Research Title: Co-design research and business development - Case of Scandinavian Airlines (SAS)

Author 1 Hakan Alm, Doctoral Candidate at Asian Institute of Technology
Address AIT, P.O. Box 4, Klong Luang, Pathumthani 12120, Thailand
Email hakan@alm.bz
Tel: +66 81 811 8128

Author 2 Dr. Paul Janecek
Address AIT, P.O. Box 4, Klong Luang, Pathumthani 12120, Thailand
Email paul_janecek@ait.ac.th
Tel: +66 2 5160110

Author 3 Professor Olov Forsgren
Address Stockholm University, SE-106 91 Stockholm, Sweden
Email olovf@dsv.su.se
Tel: +46 816 20 00

Abstract

This paper is presenting a case study of Scandinavian Airlines Systems (SAS) showing how improvements of service quality aspects with Avatars can be managed with a Co-Design research approach. The Co-Design practices are carried out in different fields of studies. Some of the key advocates of Co-Design originate from business. In this study the four steps of Co-design approach is applied. From the first step of Co-design, through interviews, log analysis and a channel survey, findings show that the failed dialogues with Avatar Eva are mainly concerned with five factors: interactivity; dialogue capability; consistency; knowledge; and synonyms. In the second step, carrying out customer workshops, we suggested ten ideal scenarios for Avatar Eva to perform better. In the third step, SAS decision makers decided to implement the first three scenarios: Eva's synonyms; knowledge and Eva's consistency. In the fourth step, another channel survey was carried out as well as a new log analysis to know the impact of the redevelopment above three scenarios. An important result of the study was that the company adopted a continuous use of Co-Design as an approach of continuous improvement of the service quality performed by the Avatar Eva. It also opens a new set of questions framing the relation and transformation between Co-Design as a research approach for knowledge creation and Co-Design as a method for innovation and service quality improvements. The study presents an Extended Co-design Model, which illustrates how the Co-Design inspires staff to use it for other functions within and without the SAS.

Key Words: Co-Design, Avatar, e-Services, dialogue, Synonyms, Self Service Technologies

1. Introduction

In today's highly dynamic and competitive business environment, cost savings/efficiency and sales revenue maximization are the two most important motivators for the use of electronic service (e-services). Substantial economic resources are spent every year on research projects aiming to improve e-service quality as an integrated part of the business. One important trend in this development is the use of Self Service Technologies (SSTs).SST's can be used when customers are more active and willing to participate in order to gain value and convenience Chad Lin & Pervan, 2001 and Chad Lin & Pervan, 2002; Nadar & Vijayan, 2009). Many researchers have reported failures with SSTs when service quality requirements are not met (Alm and Forsgren 2011a).

In this paper, a case study showing a new model for collaborative efforts between academic research and business innovation is being presented. In the process the co-design research efforts spreads like a natural bacteria and influences the rest of the organization transforming the ordinary quality improvement routines of the company. The case study uses improvements of service quality aspects with Avatars as a concrete example.

Theoretically, the work is building on systems thinking (Flood & Jackson, 1991)applied in IT-development (Fornell et al. 2008; Forrester, 2006).System thinking is an approach of problem solving and viewed the problem is a part of the overall system. This consists of people, structure and process that work together to make an organization productive, efficient and effective (Chen and Chuang, 2013; Morandi et al, 2013; Schiuma et al, 2012; Yawson, 2012;Kapsali, 2011; Sweeney and Sterman, 2000).In this specific example, we are focusing on the use of Avatars as an area of SSTs. Avatars are a type of humanoid question and answer robots, which are often used in corporate and government web pages. An Avatar is a person-like "being", a humanoid, which encourages customers or clients to engage in a dialogue. From an information provision perspective, there are potential cost savings by having an Avatar answering questions compared to using personnel. However previous studies provide limited analysis of actual dialogues between users and Avatars (Lind & Salomonson, 2006)and limited data showing actual savings/gains. For instance the cases of Marks.se, kista.com and ikea.com in Sweden, Avatars of these companies failed in providing services to their customers because of limited understanding of the Co-design approach in designing the Avatars (Campbell et al. 2011; Alm and Forsgren 2011a; Lind et al. 2008).

As practitioners and researchers are all stakeholders, working together in the design team, the theory and practice are also closely entwined. The work is managed as co-design workshops and the focus is the view of individual users. Systems thinking and more specific soft systems thinking (Checkland, 1994) or systemic thinking (Ackoff, 1988) can also be regarded as a research approach. We develop this further in the section research method.

The objective of this research study is to illustrate a model for improving e-service quality in SST-applications where research and technical development are integrated in one process. Another objective is to demonstrate how a systems co-design research approach can be transformed into ordinary business development routines. The Model is inspired by a line of Critical Systems thinking as it has been described by Churchman, (1971) later developed as a method for IT service development (Forsgren, 1998 and 2005) The result is a new model for collaboration between research and business development.

2. Main Concepts

This study applies some main concepts which together form a framework. In this section, we briefly describe these concepts.

2.1 Customer and Customer Satisfaction Index (CSI)

The concept of customer or client is well discussed as a cornerstone in a teleological worldview(Churchman, 1971).In this way, according to (Johnson et al. 2001), customer satisfaction is "conceptualized as a cumulative construct that relates the total consumption experience with a product or service to date". Identifying the customer's requirements, companies can improve their productivity and enhance service quality and performance, leading to customer satisfaction (Jacka, 2009; Lewin, 2009; Hayes, 2008; Hallowell, 1996; Szwarc, 2005; Hill et al. 2002; Anderson et al. 1994; Transportation Research Board, 1999).

In the last two decades, various indices and barometers were introduced to measure customer satisfaction (Szwarc, 2005;Johnson et al. 2001; Johnson et al. 1996). The main factors of these indices are "perceived company image, customer expectations, perceived quality and perceived value for money"(Gronholdt et al. 2000). Satisfying the customer's needs is the main objective and goal of any company or organization to achieve their target or mission. In 1989 Sweden established a customer satisfaction barometer called the Swedish Customer Satisfaction Barometer (SCSB), which was later adopted by America in the American Customer Satisfaction Index (ACSI) (Gronholdt et al. 2000; Fornell, 1992). The success of the SCSB and ACSI led to the creation of the European Customer Satisfaction Index (ECSI), which was founded by the European Organization of Quality (Gronholdt et al. 2000; Kristensen et al. 2000).Customer Satisfaction Index is commonly known in Sweden as 'Nöjd Kund Index, NKI'. It is commonly used in Europe and US in surveys and makes the respondents rate their satisfaction with a specific product or service on a scale from 1 to 10. One could argue that it is a quantitative way to measure qualitative matters.

2.2 Self Service Technology (SST)

Normally we name actions aiming to serve people as services (Hoffman & Bateson, 2010; Longenecker et al, 2007; Baron and Harris, 2003). When someone can perform the entire services on their own, without direct assistance from employees we name it Self Service technology (SST)(Bitner, 2005).The reasons for using SSTs are "convenience, time savings, control and intrinsic benefits such as enjoyment from using technology" (Dabholkar, 1996; Meuter et al. 2003). An e-service is a type of SST where a customer is able to access a service using a browser connected to the Internet (Hassan et al. 2011).

2.3 Avatar

According to Mason & Swanson (1981) we can implement assumptions or perspectives into self-services making them into competent social agents. When we visualize this social agent as a virtual human being, we normally name this an Avatar. Avatars are also regarded as one of the most powerful and generic design metaphors for e-services (Grönlund, et. Al. 2000). Some companies use Avatars on their e-service Web sites to assist customers.

Sales conversion rates are low on the Internet compared to a physical venue (Juon et al. 2012; Saleh and Shukairy, 2011; Kurtz, & Bonne, 2010; Curtis, 2009).The confidence can be increased and the sales conversion rate can be improved by using human-like interaction on retail Web sites.Wang et al. (2007) used the social response theory that posits that consumers may respond to a Web site that exhibits human-like characteristics in much the same way they respond during human–to-human interactions. Computer technology that exhibits human-like behaviour, such as turn taking, in conversations and reciprocal responding, triggers users to a higher degree personify the technology (Moon, 2000; Nass et al. 1995).According to Wang et al. (2007)"Avatars can increase the persuasiveness of online sales channels". In the log analysis of Eva, SAS's Avatar, this was evident as well. For example, the customers would say thank you at the end of dialogues, much like when talking to a real life call centre agent.

Other studies have investigated the benefits of using Avatars as company representatives on commercial retail Web sites. An Avatar communicator creates a more positive perception of the entertainment value and informativeness of a Web site which leads to shoppers being more satisfied with the retailer, more positive about the product, and more likely to purchase the product(Holzwarth et al. 2006). However, factors such as age, language, income, disability and education may prove to be obstacles in obtaining and consuming the services on offer. Such differentiation in accessibility among citizens in turn would imply digital exclusion, which is likely to result in social exclusion (Raoufi, 2005). The advantages persist even when the information content is held constant between an Avatar and a non-Avatar format. Another finding was that attractive Avatars are persuasive because of their likeability, whereas expert Avatars are persuasive because of their credibility. Other researchers (Barlow et al. 2004; Redmond, 2002) also claim that Avatars can increase customers' entertainment value, information value, and satisfaction of Web-based shopping experiences.

The number of Internet applications and their users has grown rapidly over the past decade, increasing the importance of trust in information technology, especially in the area of Internet commerce (Rattanawicha, 2005). As younger participants are more used to seeing Avatars and robots in video games, films, Internet, etc., they may feel more comfortable when interacting with a robotic or animated interface (Marcos et al. 2010). People ascribe social attributes to technological artifacts, especially when the artifact is perceived to possess a set of characteristics normally associated with human behavior (Qiu & Benbasat, 2010). From an information provision perspective, there could also be potential cost savings by having a virtual servant answering questions compared to using personnel. However, these studies do not provide an analysis of actual dialogues between users and Avatars. Another area of less research is Avatars on Web sites provided by governments and municipalities.

2.4 Co-Design as part of the CO3 movement

CO-design, CO-creative development, CO-constructive development have later years been setting the R/D scene together with Living Labs, Soft systems approaches, Participatory design, Open Innovation and lately PIDoT-process (Public Innovation Do Tank). All those

approaches can be regarded belonging to the CO^3 paradigm, all closely related in a movement with roots far back in time.

One of the earliest and most reported sources of this movement is the CO-constructive branch of the movement. An important breakthrough inspiring many initiatives around the world, showing the *close relation between the CO^3 –area and information technology in the classical article "Misinformation systems" by Russel Ackoff* (1967). Later he wrote many books and papers focusing on "*creating the cooperate future*"(1981) all developing different important aspects and results of this new approach to innovation. A way of thinking, radically different from the classical "operational research" or applied classical scientific thinking, but deeply based in the philosophical debates about knowledge and knowledge development.

This line of thinking is often described in a line back in time from Ackoff via West Churchman, Tom Cowan, Edgar Singer, William James, and Immanuel Kant, also with influence from Hegel's dialectical thinking. Some other partly connecting, parallel and crossing threads are "Second order cybernetics", "Double loop learning", "the fifth discipline", Design thinking and Soft systems thinking. Also modern natural science with names as Einstein, Pasteur, Capra, Rosen and Prigogine, are important sources to the CO3 movement, possible to describe as three important levels of ambition:

- CO-1: Co-design – integrating the physical and the virtual aspects into augmented co-evolving realities and products. Early example: Steve Jobs with Apple. We have also been involved in a number of such projects. One of the earliest and most impacting cases was the MIT-project with IKEA resulting in an integrated solution between the Stores, the catalogue and the web. (Forsgren 2005)

- CO-2: Co-creative – Involving key stakeholders in an "Open innovation" approach - synthesizing different perspectives into new co-created perspectives with possible implementations and impact. A further development of Hegelian thinking. Early Example: Russel Ackoff with Anheuser-Busch

- CO-3: Co-constructive – On this level the research and knowledge development process is integrated with the innovation and artifact development process. The result can be described as a new worldview where the artificial walls between public, private, political, business, culture, art and knowledge development have been removed and replaced with the co-construction of integrated service complexes governed by new forms of Public-Private-Partnerships. There are now many projects globally aiming at this level –often regarded as radical.

Co-design can also been related to action research and user centric design as the user is definitely in the center, however, not only the user is being taken in consideration, but as many as possible of stakeholders' views are considered and the design team consists of as many stakeholders and views as possible.Cochran-Smith and Lytle (1993) defined action research as "systematic and intentionality inquiry". Action research is implementing research into action and is able to solve real problems (Pelton, 2010; Baskerville &Wood-Harper, 1996; Baskerville, 1999; Greenwood, 1999; Lewin, 1948). It addresses the "organizational problems while at the same time contributing to scholarly knowledge" (Baskerville and Myers, 2004). Also, it needs active involvement from the researchers to obtain knowledge and at the same time apply the gained knowledge in solving practical problems (Baskerville, 1999). As practitioners and researchers are all stakeholders working together in the design

team the theory and practice are also closely entwined. The work is managed as co-design workshops and the focus is the view of individual users.

The Co-Design approach inspired by a basic philosophy of knowledge creation(Churchman, 1971) that has been spread outside academia and projects in many ways. For instance, it has been used as a whole or in parts in management training for some 200 managers and executives at ExMI17 and at Edinburgh Business School during 1996-2009, in teaching some 600 architectural students. It is also now commonly used as an approach to design and develop e-services. In this study, we have used Co-Design both as a research approach and as an approach for developing SST.

In the Co-Design approach, it is stipulated that the overall quality of services will increase if as many as possible of the stakeholders are actively involved in co-producing the service.Co-Design is the incorporated design of systems using both hardware and software elements given a set of performance goals and an execution technology (Subrahmanyam, 1992 and 1993). The Co-Design practices are carried out in different fields of studies depending on the expertise and mind-set of its practitioner. Some of the key advocates of Co-Design originated from business.

Nedjah & Mourelle, (2007) argued that the framework for Co-Design means a methodology along with a complementary set of tools for the specification, development, simulation/prototyping and testing of systems, and this may be suitable for the general application but usually it consists of different steps. For instance, one of the secrets of Lego's success is engaging the customers as co-designers and consultants in making its products. Lego is one of the world's largest toy manufacturers and the largest in construction toys.

One key idea in Co-Design is the close relation between knowledge development and service development. That means it is possible to design an infinite number of true perspectives on, for example, a day care center. A useful such perspective can also be implemented as an information service. Following that idea, it's a waste of energy and difficult to try to analyze for example a day care center into its smallest detail to find the true depiction. Co-Design instead suggests considering perspectives of value for different groups of people during the design process, such as the distance between the home and a day-care center (Forsgren, 2005).

The results of a developed distance home-day care center model with measure data is normally called knowledge. If this model is implemented in a computer application, it can be called a self service technology (SST). As a user of this SST, you might give your address and as an answer you get the distance from the home to a day care center. In summary co-design is both about creation of knowledge and an innovation process.

Influenced by this basic idea as well as the study by Churchman (1971), Forsgren (1988) developed the first Co-Design framework. This framework is a multi-stakeholder model in which all stakeholder concerns, related to a certain situation or problem, are taken into consideration by either inviting, or considering the perspectives of, diverse stakeholders in a workshop process (Forsgren, 2005).This work can be summarized in a raw model for performing the Co-Design process as four types of workshop activities.

Figure 1: Co-Design Innovation Process (Forsgren, et al. 2010)

1) Co-Design of the problem situation and ideal scenarios including a first idea of useful views possible to implement in integrated solutions (*Step 1: In my view, this is a problem*).
2) Co-Design of one or a few specified useful views with implementation integrated solutions and related measure of performance systems (*Step 2: I'd like to have it this ideal way*).
3) Co-Implementation of selected integrated solution and related measure of performance systems (*Step 3: I hope these solutions will get me to my ideal way*)
4) Co-evaluation and feedback based on key stakeholder views (*Step 4: Did "these solutions", bring me closer to my ideal way?)*.

These four types of workshop activities are complemented with a fifth type of reflective co-design workshop activity. The question raised here is "if and how the co-design process itself can be developed in order to be more effective in producing knowledge and services"(Forsgren et al. 2012).

This process is developed further in the research methodology section.

3. Research Methodology

This report is written from a co-constructive scientific perspective. The approach belongs to a tradition often called "soft systems- , systemic-, co-design-, co-creative- or co-constructive-approaches. The very basic idea in these approaches is that different actors can have different but legitimate views on the same situation. During a co-constructive conversation these views emerge. When many actors agree on a stabilized view, this is regarded as a scientific result possible to use for different purposes.

A basic example of this scientific approach applied is the concept of time. As humans we can co-construct an infinite number of ways measuring time – but it is not possible in this approach to say that this is "a true way" to understand time. During many years of co-constructive conversations most people have agreed with a global system of measuring time in relation to the relative position between earth and the sun. This view is now implemented as a view in action in many "time –services" with enormous impact on human life. This co-constructive scientific approach, to a high degree inspired by work of scientists like Kant,

Bohr, Einstein, Cowan and Churchman, is possible to apply on every piece of reality and the use and development of Avatars as Self Service Technologies is in this report regarded to be such a piece of reality.

Today, Information Technology systems area is a vital key to the success of most organisations. It can be internal administrative systems, but also systems for communication with customers and suppliers. To ensure that the systems have the anticipated effect, it's important to evaluate these both as is and when they are being used. In this case of SAS, there were sometimes problems when Avatar "Eva" was communicating with its customers. In solving the problems faced, researchers applied the Co-Design approach. Co-Design encourages sharing and learning of knowledge involving users, technical experts, business specialists and other stakeholders etc. in designing its product: Avatar (Kankainen et al. 2012; Lenihan & Briggs, 2011; Miller, 2002). These problems were identified during the log analysis, staff / supplier interviews as the first parts of the step 1 in the Co-Design process. The case study was carried out in two time periods, in the first period, participants were asked about the services provided by SAS. This was carried out in the month of June to September 2010. Researchers carried out interviews with key staff anddecision makers of SAS as well as Artificial Solutions (the supplier of the Avatar). In the second period, researchers and SAS staff conducted workshops with customers. This was carried out in April and May 2011 as a crucial later part of the step 1 in the Co-Design process. The workshops with customers were carried out at the same time with different categories of customers from different parts of the country.

As part of the case study, some critical reflections on the use and results of the co-design method were made. The results are summarized in a further developed model of the co-design process focusing on the transfer of co-design from a research approach into an e-service redesign approach with Avatars as self-service technologies.

4. Case Study of Scandinavian Airlines (SAS)

SAS' Avatar "Eva" plays a significant role in interacting with customers. Customers enjoy a positive experience with Eva (Alm and Forsgren, 2011b). Eva improves the efficiency and saves the cost of employing a number of full time staff. Eva manages to send customers into specific sales situations. For instance, during the interview, one of the participants stated that "*Eva sells pretty well and has excellent stability and performs well*". Eva's logs give feedback on what the customers think about Eva, the home page and also about the SAS organization as a whole. When Eva cannot answer, she starts a live chat and she refers the dialogue to call center staff. SAS is proud to be early adopters of this new technology. Results show that having an SST, it helps in managing and also saving cost (Mehrjerdi, 2013; Kim et al. 2013; Alm and Forsgren 2011b; Hsieh, 2005). It is also better than a manual service in some ways as it's faster. During the workshops one user said '*Sometimes using a machine can be good as one doesn't always want to talk to somebody and be polite'*.

Researchers applied the four step of Co-design approached based on the Co-Design research and Innovation Process Forsgren, et al. 2010

4.1. **Co-design Step 1** (*See figure 1: Step 1: In my view, this is a problem).*

Applying the first step of Co-design, researchers carried out log analysis, interviews and a channel survey, to identify problems, was carried out in June to September 2010.

4.1.1. Log Analysis

The log analysis is a study of electronically recorded interaction. Researchers carried out log analysis for Avatar Eva. Log analysis helps in analyzing and identifying the problems of EVA and this helps in the Co-Design process. Researchers selected 100 dialogues that customers had with Eva from the thousands of dialogues recorded. The researchers analyzed the dialogues between customers and Eva (one week in July 2010 and another one week in September 2010) about the SAS service for example in getting flight details, re-fund of tickets, booking flights, telephone numbers, flight costs, cancellation of tickets, taking pets on flights, check-in, passport issues and other information. Table 1 shows some of the dialogues where Eva succeeded in answering the customers/clients.

Table 1: Some of the successful dialogues with Eva.

#	Questions from Participants	Eva's Response
1	Can I get a refund on my ticket	You always get a full refund if you book the trip within 24 hours from the time of booking. You book yourself a ticket on www.sas.se. If the delay time varies possibility of refunds depending on the type of ticket you purchased. Please contact SAS telephone. It may take up to 10 days before the money is in your account. Related Questions: 'Can I cancel my trip?' How do I cancel SAS payment
2	What are the measurements allowed for hand luggage?	It's fine to bring a carry-on baggage if you stay within the following requirements: Dimensions 23x40x55 cm. Weight 8kg. There may be exceptions and more about exceptions, see the page I opened next
3	How do I become a member of EuroBonus?	On the page I opened next door you can register as a new member of EuroBonus. You will receive your membership number on the screen.
4	I need help creating a profile. How do I?	Here, next I have opened a page where you can create your profile. If you do not have some of the following information in order to create the profile, click below.
5	What cards can I pay with?	You can pay for your trip with the following cards: Visa, MasterCard, Eurocard, Dankort (Denmark only), Discover or American Express. (Maestro and Electro Card is not valid).

A review of the log analysis shows that the Avatar "Eva" is able to answers questions raised by the client and respond correctly. Some of the raw data given in above tables shows the evidence that Eva is able to accurately answer the questions asked by the customers. This shows that Avatars play an important role and are cost effective for organizations, who would like to serve their customers or client by employing SST systems such as an Avatar.

Table 2: Examples of failed dialogues with Eva's responses.

#	Questions from Participants	Eva Response	Remarks (Failure)
1	Want to book with bonus points, and has been publishing both the username and password. How do I?	I find it hard to understand too complex issues. Try to ask a question at a time. I can transfer your question to a form that you can send to us by clicking the link below	Interactivity
2	Are you wearing pantyhose?	You have questions, But I do not understand about what. Kindly limit your question to one sentence	Dialogue Capacity
3	What's the difference between username, password and security code?	When you log in using your profile on the SAS website you use your username and password you created yourself. Contacting Member Services by phone, email	Knowledge

		or via the EuroBonus voice mail, use your four-digit security code	
4	Which is the closest airport to Torino,	You have any questions about travel and destinations. I will help you find answers to your questions and to find information on our site.	Consistency
5	How to book a plane ticket rebooked rebooking through your travel agent or SAS Telephone sales (some exceptions exist for EuroBonus and Travel Pass / Travel Pass Corporate travel).	To provide information on the feasibility of rerouting, and what it would cost, we need more information	Knowledge

In addition, Avatar maybe able to assist the organizations to understand the customers better in a shorter period of time. One of the most important things for the company's management to consider is how Avatars communicate with their customers and provide feedback concerning the customer needs. The company's management may apply the their strategy to the client as much as possible; however, if there is a limitation, then management needs to redevelop the Avatar and propose a proper design of Avatar to serve their customer needs. However, there are other dialogues, where Avatar: Eva is not able to answer correctly as shown in the above table 2.

From the log analysis, researchers found instances where Eva failed in responding to its customers. Above table 2, shows some of the raw data extract from thousands of dialogues that Eva had with its clients. Researchers found that Eva lacks capability in five main areas 1) interactivity; 2) dialogue capability; 3) consistency 4) knowledge 5) synonyms. Thus, these are main factors, where Eva need further development of its ability and functionality.

4.1.2. Channel survey

In accordance with the principles for Customer Satisfaction Index (CSI), Researchers conducted an online survey (Channel Survey). The purpose of this survey was to measure respondents' satisfaction and their perception of Avatar Eva based on their experience. Similar to the log analysis, CSI will enable to identify problems and difficulties faced by the respondents. Knowing and understanding Eva's problems, it could be improved further by using the Co-Design approach. The participants in the channel survey were asked the following four questions 1) general experience from the dialogue with Eva; 2) Eva's knowledge and courteousness; 3) Eva's ability to meet the participant knowledge needs and 4) the participant's perception of Eva. There were a total of 97 Participants. Participants then rated their experiences using a scale of 1-10 (where 1 represent very dissatisfied with Eva service and 10 as very satisfied) to give the researchers more accurate data.

Furthermore, researchers carried out a reliability test for the above four variables using Cronbach's Alpha. The Alpha value of more than 0.5 is acceptable (Chen and Small, 1994) for further analysis of the data. The method reliability testing supports the measurement in terms of equivalence and internal consistencies. According to Carmines and Zeller (1979) reliability "concerns the extent to which an experiment, test, or any measuring procedure

yields the same results on repeated trials". Overall Cronbach's Alpha for the six indicators is 0.7766. Detail of each variable is set out in Table 3.

Table 3: Descriptive Statistics and Pearson Correlation responding to the four questions

Q	Questions	Alpha	Mean	Standard Deviation	Q1	Q2	Q3
1	General Experiences from the Dialogue with Eva	.580	6.85	1.39	1.00		
2	Eva's Knowledge and Courteousness	.704	7.21	1.77	0.89**	1	
3	Eva's ability to meet the participant knowledge needs	.729	6.86	1.20	0.59**	0.42**	1
4	Eva service meeting the participant expectations	.831	6.80	1.37	0.34*	0.19**	0.43**
	(Correlation is significant at the 0.01 level (2-tailed).						

Based on the reliability test, Researchers carried out a descriptive and Pearson Correlation analysis as shown in the above table. The purpose of Pearson correlation is to examine the inter relationship between the variables. .

Table 3 also summarizes the result of participant's responses on the four questions/variables which were asked during the channel survey. Results show the respondents were somewhat satisfied with the Avatar's answers, but that there was still room for improvement in Eva's replies. When it comes to the perception of Eva's knowledge and courteousness, it shows an overall value or mean of 7.21 from a total of 1-10 scale, followed by Eva's ability to meet the participants knowledge needs (6.86) and the general experience from the dialogue with Eva (6.85).Among these correlation pairs given in Table 3, the correlation between question Q1and Q2 has the highest value (*0.89***), and the correlation between Q1 and Q 3 has the second highest (0.*59***). The highest correlation indicates that Q1 and Q2 are associated with the respondent's satisfaction in regards to the performance of Avatar: Eva.

4.1.3 Interviews

Interviews were conducted with key staff and decision makers of the SAS on Avatar "Eva". Researchers were informed that Eva was performing 30,000 dialogues per month and delivering 70,000 answers from the dialogues. SAS measured Eva's performance and found that using Eva improved sales and was able to answer specific questions based on the specific situations. Usage of Eva has been growing and most common questions from customers are in the areas of EuroBonus, travel with SAS, luggage and Check-in. During the interviews, staff reported that since introduction of Avatar there is reduction in number of calls to their Call Center. However, staff members stated during the interviews that since Eva is an SST, it is not 100% reliable as she lacks communication skills such as dialogue capability and interaction. Eva's weaknesses are mainly with its lack of interactivity, dialogue capability but also in the areas of synonyms, consistency and knowledge. This was also found more in detail during the log analysis as shown in the table 2.

Based on the log analysis, channel survey and interviews, researchers found the following five main problem areas with Eva:

a) ***Interactivity***: From the above three methods in analysis and understanding the problem of Eva, it was found that Eva is not interactive and also does not provide real time information to the participants. However, Eva could provide the travel suggestions for certain dates rather than a certain destination. Participants want Eva to be available during the booking. Using the co-design technique, the participants' suggestion was that Eva should enable interaction with a different SAS system for instance flight status, price and booking information and check in- or check out time. This will enhance the usefulness of Eva significantly.

b) ***Dialogue capability***: it was observed that the Eva lacks dialogue capability during log analysis, interviews and workshops. It was suggested that Eva should have more dialogue capability, which could help in providing information to the participants and also, for Eva, to be able to ask questions based on the participants earlier questions. However, Eva is not able to handle sequences of related questions.

c) ***Eva's consistency***: During the workshop, it was observed that the information provided by Eva and the information available on the Web is at times inconsistent especially the booking charges. This finding was very helpful for SAS to fix certain problems faced by the participants such as synonyms and knowledge.

d) ***User friendliness***: During the workshop, participants were not always sure how to begin their questions as it was often challenging for the users to formulate their inquiries or questions. Specific observations from the participants about the font size and also the lack of ability to communicate properly. Through the workshop, participants suggested to have a print function so that they can keep the chat dialogue for future reference.

e) ***Performances and the ability***: Participants observed that Eva is able to provide some information but not always full answers to their queries. Since participants were not happy from the beginning, it might result in users not using Eva again. For instance, one participant asked for his flight time, but Eva directed him to the Swedish airport authority's flight page.

4.2. **Co-design Step 2:** (*Step 2: I'd like to have it this ideal way*).

Based on the log analysis, channel survey and interviews: participant's responses, researchers conducted workshops with customers. Researchers carried out workshops with five different groups as shown in table 4, using Co-Design technique (see figure 1). This workshop was carried out in the month of April to May 2011 at SAS head office in Sweden. The researcher was the moderator of the workshops.

Table 4: Five group of Participants in the Workshop.

Group	Participants		
	Experts	Customers/users	SAS Staff

Group 1	2	5	2
Group 2	1	2	1
Group 3	1	4	1
Group 4	2	3	1
Group 5	2	5	2

Workshops using the 5 groups above were carried out in five different phases using the same technique to all the five groups.

1. Phase 1 was to characterize the target groups, general life situation as well as travel specific life situation
2. Phase 2 based on phase 1 generated different scenarios such as finding the right flight price/departure; Baggage; Opening hours; Check-in when and how Conditions for over bookings; Rules for changing flights; Booking; Using EuroBonus points and expiry; Ethic and Green flights
3. Phase 3 was to test these scenarios through electronic contact with Eva and SAS.se
4. Phase 4 common evaluation and
5. Phase 5 individual short interviews

During the workshops, participants were asked whether Eva should have a separate window or should be integrated into the SAS Website. The participant's recommendation was Eva to be part of the SAS web page and should not be a separate window. Using the Co-design approach and integrating Eva as a part of the actual web page will solve the problem and enable SAS to provide required information.

Based on the workshop using the co-design technique shown in the figure 1, the researchers gave their feedback to SAS which was used by SAS to redevelop their Avatar. Researchers suggested SAS how Eva could be more helpful and generate customer satisfaction, which would translate into loyalty to SAS improving SAS's position as an innovator in the airlines business. Table 5 below shows the ten (Bowen et al.) ideal functions that Eva could best perform:

Table 5: Ideal scenarios that Eva could perform:

#	Suggested Ideal Scenarios	Rank
1	In order for Eva to better understand the client's questions in everyday language, more synonyms should be added to Eva's 'vocabulary'.	1
2	In certain areas (e.g. Frequent Flyer Program) Eva should be given more knowledge, i.e. be able to answer more questions.	2
3	When contacting Eva, she sometimes provided different answers compared to when browsing the web page or calling the call centre. The consistency of information between channels must be safeguarded.	3
4	Eva could help the passengers in all their booking arrangements. At the same time SAS web could be interactive for booking including current and most frequent travels that the passenger have made in the previous years.	
5	When booking flights using Eva, she can assist in showing the baggage allowance during the booking process.	
6	Since, above, differs by flights and airlines, Eva could connect to relevant airlines' online databases and can use statistics for consumers' web pages of the	

	flexibility and 'leniency' of each airline. She could also show the fee for overweight luggage allowances to the travellers.	
7	In Eva's booking form, the passengers could choose to use points for themselves and for family members. In addition. Eva could also show the list of available flights to passengers with kids and where flights are available using points.	
8	Once Eva knows that the passengers are minors, she could also offer the passenger the opportunity to check box for 'unaccompanied child assistance'. Eva could do this by connecting directly to SAS's flight databases.	
9	Eva could help to easily order a new trip if the passenger has done the same trip before and it could with a click on that trip and just a change of dates. As a result all possible flights around that date could be shown to them including flights with other companies with a lower price. This will be enhanced the customer loyalty because SAS not only care about their flights but also understand the budget requirement for their travelling;	
10	Eva could give a message that it is possible to upgrade them to business class by using extra mileage / points. This up selling will help the Airline to maximize its passenger load and use up miles which are liabilities on the Airline's books;	

4.3.3. **Co-design Step 3**(*Step 3: I hope these solutions will get me to my ideal way*)

As some of the suggestions given above in Table 4 are expensive and time consuming, SAS decision makers decided to implement the first three scenarios: Eva's synonyms (Scenarios 1); Eva's knowledge (Scenarios 2); and Eva's consistency (Scenarios 3). Eva was improved and upgraded accordingly. This helps their customers get better answers with greater consistency. However as many ideal scenarios and their requirements have not been met, there is still a lot of room to improve Eva.

4.3.4 **Co-Design Step 4**: (*Step 4: Did "these solutions", bring me closer to my ideal way?)*.

Based on the feedback and suggestion considered by SAS, researchers again carried out a channel survey to know the impact of the redevelopment of synonyms and the knowledge of the Eva. This survey was carried out in the months of December 2011 to February 2012. There were total 114 responses to this question. From the scale from 1-to 10: Very dissatisfied to very satisfied.

Table 6: Participants responded to the four questions

#	Questions	Alpha	Mean	Standard Deviation	Q1	Q2	Q3
1	General Experiences from the Dialogue with Eva	.592	.7.47	1.19	1.00		
2	Eva's Knowledge and Courteousness	.758	.7.28	1.31	0.25**	1.00	
3	Eva's ability to meet the participant knowledge needs	.768	.7.25	1.17	0.26**	0.25**	1.00
4	Eva service meeting the participant expectations	.821	7.11	1.31	0.09**	0.03	0.09

The above table shows participant perception of Eva's service after the modifications. The overall alpha test was 0.734 and details of each alpha for the variables are given in above table. Researchers further carried out a descriptive and Pearson Correlation analysis as shown in the above table.

Results show that respondents were satisfied with the Avatar's responses. When it comes to the perception the general experience from the dialogue with Eva, it shows an overall value or mean of 7.47 from a total of 1-10 scale, followed by Eva's knowledge and Courteousness (7.28), Eva's ability to meet the participants knowledge needs (7.25) and Eva's service meeting the participant expectations(7.11).Among these correlation pairs presented in the Table, the correlation between question (Q) 1and 3 has the highest value (*0.26***), and the correlation between Q1 and Q 2 has the second highest (0*.25***). The highest correlation indicates that Q1 and Q 3 are associated with the satisfaction of the respondent in regards to the performance of Avatar: Eva.

There is a slight improvement of Eva before and after using the co-design technique. In regards to the participants' general experience from the dialogue with Eva, there is improvement in the overall satisfaction level of participants: .36 (7-21-6.85: see Table 3). Similarly to Eva's service meeting the participant expectations: .15 (6.95-6.80: see Table 3). Comparing the situation before and after the workshop, participants perceive an improvement. One thing to be noted here is that the respondents are the not the same individuals before and after. This increase of customer satisfaction has a impact on the cost of SAS.

Improvement of the customer satisfaction can be seen in figure 2. The figure shows that there is an increase in respondent's satisfaction level when comparing the before and after the changes in "Eva". It is noteworthy that in the two surveys, the respondents are different and the total number of respondents also differs. In the 'before', 97 respondents responded and in the 'after', there were 114 respondents stating their satisfaction level in regards to their experience with Eva. In the CSI scale, there is a clear improvement regarding respondents experience with Eva.

Figure 2: Customer Satisfaction after improvement in the Eva capacity

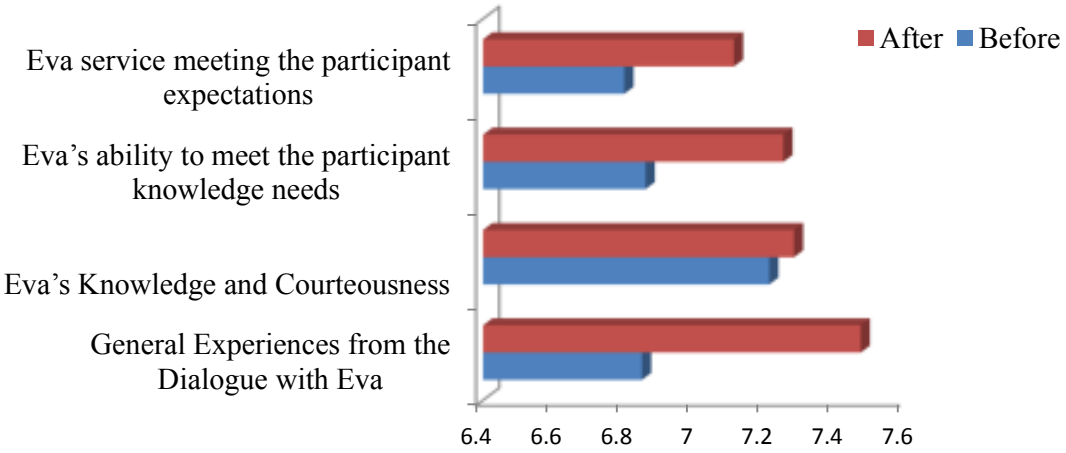

Figure 2 clearly shows that the SAS customer satisfaction level has improved when comparing such levels of satisfaction with the results obtained before modifications were made. Blue color (below) shows before modifications and maroon color (above) shows after. Eva has been improved through Co-design approach and this can also help other industries. Co –design approach can be used in any industry following the four step of co-designed that was developed by Forsgen (1998 and 2005).

In addition, after the improvements and modifications were made, there was a decrease in the number of calls to SAS' Call Center. An important result of the study was also that the SAS adopted a continuous use of Co-Design as an approach of continuous improvement of the service quality performed by the Avatar Eva.

Later studies show that this continuous improvement process is an important key to Eva's long term improvement and plays a crucial role in terms of cost effectiveness for SAS, as Eva is more cost effective than her human counterparts (Alm, et al. 2011). This can also be compared with the increase in the acceptance of Eva, which is likely to lead to increased usage. A slight increase in the usage of Eva helps the company achieve greater cost savings when serving current and potential customers.

4.3.5 Summary and - Co-constructive reflections on the method used

In this case study, we have described the application of a co-design approach for improving the service quality of SST Avatar Eva as part of the web portal of the company Scandinavian Airlines (SAS). In this part we will also give some reflections on the method used. Such reflections can also be regarded as a self reflective activity possible to add as the fifth type of workshop activity in the co-design model.

1) Co-Design of the problem situation and ideal scenarios (*In my view, this is a problem*).
2) Co-Design of one or a few specified useful views with implementation (*I'd like to have it this ideal way*).
3) Co-Implementation of selected integrated solution (*I hope these solutions will get me to my ideal way*)

4) Co-evaluation and feedback based on key stakeholder views (*Did "these solutions", bring me closer to my ideal way?)*.
5) **Co-evaluation and redesign of the used co-design model (Can we improve the used co-design model?)**

Following this extended model we can now demonstrate the co-design process
with co-design workshops as an important element. In the process created, co-created views can be transformed into suggested improvements of the actual services performed by the Avatar and also how these improvements can be implemented and later evaluated in other co-design workshops. The case study also demonstrates how other complementary techniques such as log analysis and channel survey can be used as input in the co-design process.

During the workshops, a number of problems were found and discussed. As an example, it was found that when Eva is not a part of the web page but a separate window, it has a tendency to confuse the users. Sometimes Eva also gives incomplete / limited answers. Answers lack time information and interactivity. Sometimes answers are confusing (e.g. Greenland / Green flights). It is unable to print a dialogue log with Eva and live chat and it cannot support throughout the booking process. Customers are not sure how to ask the questions to Eva. Sometimes inconsistent answers from web pages and Eva create a lack of dialogue capabilities and do not handle sequences of related questions. Eva sometimes gives only some info, not full answers. Eva's lack of synonymsimpedes Eva's ability to handle a full array of questions, and makes her most effective when responding to simple questions.

Many of these problems were transformed into service improvements according to the Co-Design approach. This was important for the improvement of avatar service quality.

Even more important was that SAS adopted the co-design approach for continuous improvement of the Avatar performance. It was also discussed how this approach could be expanded to other service offers.

Further as an important value added for the SAS organization, we could see that staff who participated in the workshop seemed to be inspired to use the Co-Design technique in other parts of the operations (e.g. Call center & online support, Flight Scheduling and Sales& Marketing). The Co-Design spread and evolved like a natural bacteria within and without (e.g. to Artificial Solutions) the organization leading to improvements in many areas.

These findings we have tried to illustrate in the model below:

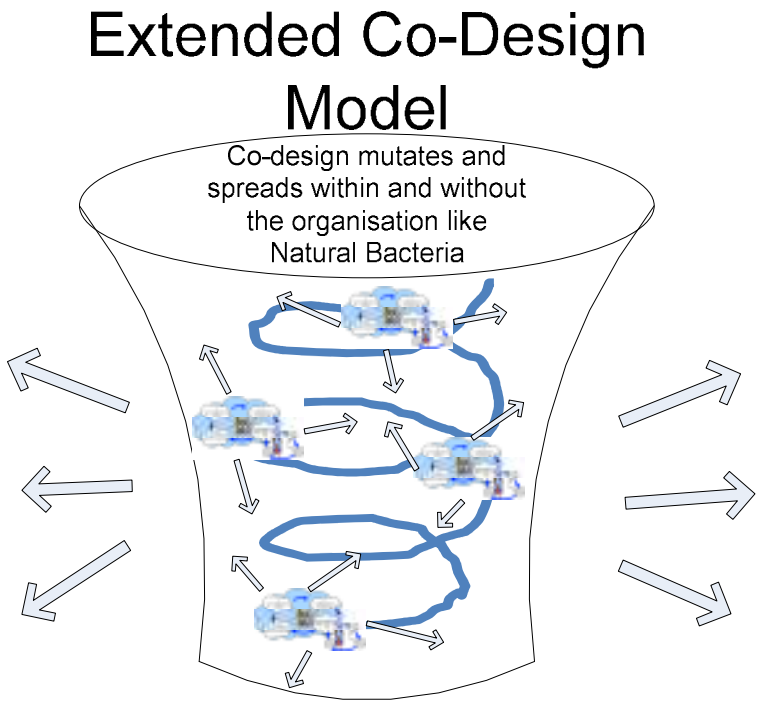

Figure 4 Extended Co-Design Model

The model illustrates how the Co-Design inspires others staff to use it for other functions and uses in their organization. In actuality staff are Co-Designing the Co-Design to fit other applications. In a number of years, the original co-design model will perhaps look very different and may even be called something entirely different. This will then mean that the staff themselves will be researchers and developers reducing the dependency on academic involvement in each phase of the Co-Design. This would be an understandable and natural evolution in the development stage.

The observed results open a new set of questions framing the relation and transformation between co-design as a research approach for knowledge creation and co-design as a method for innovation and service quality improvements.

References

Ackoff, R. L. (1967). Management misinformation systems. Management Science, Volume 14, No. 5, pp. B147-B156.

Ackoff, R. L. (1981). Creating the corporate future.John Wiley and Sons, New York, United States of America.

Ackoff, R. L. (1998). "A systemic view of transformational leadership", Systemic Practice and Action Research, vol. 11, no. 1, pp. 23-36.

Alm H, and Forsgren O. (2011a) "Successful use of Avatar/e-services – powerful, but needs a knowledge manager with proper skills" accepted at BAI2011International Conference on Business and Information 4-6 Jul 2011, Bangkok, Thailand

Alm H, and Forsgren, O. (2011b). Successful use of Avatar/e-services – powerful, but needs a knowledge manager with proper methods. Paper presented at the BAI2011 International

Anderson, W. E., Fornell, C., & Lehmann, R. D. C. (1994). Customer satisfaction, market share, and profitability: finding from Sweden. Journal of Marketing, 58(2), 53-66.

Barlow, A. K. J., Noreen, Q. S., & Mannion, M. (2004). Development in Information and Communication Technologies for Retail Marketing Channels. International Journal of Retail and Distribution Management, 32(March), 157-163.

Baron, S., and Harris, K. (2003). Service Marketing: text and cases. 2nd Edition, Palgrave Macmillan, New York, United States of America

Baskerville, L. Richard. (1999). Investigating information system with action research. Communications of the Association for Information Systems, Vol. 12, Article 19, Retrieved on 25 August 2013 from <http://aisel.aisnet.org/cais/vol2/iss1/19>

Baskerville, Richard and Myers, D. Michael. (2004). Special issues on action research in information systems: making a research relevant to practice-foreword. MIS Quarterly, Vol. 28, Issue 3, pp. 329-335.

Baskerville, L. Richard and Wood-Harper, A. Trevor. (2002). A critical perspective no action research as a method for Information, pp. 129-146. In Myers, D. Michael, (2002).Qualitative Research in Information Systems. Sage Publication Ltd, California, United States of America.

Bitner, M. J. (2005). Creating Customer Demand through Service Innovation. Research Center, Penn State University.

Bowen, S., Dearden, A., Wright, P., Wolstenholme, D., & Cobb, M. P. h. s. d. a. i. I. p.-I. B., Keld., Bratteteign, Tone., and Loi, Daria. (2010). PDC '10 Proceedings of the 11th Biennial Participatory Design Conference, Sydney, Australia..

Campbell, C. S., Maglio, P. P., & Davis, M. M. (2011). From self-service to super-service: a resource mapping framework for co-creating value by shifting the boundary between provider and customer. Information Systems and E-Business Management, 9(2), 173-191.

Checkland, P. (1981). Systems Thinking, System Practice. Chichester: Johy Wiley and Sons. New York. United States of America.

Chen, Kuwan-Chou and Chuang, C. Keh-Wen. (2013). Using system thinking to analyze health care in the united states: should we move to a government sponsered health

Churchman, C. W. (1971). The design of inquiring systems: basic concepts of systems and organization. New York,: Basic Books.

Cochran-Smith, Marilyn, and Lytle. L. Susan. (1999). The teacher research movement: a decade later. Educational Researcher, Vol. 28, No. 7. pp. 15-25.

Curtis, V. (2009). Small business for dummies. 3rd Edition, Australian & New Zealand, Wiley Publishing Australia Pty Ltd 42, McDougall Street Milton.

Dabholkar, P. (1996). Consumer evaluations of new technology-based self-service options: An investigation of alternative models of service quality. International Journal of Research in Marketing, 13(1), 29-51.

Flood, R. L., & Jackson, M. C. (1991). Creative problem solving: Total systems intervention (Vol. 55). Chichester: Wiley.

Fornell, C. (1992). A national customer of satisfaction barometer: the Swedish experience. Journal of Marketing, 56, 6-21.

Forrester, J.W. (2006_ENREF_25). Systems dynamic, systems thinking, and soft OR. System Dynamic Review, 10, pp. 245-256.

Forsgren, O. (1988). Samskapande datortillämpningar : en systemteoretisk ansats för lösning av vissa förändringsproblem vid administrativ datoranvändning = Constructive computer applications : a systems approach for solution of certain change problems in administrative computer applications. Umeå.

Forsgren, O (2005) Churchmanian Co-Design – Basic Ideas and Application Examples, in Advances in Information Systems Development: Bridging the Gap between Academia and Industry. Edited by A.G. Nilsson et al., Springer.

Forsgren, O., Johansson, T., Nilsson, O., & Siösteen-Thiel, M. (2010). e-Power to the People– a Driver for Cross Sector Regional Development in Europe eChallenges e-2010. Warsaw. (Awarded second best conference contribution)

Greenwood, J. Davydd. (1999). Action Research: From practice to writing in an international action research development program. John Benjamins Publishing Company, Unites States of America.

Gronholdt, L., Martesen, A., & Kristensen, K. (2000). The relationship between customer satisfaction and loyalty: cross-industry differences. Total Quality Management, 11(4-6), 509-514.

Hallowell, R. (1996). The relationships of customer satisfaction, customer loyalty, and profitability: an empirical study. Journal of Service Industry Management, 7(4), 27-42.

Hassan, H. S., Shehab, E., & J., P. (2011). Recent advances in e-service in the public sector: state-of-the-art and future trends. Business Process Management Journal, 17(3), 526 - 545.

Hayes, E. B. (2008). Measuring customer satisfaction and loyalty: survey design, use and statistical analysis method. 3rd Edition, American Society for Quality. United States of America. : Quality Press.

Hill, N., Self, B., & Roche, G. (2002). Customer satisfaction measurement for ISO 9000:2000. Oxford,: Butterworth-Heinemann.

Hoffman, K. D., & Bateson, E.G. J. (2010_ENREF_4). Services Marketing: concepts, strategies & cases. 4th Edition, South-Western Cengage Learning, Mason, United States of America.

Holzwarth, M., Janiszewski, C., & Neumann, M. (2006). The Influence of Avatars on online Consumer Shopping Behavior. Journal of Marketing, 70, 19–36.

Hsieh, Chang-Tseh. (2005). Implementing self-service technology to gain competive advantage. Proceedings of the Annual Conferences Communications of the International Information Management Association (IIMA), pp.77-84. Access on 21 December 2012 from <http://www.iima.org/CIIMA/CIIMA%205.1%2077%20Hsieh-9.pdf>

Johnson, D. M., Gustafsson, A., Andreassen, T. W., Lervik, L., & Cha, J. (2001). The evolution and future of national customer satisfaction index models. Journal of Economic Pschology, 22(2), 217-245.

Johnson, D. M., Nader, G., & Fornell, C. (1996). Expectations, perceived performance, and customer satisfaction for complex service: the case of bank loans. Journal of Economic Psychology, 17(2), 163-182.

Juon, C., Greilling, D., & Buerkle, C. (2012). Internet marketing start to finish: drive measurable, repeatable online sales with search marketing, usability, CRM, and analytics. Que Publishing, United States of America.

Kankainen, A., Vaajakallio, K., Kantola, V., & Mattelmäki, T. (2012). Storytelling group - a co-design method for service design. Behaviour and Information Technology, 31(3), 221-230.

Kapsali, Maria. (2011). System thinking in innovation project management: a match that works. International Journal of Project Management. Vol. 29, Iss.4, pp. 396-407.

Kim, J., Christodoulidou, N., and Choo, Y. (2013). Factors influencing customer acceptance of kiosks and quick service restaurants. Journal of Hospitality and Tourism Technology, Vol. 4, Issue 1, pp.

Kristensen, K., Martensen, A., & Gronholdt, L. (2000). Customer satisfaction measurement at Post Denmark: Results of application of the European Customer Satisfaction Index Methodology. Total Quality Management, 11(7), 1007-1015.

Kurtz, L. D., & Bonne, E. L. (2010). Cotemporary Business 2009. Neil Marquardt, South-Western Cengage Learning, Mason, United States of America.

Lenihan, D., & Briggs, L. (2011). Co-design: toward a new service vision for Australia? Public Administration Today(January - March), 35-47.

Lewin, E. J. (2009). Business customers satisfaction: what happens when supplier downsize. Industrial Marketing Management, 38(3), 283-299.

Lewin, K. Zadek. (1948). Resolving social conflicts: selected papers on group dynamics. New York: Harpers & Brothers.

Lin, C., & Pervan, G. (2001). IS/IT Investment evaluation, benefits management and outsourcing issues in an Australian government agency. Paper presented at the Eight European Conference on IT Evaluation, MCIL Management Centre International Limited, Reading, United Kingdom.

Lin, C., & Pervan, G. (2002). A public sector case study on evaluating and managing the benefits of IS/IT. Paper presented at the International conference proceeding Issues & trends of information technology management in contemporary, Hershey PA United States.

Lind, M., & Salomonson, N. (2006). The Role of Virtual Servants in e-Interaction", in Proceedings of the First International Pragmatic Web Conference (PragWeb06). 124-138.

Lind, M., Salomonson, N., & Alm, H. (2008_ENREF_37). How can I help you? - The role of a virtual servant in a municipal context. In Proceedings of the Servsig Conference, Liverpool UK.

Longenecker, G. J., Moore, W. C., Petty, W., Palich, E. L. (2007). Small business management: launching and growing entrepreneurial ventures. 14th Edition, South-Western College Publisher, United States of America.

Mason, R. O., & Swanson, E. B. (1981). Measurement for management decision. Reading, Massachusetts: Addison-Wesley.

Marcos, S., Gómez-García-Bermejo, J., & Zalama, E. (2010). A realistic, virtual head for human–computer interaction. Interacting with Computers, 22, 176–192.

Mehrjerdi, Z.Y. (2013). A framework for Six-Sigma driven RFID-enabled supply chain systems. International Journal of Quality & Reliability Management, Vol. 30 Iss: 2, pp.142 - 160.

Meuter, M. L., Ostrom, A. L., Bitner, M. J., & Roundtree, R. (2003). The influence of technology anxiety on consumer use and experiences with self-service technologies. Journal of Business Research, 56(11), 899-906.

Miller, E. J. (2002). Co-design in action: knowledge sharing, mediatin and learning. Inside the communication revolution: evolving patterns of social and technical intraction. Oxford University Press, London, United Kingdom, 165-185.

Moon, Y. (2000). Intimate Exchanges: Using Computers to Elicit Self-Disclosure from Consumers. Journal of Consumer Research, 26(March), 323-339.

Morandi, I.W.M, Maria., Rodrigues, H. Luis., Lacerda, P. Daniel., and Pergher, Issac. (2013). Foreseeing Iron Ore Prices Using System Thinking and Scenario Planning. Systemic Practice and Action Research. Retrieved on 23 August 2013 from <DOI. 10.I007/s 11213-013-927709>.

Nadar, E. N., & Vijayan, S. (2009). Managerial Economics, Eastern Economy Edition. PHI Learning Private Limited, 33-36.

Nass, C. I., Lombard, M., Henriksen, L., & Steur, J. S. (1995). Anthropocentrism and Computers. Behaviour and Information Technology, 14(4), 229-238.

Nedjah, N., & Mourelle, M. D. L. (2007). Co-design for System Acceleration: A quantitative approach. . Dordrecht: Springer, Dordrecht, The Netherlands.

Pelton, P. Robert. (2010). Action research for teacher candidates. Rownman & Littlefield Education, Unites States of America.

Qiu, L., & Benbasat, I. (2010). A study of demographic embodiments of product recommendation agents in electronic commerce. International Journal of Human-Computer Studies, 68, 669-688.

Raoufi, M. M. (2005). How can I help you? - The delivery of e-government services by means of a digital assistant. Department of Informatics.Umeå.

Rattanawicha, P. (2005). Communicating Customer Trust in e-Commerce Through Website Design. Thesis Asian institute of Technology(May).

Redmond, W. H. (2002). The Potential Impact of Artificial Shopping Agents in E-Commerce Markets. Journal of Interactive Marketing, 16(December), 56-66.

Sander, N. B. E., & Stappers, J. P. (2008). Co-creation and the new landscapes of design. CoDesign:. International Journal of coCreation in Design and the Arts, 4(1), 5-18.

Saleh, K., & Shukairy, A. (2011). Conversion optimization: the art and science of converting prospect to customers. O'Reilly Media, Inc, Sebastopol, United States of America.

Schiuma, Giovanni., Carlucci, Daniela and Sole, Francesco. (2012). Applying a system thinking framework to assess knowledge assest dynamic for business performance improvement. Expert System with Applications. Vol.39, pp. 8044-8059.

Subrahmanyam, P. A. (1992). Hardware/software co-design: What is needed for success. . Paper presented at the In International Workshop on Hardware/Software Codesign, ACM/IEEE., Estes Park, Colorado.

Subrahmanyam, P. A. (1993). Hardware–software co-design – cautious optimism for the future. January. IEEE Computer, 84.

Sweeney, B. Linda., Sterman D. John. (2000). Bathtub dynamics: initial results of a system thinking inventory. System Dynamics Review, Vol. 16, No. 5. pp. 249-286.

Szwarc, P. (2005). Researching customer satisfaction & loyalty: how to find out what people really think. United Kingdom: Kogan Page Limited.

TransportationResearchBoard. (1999). Report 47: A handbook for measuring customer satisfaction and service quality. Washington, D.C. United States of America: National Research Council, National Academy Press.

Wang, L., Baker, J., & Wakefield, K. (2007). Can a Retail Web Site Be Social? Journal of Marketing, 71(July), 143-157.

Yawson, M. Robert. (2012). System theory and thinking as a foundational theory in human resource development - A Myth or Reality?. Human Resources Development Review, Vol. 12, Iss 1, pp. 53-85.

Zenker, S., Petersen, S., & Aholt, A. (2012). The citizen satisfaction index (CSI): evidence for a four basic factor model in a German sample. Retrived on 11 September 2012 from< Cities, advanced online publication, doi:10.1016/j.>.

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