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Self-service on the Internet: An Explanatory Model

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Abstract

This paper describes research that identifies and classifies the dimensions of selfservice activity enabled through the Internet. Self-service is effected by organizations providing ways and means whereby customers perform tasks related to the procurement of goods and services. We describe how an instrument used to measure Internet based self-service was developed, validated and applied. The results from the application of the instrument across a large number of websites covering a range of industries, countries and cultures are analysed and discussed. The study supports our initial model in which type of industry, level of technological development, and cultural factors are proposed as explanatory variables for web based self-service. We conclude with an assessment of this programme of research's achievements so far.

Keywords: Self-service, Web based, Internet

1 Introduction

The need to explore the social impact of innovations in information technologies has been of long standing interest for information systems academics, notably Kling (1991) and Zuboff (1988). Following this theme we explore here the role of the Internet in enabling self-service activities. Self-service involves customers performing tasks that would otherwise be undertaken by employees of the organization providing the service. Such changes clearly impact on the social dimensions of life. We introduce the concept of self-service technologies (SST's) and how the Internet facilitates forms of web based self-service. We describe how an instrument to measure the extent of web based self-service was developed and validated. We then present, analyse, and discuss results that emanate from the

application of the instrument across a number of websites and industries. Finally we conclude with an assessment of this programme of research's achievements so far.

2   Self-service

Examples of the service aspect of consumption where customers perform functions that used to be performed by employees are numerous. For example, it used to be the case, when grocery shopping in western countries, that the shop worker would retrieve items a customer wished to buy. Nowadays, in the era of self-service, it is customary for customers to select their own purchases, place them in a cart, and carry them to the cashier. Customers may even scan purchases and tender payment unaided by an employee. The phenomenon of customers performing tasks that used to be provided by employees of companies is now being enabled through e-commerce. A well known example is Internet Banking where bank customers can perform functions to obtain balances of accounts, view lists of transactions and pay bills via a website.

Sayers (2003) drawing on Fitzsimmons & Fitzsimmons and Harrington, Esseling & van Nimwegen describes how consumers are perceived as service providers within the supply chain:

> re-engineering service to take full advantage of self-service is now a fullblown science. 'Process Design' specialists map out service interactions, timing and measuring each component of a service chain so that ways to gain efficiencies in the system can be achieved, including ways to get the customer to do tasks previously done by a staff member.

There is a need to explore the role that websites play in transforming aspects of the service experience that used to be performed by employees into ones that are now performed by customers. This study does not seek to extend this "science" but rather to define, document, categorise, measure and theorise about the phenomenon within the e-commerce arena. Our objectives in this research program are to proceed from a definition of this phenomenon to a creation of an instrument that would measure it, which we can then use to make comparisons across industries, countries and cultures. In earlier papers (Oliver, Romm Livermore et al. 2005), (Romm Livermore, Farag et al. 2005) we focused on the potential use of customer service websites for shifting work from employees to customers and the development of an instrument for measuring this activity. In this paper we build on this foundation by providing some experimental results obtained from applying this instrument.

3   Self-service Technologies

Online self-service websites are typically categorized into two main types; informational and transactional. Informational websites provide information about companies, services or products. Those which are transactional involve an Internet mediated transaction such as placing an order, making a bank transfer or booking a flight (Conneighton 2004), (Young and Benamati 2000). Conneighton (2004) maintains that "Web based customer self-service is a vastly more cost effective way of managing customer interactions and inquiries than are channels that require any kind of human intervention". He adds the proviso "so long as customer service quality is maintained". Companies can reduce operating costs by providing the opportunity for customers to self-serve using the Internet. These reduced costs can be passed on to consumers. For example the Virgin Blue website (an Australian domestic carrier) advises that fares booked by a service call attract a $15 loading

compared to the Internet booking fee (VirginBlue 2006). The service that is being purchased, namely airline travel, is a physical provision which remains the same whichever type of ticketing service the consumer chooses (Internet ticket purchase, a telephone ticket purchase or a face to face transaction at a travel agency).

Some information services that organizations provide do not usually command a fee for service, however there is clearly a cost to providing them. Providing information services on the Web gives organizations the opportunity to reduce the cost of information provision. Customers may prefer web based information provision for reasons of convenience even though there is no clear cost benefit to them. Examples of web based information provision are shipment tracking enquiry systems and weather reporting services.

Consumers interact with many SSTs without needing to acquire their own technology infrastructure. Automated Teller Machines (ATMs) are provided by financial institutions, airline check-in kiosks are provided by airlines and self scanning checkouts are provided by supermarkets. On the other hand web based services are only available to those who are able to provide themselves with access to computers with Internet connections and consequently only those people who use the Internet customarily are likely to avail themselves of these services. This suggests that for a country there may be a relationship between the level of Internet connections and the level of web based self-service.

According to a study by Meuter et al. (2000) consumers elect to avail themselves of self-service technologies for a number of reasons, which are ease of use, avoidance of service personnel, saving time, availability of the service in terms of when and where the consumer requires it, and saving money. Bitner's (2001) assessment of customer satisfaction with SSTs reflects things customers have always sought in a service situation such as "dependable outcomes, easy access, responsive systems, flexibility, apologies, and compensation when things go wrong. In other words, they still want service".

4 Turning Customers into Employees (TCIE)

We define the process in which "aspects of the customer service experience that used to be provided by the company's employees are now provided through the interaction of customers with the company's website" as "turning customers into employees" (TCIE) (Romm Livermore, Farag et al. 2005).

It should be noted that this is an **interpretive definition** that may or may not fit the subjective perception of either the company or its customers. Thus, customers may perceive their interactions with a website as an opportunity to achieve increased customization of a product, faster speed of service or lower prices (Halbesleben and Buckley 2004), while companies may believe that offering services via their websites can lead to competitive advantage through lower costs, increased satisfaction and loyalty of customers and the ability to reach new consumer segments (Bitner, Ostrom et al. 2002). The suggestion that the interaction between the customers and the company is an example of TCIE is, thus, an interpretation of reality that may or may not be shared by either the companies whose websites we intend to study or the customers of these companies.

We accept Lengnick-Hall's (1996) definition of the relationship with customers and employees as "co-production" and we view customers as "partial employees" Mills, Chase and Margulies (1983), Mills and Morris (1986), Keh and Teo (2001), and Harris, Baron, and Davies (1999). Note also that we use the term "employee" to identify those instances that reflect the role of the customer as a provider of labour in the service experience. Customers may receive a "benefit" in the form of lower

prices, greater satisfaction, greater speed of service, and greater customization (Schneider and Bowen 1995).

5 Development of the TCIE Model

We assume that the process of turning customers into employees is not uniform across companies or industries. In fact, based on preliminary research, we assume that this process is highly sensitive to variables such as type of industry, level of technological development, and organizational and national culture. Our initial model is presented in Figure 1.
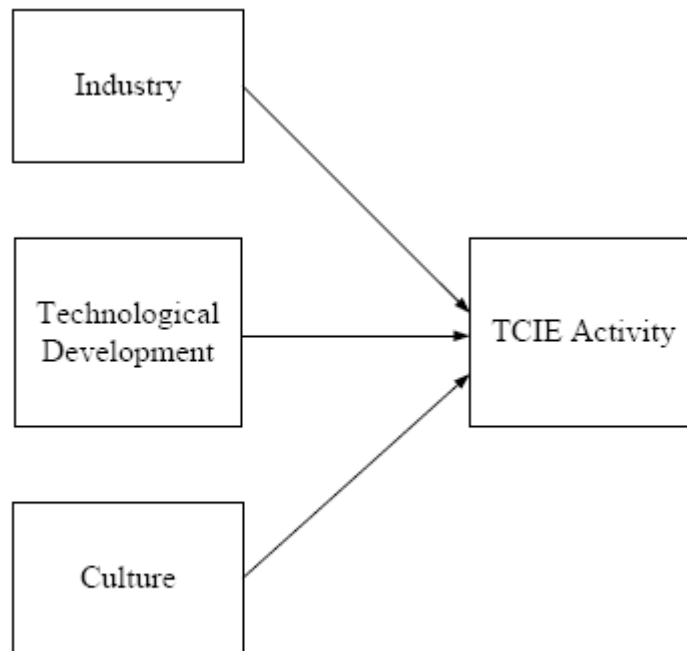

Figure 1. Initial Model of TCIE Activity

The process used to develop the measurement instrument from our interpretive definition of TCIE is shown in Figure 2. An initial set of criteria to measure the TCIE phenomenon was developed from an exploratory examination of websites made by teams of MBA students (the majority of whom are employed full time and doing their MBA part time). These students were organized into groups of about nine students. The student groups were directed to select three websites from the US, three from either the UK or from Australia, and three from a culture "very different" from either the US, the UK, or Australia (such as Japan or India). This was in order to explore different cultural settings as defined by Hofstede (1980; 1980; 1984; 1984; 1994; 1994). In determining which cultures are "very different" from the US, Australia and the UK a culture will be deemed to be at least ten points different from the US, UK, or Australia on at least two dimensions
of the Hofstede model.
Each team was asked to share with the other teams and with the instructor the organization, industry and country they intended to focus on, to make sure that there was no overlap between the teams in terms of the websites studied. These teams were instructed to study each website and to identify between four and ten distinct tasks that reflected TCIE in their sample. Teams were instructed to reach consensus on the tasks they identified. Finally, once identified, the student teams were asked to

describe the TCIE tasks in detail and to accompany their description with examples that reflected the various tasks.

A large number of websites, around one hundred, were reported on by the student groups over two successive offerings of this class. These responses were analysed by one of the authors who consolidated these findings into a single list of identifying criteria as shown in the Appendix using a form of grounded theory analysis (Glaser and Strauss 1967), (Strauss and Corbin 1990; Strauss and Corbin 1997). The measurement instrument is based on this list.
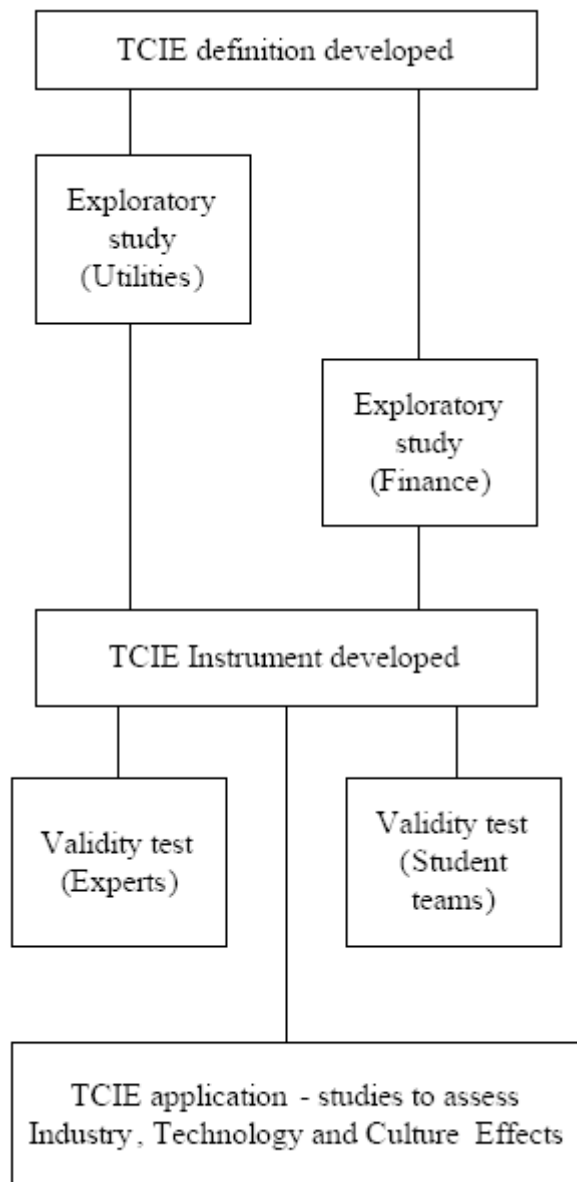

Figure 2. TCIE Instrument Development Framework

5.1 Assessing the Validity of the Instrument

This list of identifying criteria was tested for validity by asking two reference groups to check the items in the list against the definition of TCIE that was presented earlier in this paper. One group comprised six experts. The experts included, two professors of IT with expertise in issues related to E-commerce and web design, two professors of Organizational Behavior and Human Resource Management, and two executives with special expertise in establishing and managing a web based business. Their task

was to check each item in the list of criteria against the definition of TCIE and to assess the extent to which the item is an example of an aspect of the service experience that can be undertaken by a customer instead of an employee. From these responses a Kappa statistic of 0.79 was generated (Landis and Koch 1977). Landis and Koch suggest the following coefficient benchmarks: poor (<0), slight (0-0.19), fair (0.20-0.39), moderate (0.40-0.59), substantial (0.60-0.79), and near perfect (0.80-1.00). The other reference group was formed from a subsequent class of MBA students who performed the same task. The Kappa statistic from the student group was 0.66. Both groups were therefore in the 'substantial' range.

The same class of MBA students who assessed the validity of the instrument also applied the instrument to a further sample of websites from the retail sector. This application of the instrument constitutes some of the data that informs the studies that are described in the next section. From this study we computed the Kappa statistic on the use of the instrument by the student groups. A calculation was made for each group separately because each team was studying a different set of websites. We ended up with six scores for reliability representing each of the six teams. The Kappa statistics from this process were unusually high, with the lowest being 0.88. This has caused us to reflect that in this initial application of the instrument, group members were possibly not acting independently as directed.

Since these results were averaged later in the process to form a consolidated measurement of a website, this apparent collaboration in coding is not perceived to be of detriment to the accuracy of the study.

6 Application of the TCIE research instrument

In the course of a number of classes we applied the instrument to a number of different industries as shown in Table 1, which include, manufacturing Automobile, Construction materials), retail (Book, Clothing, Cosmetics, Food) and utilities (Electricity, Gas, Telephone). These were selected from a range of countries that reflected different cultural profiles as described earlier. The classes were organized into groups comprising 6 students, although some groups comprised only 4 or 5. Each student rated each website against the instrument and a consolidated rating for each website was obtained by one of the researchers by averaging these individual ratings. The rating was a number between 1 and 30. Although it may be possible in theory to obtain a zero rating, none occurred in these rounds of data collection. The primary data collected by the students consisted of 756 observations across the 41 Industry/Country groups shown in Table 1, which were consolidated into a data set of 141 websites in the manner just described to yield a value between zero and 30 for each website.

Industry	Country				
Automobile	Australia	Japan	Russia	UK	USA
Book	Australia	Norway	Singapore	UK	USA
Clothing	Australia	India	Japan	UK	USA
Construction materials	Australia	Denmark	Malaysia	UK	USA
Cosmetics	Australia	Bangladesh	Japan	UK	USA
Electricity	Japan	UK	USA		
Food	Australia	France	Italy	UK	USA
Gas	Australia	Italy	USA		
Telephone	Australia	Spain	Taiwan	UK	USA

Table 1. Industry/country groups studied

These analyses enabled us to substantiate the three explanatory variables in the model outlined in Figure 1.

6.1 Industry

We expect the website of companies in different industries to exhibit the process of TCIE in different ways. For example, from preliminary research, we are aware that companies in the gas, electricity and telephone industries offer clients features that allow them to measure usage (how much gas has been used in the past month) and report it through the website to the company. This is an example of turning the customers into employees in a way that it not evident in the websites of other industries such as retail, where the "measurement of consumption" is either irrelevant or approached differently.

This paper does not explore these diversities in any depth rather it concentrates on disparities in the overall measurements from industries and countries. The results we present from the application of the TCIE instrument are in the form of a single statistic obtained from applying the instrument as described earlier The TCIE instrument may therefore be seen as a strength indicator, where a high measurement from the TCIE instrument indicates an industry with a high degree of TCIE activity and vice versa.

	Automobile	Book	Clothing	Construction materials	Cosmetics	Electricity	Food	Gas	Telephone
Australia	10.7	15.7	16.3	10.5	18.0		13.7	9.3	19.7
Bangladesh					5.3				
Denmark				5.7					
France							9.3		
India			9.7						
Italy							17.3	10.7	
Japan	11.0		11.0		14.3	10.0			
Malaysia				8.0					
Norway		20.7							
Russia	5.0								
Singapore		17.0							
Spain									13.0
Taiwan									12.0
UK	13.0	17.3	17.3	8.0	14.7	14.0	6.7		20.0
USA	15.4	21.2	16.5	8.4	19.3	16.7	13.7	12.7	20.7
Average	11.5	18.8	14.6	8.0	15.2	13.6	12.4	10.9	17.7

Table 2. TCIE measures for Industry/Country combinations.

Table 2 shows the Industry/Country measures for TCIE activity obtained from the study so far. The last row of this table shows considerable variation in the TCIE metric across industries. This data shows that different industries have substantially different levels of web based self-service activity and therefore supports the inclusion of Industry as an explanatory variable in the model of Figure 1. These results also confirm those of Young and Benamat (2000) who report variations in the transactional capabilities of company websites in different industries. This is a strong pointer to the incidence of TCIE in an industry.

Engaging in transactional activity will almost certainly involve the customer in doing some work that would otherwise have been performed by an employee. The Automobile industry, the Gas industry and the Construction materials industries exhibit the lowest TCIE measures. This suggests the capacity for customers to engage in web based self-service over the Internet is low in these industries. That the Gas industry records a low value is puzzling since the perception of the authors was that utilities would have a high level of TCIE capacity, as they require meter values to be input periodically, which is a function users could perform on-line.

The findings reported here do not necessarily confound these assumptions. It may be that the TCIE instrument at this stage of its development is too blunt as it does not distinguish between potentially high customer workload activities and low ones. The instrument simply takes an indicator of TCIE at face value and ranks each attribution equally without any assignment of strength or importance. So an industry with few TCIE indicators used intensively would register a low rating, whereas another industry with many little used TCIE indicators would register a high rating. A consumer survey may be needed to develop a deeper understanding of what the TCIE activities mean to those consumers who undertake them and their relative workloads.

The Electricity and Telephone utilities show high TCIE values compared to Gas. This result also poses some questions, for whereas Gas and Electricity consumption is measured by meters located at the consumer end, which can therefore be easily read by consumers, that is not the case for the telephone industry where the metering is done centrally and therefore does not present the same capacity for consumer work. Nevertheless the instrument records a substantially higher level of TCIE activity for the Telephone industry compared to Gas and Electricity. This is clearly due to other TCIE factors.

The Book and Telephone industry yielded the highest levels of TCIE involvement at 18.8 and 17.7 respectively. The Book industry is well known as having a high profile in terms of e-commerce activity, so this result serves to confirm the effectiveness of the instrument. However both these levels are still less than 66% of the maximum value possible. This again points to the issue of the broad scope of the measurement instrument, distilled as it was from a study of many websites in many industries, which perhaps inhibits the possibility of achieving a very high score in a single industry.

6.2   Technological development

To answer this question we compare the results of applying the TCIE instrument across countries that represent different levels of technological development. The measures of technological development we selected were the number of Internet users and the number of PC's per 1000 of the population in 2004 obtained from the World Bank website (World Bank no date). These measures seemed appropriate for technological development, as we are investigating a SST that requires Internet connectivity and a PC. We would expect a correlation between these measures and

the TCIE metric if the level of technological development is associated with TCIE activity. Table 3 shows the measures for the countries that were chosen for this study.

Country	Internet users per 1000 people	PC's per 1000 people
Australia	497	616
Bangladesh	2	4
Denmark	556	648
France	399	414
India	23	11
Italy	321	232
Japan	606	425
Malaysia	392	170
Norway	546	567
Russia	91	113
Singapore	559	565
Spain	317	199
Taiwan	No data	No data
UK	533	496
US	569	760

Table 3. Internet users and Personal Computers, 2004 (World Bank no date)

The coefficient of correlation between the number of Internet users and the TCIE index was 0.36 and that between the number of PC's and the TCIE index was 0.42 (N=141). This moderate degree of correlation provides support to the inclusion of Technology as a factor influencing TCIE in the model in Figure 1.

6.3   Culture

It will be recalled from earlier in this paper that the student teams that collected data for this project were instructed to select three websites from the US, three from either the UK or from Australia, and three from a culture "very different" from either the US. In order to discern the effect of culture we correlated each of the four measures Power Distance Index (PDI), Individualism (IDV), Masculinity (MAS), and the Uncertainty Avoidance Index (UAI) of the Hofstede model with the measure of TCIE obtained from each website. The values for the Hofstede measures for the countries visited in this study were obtained from Hofstede's website (Hofstede 1967-2003). These results are shown in Table 4.

	Power Distance Index (PDI)	Individualism (IDV)	Masculinity (MAS)	Uncertainty Avoidance Index (UAI)
Correlations with TCIE index (N=141)	-0.08	0.32	0.1	-0.02

Table 4. Hofstede dimension correlations

The only Hofstede dimension that demonstrates correlation with the TCIE index is Individualism (IDV). This moderate level of correlation suggests Individualism is a cultural trait that tends to a disposition towards web based self-service. This result suggests obtaining goods and services via a computer based mechanism appeals more in cultures oriented towards self reliance than those where more socially orientated practices predominate. Interacting with a website is a highly individualistic type of behaviour. On the basis of these results we therefore conclude that countries where individualism ranks highly are more likely to be receptive to web based self-service.

7 Discussion

The social impact of e-commerce is an important and emerging area of study. Although exploring mechanisms to aid the pursuit of corporate efficiency remains high on the agenda of information systems academics, there is a need to examine the social effects of these initiatives as they invoke changes to existing practices and behaviours. The introduction of new mechanisms for self-service are initiatives of the organizations that provide them and increase its extent. Selfservice mechanisms that operate from organizational web servers and run on personal web browsers are a relatively recent phenomenon and their social consequences relatively uncharted.

As stated at the outset this study does not seek to extend this "science" but rather to define, document, categorise, measure and theorise about the phenomenon within the e-commerce arena. Some of our initial suppositions have been confirmed as a result of the application of the instrument reported here. The initial model postulated that industry, technological development and culture were likely explanatory variables for the incidence of TCIE. This analysis has provided confirmation of the initial model presented in Figure 1. The Industry dimension possesses the strongest support for inclusion, while the Technology and Culture dimensions are supported less strongly.

The main limitation relating to our application of the TCIE instrument is that it has only examined dimensions visible from the websites themselves. Additional data that could expand upon this study would be measurements of the intensity of web traffic on the sites in question as well as consumer studies of those who avail themselves of these services.

8 Conclusion

This research in progress outlines an approach that has been taken to researching the TCIE phenomenon as it is manifested in information systems. It outlines the

development of a measurement instrument and its application to a number of industries in a number of different countries and cultures. This research provides industry, technology and culturally based insights into the web based self-service phenomenon. We have provided some additional measures to assess the penetration of this activity to build on those provided in earlier studies. We have developed an explanatory model and provided justifications for the explanatory variables selected. The process of applying the instrument is ongoing and further results may be forthcoming.

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Appendix – TCIE Measurement Instrument

❑ **Pre-purchase decision making**	
1. Customers can see a display of products/services with product details	Yes No
2. Customers receive an on-line invoice	Yes No
3. Customers can use diagnostic tools to help them define their needs	Yes No
4. Customers can sample or try products for free before purchasing them (receiving sample reports, trying on a virtual dress, etc)	Yes No
5. Customers can compare different products by the same company	Yes No
6. Customers can get information on products of other companies (directly or through banners)	Yes No
7. Customers can see other customers' comments on products before they make the purchase	Yes No
8. Customers receive suggestions based on their own past purchases on what products to consider	Yes No
❑ **Purchase**	
9. Customers can see a display of transaction options	Yes No
10. Customers can order on-line	Yes No
11. Customers can pay on-line	Yes No
12. Customers can pay by phone	Yes No
13. Customers can pay face-to-face	Yes No
14. Customers are able to track the merchandise until they get it	Yes No
15. Customers are able to measure and report usage of a service (for example, gas usage, electricity usage, etc)	Yes No
16. Customers receive a printable receipt and/or e-mail confirmation of purchase	Yes No
17. Customers are able to establish an account with the company	Yes No

so as to simplify all future transactions with the company	
18. Customers receive coupons for future purchases upon completion of the transaction	Yes No
19. Customers get rewards for recommending the product to others	Yes No
20. Customers are invited to receive regular information from the company on new products and services (via a newsletter or direct e-mails)	Yes No
❑ **Post purchase service and support**	
21. Customers can view their itemized bills	Yes No
22. Customers can view their payment history	Yes No
23. Customers can view a comparison of their bill to the bills of other customers	Yes No
24. Customers can complain or ask questions on-line	Yes No
25. Customers can complain or ask questions by phone	Yes No
26. Customers can complain or ask questions face to face	Yes No
27. Customers have access to on-line community of customers for questions and support	Yes No
28. Customers have access to face-to-face community of customers for questions and support	Yes No
29. Customers are provided with on-line advice on how to fix faulty merchandise	Yes No
30. Customers are provided with a physical address for returning faulty merchandise and receiving a refund.	Yes No