Service Modeling of Compliments and Complaints and Its Implications for Value Co- Creation

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Service Modeling of Compliments and Complaints and Its Implications for Value Co-Creation

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ABSTRACT

The paper demonstrates the impact of using text mining techniques to automate analysis and classification of large amounts of customer compliments and complaints (C&C). The research is using an empirical approach to generate a better understanding of how co-creation processes can be designed based on customer feedback experiences. In order to improve the service propositions, the integration of customer comments as operant resources of the organisation is discussed. A co-creation feedback model is proposed, considering positive and negative comments across three main categories, resources, activities and attributes (positive/negative comments). Finally, the co-creation feedback model enables the mapping of the organisation's service processes from the customer perspective.

Keywords: SD-Logic, Compliments and Complaints, Text Mining, Co-creation

1 INTRODUCTION

The use of the internet and ICT technologies have increased the level of customer participation in the service process and changed the way of communication and interaction with customers (Rust et al. 2006). Recent theories like SD-logic (Vargo and Lusch 2004, 2008) are proposing that customers are value co-creators, active participants of the service process, and the only ones that can assess the value propositions (Payne et al. 2007; Vargo and Lusch 2007). A key part of the customer assessment of value propositions is customer feedback obtained through a variety of mechanisms and recent research into co-creation is looking into the way that customer feedback can be used to enhance business processes (Baron and Warnaby 2011; Grönroos 2008).

Advances in ICT technologies have improved dramatically the way that customer feedback is collected, analysed and disseminated. By customer feedback, in this work, we refer specifically to customer compliments and complaints that are collected via solicited mechanisms e.g., questionnaires (Wirtz 2000). Since the majority of the customer feedback takes the form of unstructured data, the analysis of the feedback could be based on technologies such as text mining which allow unstructured information to be analysed in automated way thus, minimising the errors and delays from human intervention but also giving the possibility to improve the performance and availability of the information across the organisation. There are a number of examples where text mining technologies have been used across different sources such as emails, social networks and call centres (Ur-Rahman and Harding 2011).

This paper proposes a value co-creation feedback model based on analysing customer complaints and compliments and generating a customer-view of the value propositions. An empirical approach is used to generate a better understanding of how co-creation processes can be designed based on customer feedback experiences. In particular, the paper demonstrates the impact of using text mining techniques to automate analysis and classification of large amount of customer feedback data and the identification of operant resources. The proposed co-creation feedback model considers positive and negative comments across three main categories, resources, activities and attributes (positive/negative).

2 BACKGROUND

The two broad research areas of relevance to this work are first, SD-logic and value co-creation and secondly, customer feedback and specifically, complaints and compliments. According to the SD-logic, service is defined as: "the application of specialised competences (skills and knowledge) through deeds, process, and performances for the benefit of another entity" (Vargo and Lusch 2004, p. 5). SD-logic makes an important distinction between two types of resources, operand and operant. Vargo and Lusch (2004) explain that "in a service centred view, firms must focus on operant resources identifying or developing core competences, the

fundamental knowledge and skills of an economic entity". Furthermore, according to SD-logic literature, "value is co-created through the combined efforts of firms, employees, customers, stockholders, government agencies, and other entities related to any given exchange, but are always determined by the beneficiary" (Vargo et al. 2008, p. 148). Once the service experience has been performed between the company and the customer, only the customer can assess the real value through their satisfaction level, called *value in use* (Vargo and Lusch 2007).

Previous studies have highlighted the importance of customer's feedback in the achievement of high service quality standards and on the organisational learning process (Bell et al. 2004; Caemmerer and Wilson 2010). Compliments and Complaints are a type of an active form of customer feedback generated by a delight or dissatisfaction episode with the service (Friman and Edvardsson 2003). In particular, complaining customers can contribute to the firm by giving information about what part of the service can be improved and potential service innovations (Blodgett and Anderson 2000; Gruber 2011). From an SD-logic perspective, focusing customer feedback analysis only on specific attributes of a service process is an incomplete understanding of customer experience (Macdonald et al. 2011). Evaluating output attributes such as reliability, assurance, tangibility, empathy, and responsiveness (Parasuraman et al. 1988) represents an oversimplification of the different resources, encounters and activities that interact across the service process (Edvardsson and Tronvoll 2011; Macdonald et al. 2011). Indeed, the classification of attributes into predefined quality dimensions provides only superficial information about customer experience (Caemmerer and A. Wilson 2010), which can possibly distort the feedback analysis, especially when the co-creation process considers many interactions (Payne et al. 2007). Considering that a service centred view of marketing perceives marketing as a continuous learning process directed to improve operant resources (Vargo and Lusch 2004), then customer feedback analysis should provide information about resource performances across the value co-creation process (Tronvoll 2007).

The paper proposes a value co-creation process which considers that the firm has a value proposition and the customer is a value co-creator who interacts with the service proposition and creates value (Payne et al. 2007; Tronvoll 2007). Both, the firm and customer have their own resources and activities that interact across this service process. As a consequence, satisfaction or dissatisfaction episodes are generated by interactions, driven by specific resources that perform over or under expectation. The proposed approach is focuses on extracting the resources and activities that are determinants of a customer positive or negative evaluation. In the proposed model "attributes or quality dimensions" are not seen as the final evaluation of customers of the entire service, but as a positive or negative opinion about a resource or activity in the co-creation process.

3 CASE STUDY

The research approach follows a case study methodology providing empirical

evidence of the applicability of SD-logic into real business problems. The research aims to examine co-creation process perspective through identifying the resources and activities that generate customer complaints and complements. Furthermore, the paper examines the ability of text mining techniques to automate the analysis of them adapting a value co-creation process model.

The participant organisation is a car park company in one of the UK airports. The organisation provided a dataset with 1091 customer comments over a week and related to data from a car park survey that sent to customers two days after using the service. Table 1 shows the structure of the dataset. The *Car Parks - Single Improvement Factor* contains the answer of the open question "*What is the single most important factor you feel we can improve upon to enhance your car park experience*" and *Recommendation Rating* represents a net promoter score question that asks how likely is the person to recommend the car park to a colleague or a friend on a scale from 0 to 10.

Table 1 Customer Feedback Data Source

REF	Car Park	Car Parks - Single improvement factor	Recommendation Rating	Car Park Departure Date
1	Car Park E	Barrier did not recognise my pre-booked credit card - had to press buzzer but person very helpful. Bus going out was fine - after waiting 15mins for bus on return we walked - very poor	5	05/06/2011

Currently, comments are analysed manually and coded into different categories and sub-categories based on one annotator's judgements. Normally, the process takes around two weeks to analyse comments and produce the report.

3.1 Text mining process

The objective of the text mining process is to help the organisation to automate the analysis of customer feedback. The process follows a two stage approach as shown in figure 1, namely, *Training* and *Population*. In particular, the process extracts the main concepts to build a domain specific library and map these concepts to four main categories, namely, Company Resources, Customer Resources, Activities (Company, Customer), Attributes (Positives, Negative) (Yu et al. 2011, p. 736). The first three categories are extracted because of their relevance to SD-logic, and to understand the co-creation process (Payne et al. 2007; Vargo and Lusch 2007). Furthermore, resources and activities represent the different interactions between the company and customers (Payne et al., 2008; Kwan and Min, 2008). The last category is extracted to analyse whether the customer experience was positive or negative.

As part of the training stage, a sample of 100 comments were randomly selected and manually annotated by the research team. The manual annotation used the categories and subcategories employed by the company but also extended these with some new or modified subcategories. The revised manually annotated training sample contains a total of 453 concepts annotated and classified to the categories and subcategories. Following this process, an evaluation took place with the customer relation department of the participant company to review and validate the categories and subcategories and the proposed annotations.

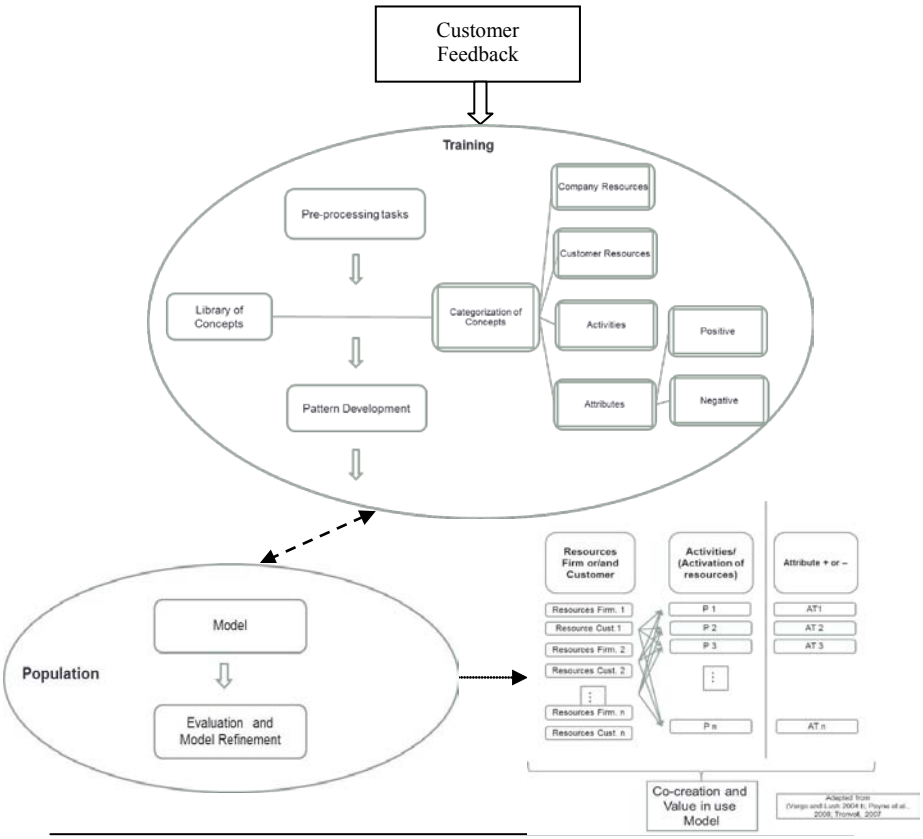

Figure 1 Value Co-creation Feedback Model

In order to map the comments to a designated service process from customer centric view, the approach adapts the co-creation process model (Payne et al. 2007). According to this, compliments and complaints are mapped on the main activities that take part in a service process. Therefore, the manual annotation process helped in the pattern development as the comments has been split into information units to analyze comments using sentence level analysis (Singh et al. 2011). The research employed sentence level analysis for more detailed insightful information about the customer experiences as each comment could express different experiences of various services offered by the participant company.

The patterns used the developed library resources to extract resources and activities from these information units. In the training sample, overall the text model have 72 patterns designed to extract resources and activities of service process where customers were having positive or negative value in use experiences. As result, the analysis showed that there are four main service processes (*Booking*, *Arriving to Car Park, Parking Car, and Bus Service*) were experienced by customers as shown in figure 2.

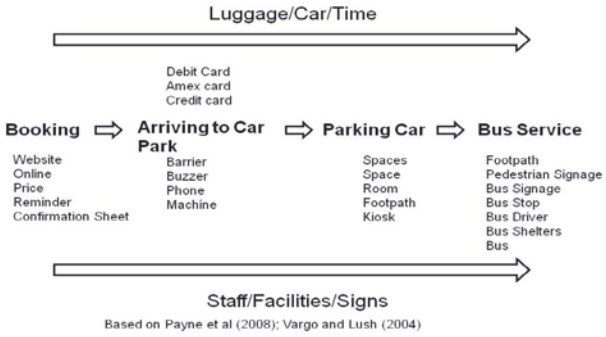

Figure 2 Adapted Service Process Model for pattern development

Table 2 shows an example the patterns extracted and the corresponding linguistic structure per information unit. Patterns are grouped based on the highlighted service process (booking, arriving car park, parking car and bus service) which contains the total number of patterns were developed across the different service processes. The pattern structures of the first information unit "*Barrier did not recognise my pre-booked credit card*" is [company resources+customer activity+company activity+customer resources]. The pattern automatically classifies this information unit as a complaint about the entrance and maps it to two service processes booking and arriving to car park. However, the structure of the second information unit "*Had to press buzzer but person very helpful"* is different [customer activity+company resources+company resources+attribute (positive)]. The customer in this information unit compliments the staff. In the same comment, the customer evaluated and experienced the bus service. The pattern of the information unit of *"bus going out was fine"is* structured as [company resources+customer activity+attribute (Positive)]. The customer was neutral in his evaluation about the bus services. In this case, the pattern analysis deals with neutral feedback as a compliment and maps the information unit to a bus service process. However, the customer was not happy about waiting 15 minutes for the bus on his return as he commented *"waiting 15mins for bus on return we walked- very poor"*. The pattern structure of this information unit is [customer activity+customer resources+company resources+attributes (negative)].

The second stage, population, applies the model on the complete dataset and evaluates its capabilities through evaluating the accuracy of the annotations generated.

3.2 Results

The prediction capability of the model was evaluated based on the number of comments that were presented in the training sample and the number of accurate annotations. This gives an indication about the missing and inaccurate extraction which will be considered in the model refinement process (Feldman and Sanger 2007).

Regarding the training sample, the model annotated 76 comments from a total of 100. Due to language structure complexity, the model could not extract 24 comments from the training sample. Overall, from the 76 comments, 110 patterns were found. From the 110 patterns, there were three inaccurate annotations, which gives 98% overall accuracy. Finally, 84% of the comments were classified as complaints and 16% of the comments were classified as compliments.

Table 2 Pattern Development and Service Process

Single improvement factor	Pattern Development	Company Resources	Customer Resource	Customer Activity	Company Activity	Attributes	Service Process	C&C
Barrier did not recognise my pre-booked credit card - had to press buzzer but person very helpful. Bus going out was fine - after waiting 15mins for bus on return we walked - very poor	Barrier did not recognise my pre-booked credit card	Barrier	credit card	did not recognise	Pre-booked		Arriving to car park & Booking	Complaint
	Had to press buzzer but person very helpful	Buzzer/ Person		press		very helpful	Arriving to Car Park	Compliment
	bus going out was fine	bus		going out		fine	Bus Service	Compliment
	waiting 15mins for bus on return we walked- very poor	bus	15 mins	waiting		very poor		Complaint

As part of the population stage, the model captured 550 comments from 1091 comments, which represents 50% of the total dataset. From the 550 comments, 694 patterns were found, only 55 were wrong predictions, which gave 92% overall accuracy. The model found 86% complaints and 14% compliments which is consistent with the result of the training sample. Overall, the result was fairly good enough to demonstrate how text mining could be used for automating the analysis of compliments and complaints following a value co-creation process model. Indeed, the model needs improvement and design more patterns to fit the analysis and increase the model accuracy which is considered in future work.

Table 3 and table 4 show details about model accuracy to extract compliments and complaints per service process. The analysis evaluated the customers experience across the different service process from a customer centric perspective. The analysis gives an indication which services are mostly complained or complimented by customers. Therefore, the presented results could contribute to the participant organisation to improve value proposition and enhance the relationships

with customers. For example, table 4 shows that highest percentage of customer complaints are inside the car park (298) to use the facilities to park his/her car. In particular, the analysis classified different complaints about company resources such as directions, space, staff, facilities, others parking, and others customer resources that customers addressed in their feedback. Generally from the analysis, customers were complaining frequently about directions, information or signs that direct customers to the car park.

Table 3 Model Accuracy for Compliments

Service Process	Right Predictions	Wrong predictions	Total	Accuracy
Booking	1	0	1	100%
Arriving Car Park	0	0	0	0%
Parking car	83	10	93	89%
Directions	1	1	1	100%
Staff	20	2	22	91%
General	62	7	69	90%
Bus Service	7	1	8	88%
Total	110	13	123	89%

Furthermore, the analysis shows that booking and parking car services represent the main complaints activity. In particular, booking service has complaints reached 54%. In particular, customers were complaining about online booking service on the website, e-mail confirmation, and information about the car park in the website. Price was another subcategory that has frequent complaints by customers, as 71% of the booking comments referred to price resources. Most of the cases price resource is linked to negative activities such as "reduce" and "increased", and also towards negative attributes such as "expensive", "less", "cheaper" and "same".

Table 4 Model Accuracy for Complaints

Service Process	Right Predictions	Wrong predictions	Total	Accuracy
Booking	87	3	90	97%
General	23	1	24	96%
Price	64	2	66	97%
Arriving Car Park	54	1	55	98%
Parking car	298	38	336	89%
Space	71	3	74	96%
Staff	25	4	29	86%
Facilities	9	0	9	100%
Directions	111	3	114	97%
Others car park	65	12	77	84%
Others Customer resources	17	16	33	52%
Bus Service	111	3	114	97%
Total	550	45	595	92%

Figure 4 shows an example of booking analysis that map complaints related to price resources. The words in circle presents the resources of the company and others are mainly the attributes that are classified into complaints.

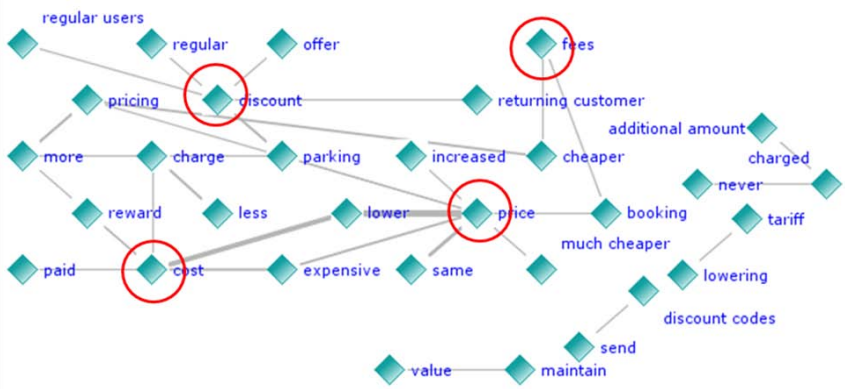

Figure 4 Price resource and associated attributes

4 EVALUATION AND CONCLUSIONS

The evaluation process analyses how the results could be used to improve the organisation service process, value proposition, and enhance the relationship with the customers. It follows a similar approach discussed in Baron and Warnaby (2011). First of all, the customer feedback for the car parking is a major area of concern because of the large number of complaints received from the customers. Following a demonstration of the approach to the company, the manager of the customer relation department commented "*You definitely have got a good approach around this…" "… from my point of view you have developed something that works… you could drag it off to different areas of the business and just be as efficient as possible, … however no matter how good it is, it always is going to drop off a few data points, but there's a big benefit of using it compared with doing it manually … Especially as the manual method data is so delayed".*

Getting the analysis done quickly is certainly one of the major advantages but it is also important to consider advantages such as the consistency of the information extracted highlighting areas of concern and allowing the organisation to respond much quicker and in a more informative way. In general, the manager's comments validated the importance of detecting complaints quickly especially if the resource is easy to solve. In terms of value in use of customers, it was highlighted the practicality of identifying some resources of the company which could be improved immediately such as the staff as quoted "*tactically you want to solve the problem straight away… and make sure you improve in a way that affects the majority of people, so it might be looking at improving something… not something like price which can take time, but might be something like staff which you could do straight*

away" and *"….and if the customer decides as an example of what they have improved I think the customer is doing the job for you…"*.

The paper contributes to the SD-logic development by utilising text mining to analyse large amount of customer feedback and define how the co-creation process can be designed based on customer experience. This could be considered as an alternative approach compared to previous "attribute" or "quality" dimension approaches. Applying resources and activities could help organisations to gain insightful information from analysing customer experiences which could be mapped directly to the service process. Also, sentence level analysis gives a better feedback resolution as the customer is able to comment on different service processes (or parts of) and different resources and their attributes. The customer focus provides however, a very powerful feedback mechanism including the ability to not only facilitate value co-creation but also to integrate customer information into the customer relation management system.

However, the model is still in the early stage of development. Given that the accuracy level of the extraction result is still relatively because of the ultimate need to enrich and train the model with library resources and develop relevant linguistic patterns. The future work will focus in increasing the accuracy of prediction to reach at least 90% for better customer feedback analysis. Furthermore, the model will incorporate structured data from CRM systems to produce rich analysis and profiling about customers. More emphasis on extracting complicated phrases structure such as irony comments.

Furthermore, the research is working to incorporate the customer context into the value co-creation model. This will include an analyser for contextual comments related to personal situational contexts. An example of the customer comments that describe a situational context is: *"A death in my colleagues' family on the morning I was due to travel resulted in the trip being cancelled. Having pre-paid I was informed on your web site that I could not cancel or amend the booking therefore I lost my money. Not happy about that"*. By analysing the context, the organisation could react differently depending not only on the customer information but also the situational context.

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