk and course planner.

#### Contents Developer

The content developer develops, creates or revises a new educational materials in accordance with the guidelines from course administrators

#### System Administrator

The system administrators manage e-learning servers. They manage the servers and contents.

#### Help Desk

The help desk answers for queries from customers, e.g. questions about educational materials, requests for help with network problems or operations of web interfaces. When the requests cannot be handled, it delegates the problems to the course administrator to dispatch the task to other divisions.

#### Course Planner

The course planner explains educational plans to people who will take courses. It also monitors effectiveness, and evaluates how much the course contributed to their job skills.

Figure 6 shows the role persona of the course administrator. Some IT systems involved in the service system will be operated or maintained by any people with roles. The functions in those IT systems are expressed through role persona functions. Therefore, the whole service system can be modelled as personas and their interactions.

name:	Course Administrator	
objectives:	Increase ROI on e-learning	
goal:	Increase learners knowledge Provide well-timed contents to learners	
scenario:	Cooperate with personnel dev. managers to design courses Evaluate the courses for further improvement	
function	evaluation point	KPI
Report evaluations on the course	Well-timed contents for the learners	High scores in questionnaires
Assist to write instructions for learning environment	Low workload for the assistance	Times of meetings Times of e-mails
Report evaluations on the course	Effectiveness of the course	Knowledge acquisition Motivation increase
Assist to develop course contents	Optimization of content development processes	Reflection of learners expectations

Figure 6: Role Persona

### 3.2 Identifying Service Boundary

7, 8. Aligning actions in accordance with phases of service encounters comprehensively, the boundary of the e-learning service was determined. The e-learning service system is shown in figure 7.

### 3.3 Optimizing Service Functional Quality

As the service system is defined, the PRM helps to determine how to optimize the quality level of functions.

9. Five e-learning service providers were surveyed, and clarified the degree of importance of each function among vendors was clarified. Then, the PRM was completed to show the gap between customers' demands and providers' perceptions.

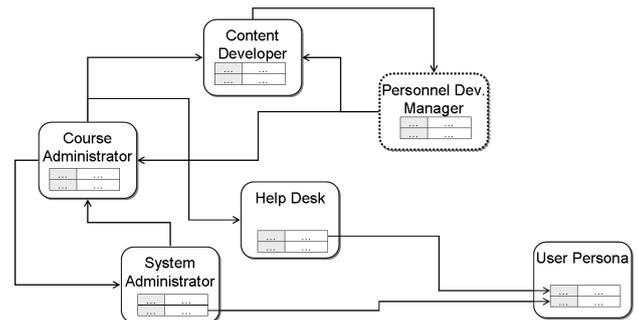


Figure 7: E-learning service system

10. By comparing the functions of the providers' perceptions with the persona's needs, interesting results were found. Functions in line with the phases of service encounters are listed from the top to the bottom. Some of the items are listed only on the provider's side, or on the receiver's side in table 4. More precisely, 'courteous response', 'reporting achievement', and 'improving services' are only on the providers' side. 'Being aware of services', 'experiencing free-trials', and 'comprehension of course outlines' are only on the receivers' side.

## 4 DISCUSSION

Figure 8 shows BtoB and BtoC service models. In the BtoB model, the customers who pay for the service are the managers of companies, and the users are the employees who take courses. However, in the BtoC model, the customer and the user are the same. The persona in the BtoC model uses the service and pays for it. The border between the provider and the receiver has to be shifted when changing the target from corporate users to consuming public.

The proposed methodology clarifies the gaps in service qualities between the provider and the receiver. It also reveals the predominant perceptions in the provider. The BtoB segment accounts for more than 80% of the e-learning business. The major customers are the managers of companies who evaluate the achievement of the employees, and give requests to the providers to customize or improve the course for their business goals. Therefore, the functions targeting the managers' satisfaction are shown in the providers' perception. The comparison helps the providers to realize there are important factors left unnoticed, and they can redesign functions in the new service.

Table 4: Importance of each factor in quality (PRM)

Phase	Provider	Importance	Receiver	Importance
Access	-	0	Being aware of services	5
Check-in	Ease of finding course	3	Ease of finding popular courses	3
Check-in	Ease of comparing programs	3	Ease of estimating ROI	3
Check-in	Ease of getting course information	3	Ease of confirming business records	3
Diagnosis	-	0	Experiencing free-trials	5
Diagnosis	Providing sample contents	3	Confirming IT environment through free-trials	3
Diagnosis	-	0	Comprehension of course outline	5
Diagnosis	Course information	3	Ease of accessing course information	3
Diagnosis	Sincerity for inquiries	3	Ease of applying for courses	3
Delivery	Ease of distributing contents	3	Ease of preparing IT environment	3
Delivery	High-quality contents	3	Interest in contents	3
Delivery	Ease of paying tuition fee	3	Ease of paying tuition fee	3
Delivery	Customizability of certificates	3	Sense of accomplishment	3
Check-out	Courteous response	5	-	0
Check-out	Quick response to inquiries	3	Sincerity and rapidity toward inquiries	3
Follow-up	Course promotion (direct-mail)	3	Receiving next-step courses	3
Follow-up	Reporting achievement	5	-	0
Follow-up	Improving services	3	Renewing courses	0

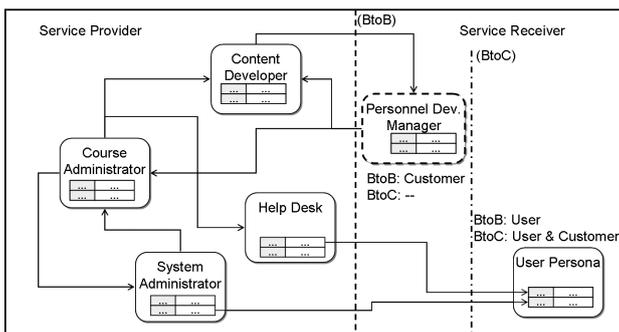


Figure 8: Service boundary and border

## 5 CONCLUSION

It has been shown that a methodology of persona-centric service design gives a framework for service development. A case study on e-learning services showed that the methodology can identify the gaps that exist between the providers' recognition and the receivers' expectation, and the service developers could become aware of the important factors for providing services. Although the work has shown the effectiveness in this particular service, further evaluation should be conducted on other services in different business domains. The feedback will improve the methodology. The methodology will contribute to Service Engineering, strengthen Service Explorer, and accelerate service production.

## 6 ACKNOWLEDGMENTS

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