

Understanding the Nature of the Consumers and Their Satisfaction on Value Drivers of Business to Consumer E-Commerce Sites: A Study among Some Consumers of Khulna

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Abstract

Business-to-Consumer e-commerce (B2C), in which Business develops electronic marketplaces to entice and sell products and service to consumers. Here, businesses seek to reach individual consumer through online. The research tries to identify the types of business to consumer (B2C) e-commerce sites the consumers are visiting most, the reasons of surfing those sites and to assess the presence of value drivers in B2C. The study area is Khulna, the third largest divisional city of Bangladesh. A total no of 10 factors related with e-commerce sites' value drivers (i.e. data availability accuracy, completeness, speed and performance, security and privacy, quality of services etc.) have been investigated, analyzed and evaluated in this regard. The result shows that most of the value drivers 8 out of 10 are widely present in business to consumer e-commerce service providers.

Key Words: E-commerce, Business to Consumer, Portal, Value driver, Content Provider, Transaction Broker

Introduction

While the term e-commerce refers to all online transactions, B2C stands for "business-to-consumer" and applies to any business or organization that sells its products or services to consumers over the Internet for their personal use. In addition to online retailers, B2C has grown to include services such as online banking, travel services, online auctions, health information and real-estate sites (cio.com). Business to consumer e-commerce sites are the most popular e-commerce sites among the users. Users surf these sites for varieties of purposes such as buying goods and services, getting news or information, watching videos, having stock transaction, exchanging views and so on. The "Global B2C E-Commerce Market Report 2011", the first report in the yStats.com series, features data relating to internet users and online shoppers along with revenue figures for most markets. In 2011, already more than two billion people worldwide used the internet and based on the latest predictions this figure is expected to exceed 3 billion by 2015. Global B2C E-Commerce revenue was approximately 400 to 600 billion US dollars in 2010 and is expected to grow further to 700 to 950 billion by 2015. Asia will continue to play a major role in this development, considering that internet penetration has been relatively low in many countries of this region. The percentage of B2C E-Commerce revenue compared to total retail revenue is 8 % in more developed markets, such as France or Great Britain, and could continue to increase to 10 % over the next few years.

In less developed B2C E-Commerce markets, this share is still far below 3%. Despite small share, B2C sites

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are gaining popularity and more and more consumers are being attracted day by day in Bangladesh. But a few or insignificant researches are carried out to know the experiences of the consumers. As a result the study have been initiated to understand what type of B2C sites the users visit frequently, what are the purposes behind their surfing, types of information or services they look for in those sites and to know the feeling/experience of the users about these sites.

Theoretical Framework

Business-to-Consumer e-commerce, in which online businesses seek to reach individual consumer, is the most well-known and familiar type of e-commerce. Major types of business to consumer (B2C) e-commerce includes services of portals, content providers, transaction brokers, market creators, service providers, and community providers. **Portals** sought to be viewed as "gateway" to the internet initially. But **Portals** such as Yahoo, MSN/Windows Live, and AOL offer users powerful web search tools as well as an integrated package of contents and service such as news, e-mail, instant messaging, calendars, shopping, music downloads, video streaming, and more all in one place. The **Content providers** such as Google distribute information content, such as digital video, music, photos, text, and artwork, over the web. Among the B2C ecommerce, the sites that process transactions for consumers normally handled in person, by phone or mail are called **Transaction brokers**. The largest industries using this model are financial services, travel services and job placement services. Whereas **Market Creators** build a digital environment in which buyers and sellers can meet, display products, search for products and establish prices. While e-tailers sell products online, **Service providers** are those sites that offer services online. The **Community providers** are sites that create a digital online environment where people with similar interests can transact (buy and sell goods); share interests, photos, videos, communicate with like-minded people; receive interest-related information and even play out fantasies by adopting online personalities called avatars. The social networking sites My Space, Facebook, Friendster and hundreds of other smaller niche sites such as Doostang, Twitter and Sportsvite, all offer users community building tools and services. (Laudon and Traver, 2008).

Value Drivers: In the study, Consumers' responses are assessed through some of the key value drivers of different B2C e-commerce sites. Value drivers are those factors that affect customers' perception of the ecommerce sites and influence their level of satisfaction on using different sites. The key value drivers are given below:

Data Availability: Data availability is a term used by some computer storage manufacturers and storage service providers (SSPs) to describe products and services that ensure that data continues to be available at a required level of performance in situations ranging from normal through "disastrous." In general, data availability is achieved through redundancy involving where the data is stored and how it can be reached. Some vendors describe the need to have a data center and a storage-centric rather than a server-centric philosophy and environment.

Accuracy and Timeliness: Accuracy of data is the degree to which data correctly reflects the real world object or an event being described. Examples of Data Accuracy:

- The address of customer in the customer database is the real address.
- The bank balance in the customer's account is the real value customer deserves from the Bank

Data Timeliness: 'Data delayed' is 'Data Denied'. The timeliness of data is extremely important. This is reflected in:

- Companies are required to publish their quarterly results within a given frame of time.
- Customers service providing up-to date information to the customers.
- Credit system checking on the credit card account activity.

The timeliness depends on user expectation. An online availability of data could be required for room allocation system in Hospitality, but an overnight data is fine for a billing system.

Functionality and Reliability: Functionality seems frequently to bring to mind interaction between the site and the site visitor. To determine the most important aspect of a site's functionality requirement, ask the question "what is this site's purpose?" The purpose describes the function the site must fulfill. For example, a site might be to describe a company and its products. In each case, the site's purpose describes the function it must perform. Its quality of functionality is determined by how well it performs that function.

The reliability of a website can be measured by the following criteria:

- Accuracy of information provided by the website
- Appropriateness of the images provided with the website
- Appropriateness of the style and focus of the article
- Susceptibility to, and exclusion and removal of, false information
- Comprehensiveness, scope and coverage within articles and in the range of articles
- Identification of reputable third-party sources as citations
- Stability of the article

For ecommerce sites functionality and reliability are very important. If the ecommerce site cannot perform according to its specific purpose, its value to the customer will be lost.

Customizability: It refers the ability to create positive shopping experiences for customers. Different ecommerce sites provide this by allowing customers to create their own profile and offer products according to customers' specifications.

Speed and Performance: Speed and performance is one of the important factors of ecommerce sectors. Many websites are not easy to access for customers and customers feel problem for information uploading and downloading. In this case customers don't want to access in those website and they lost their popularity. So, speed and performance should be ensured when developing an ecommerce websites.

Data Completeness: For ecommerce sites data completeness is important for success. Completeness of data is the extent to which the expected attributes of data are provided. For instance, customer data is considered complete if:

- All customer addresses, contact details and other information are available.
- Data of all customers is available.

Importantly Data Completeness is a subjective indicator and often defined as the 'expected completeness'. It is possible that data is not available, but it is still considered completed, as it meets the expectations of the user. Every data requirement has 'mandatory' and 'optional' aspects. For instance customer's mailing address is mandatory and it is available and because customer's office address is optional, it is OK if it is not available.

Privacy and Security: Privacy is a serious issue in electronic commerce, no matter what source one examines. Fisher (2001) reported "Forty-one percent of Web buyers surveyed last year by Forrester Research of Cambridge, Mass., said they have contacted a site to be taken off their databases because they felt that the organization used their information unwisely." A Business Week/Harris Poll found that over forty percent of online shoppers were very concerned over the use of personal information, and 57% wanted some sort of laws regulating how personal information is collected and used [Harris Poll 2000]. Similarly, Culnan (2000) argued that privacy concerns were a critical reason why people do not go online and provide false information online.

Security is also a major concern for e-commerce sites and consumers alike. Consumers fear the loss of their financial data, and e-commerce sites fear the financial losses associated with break-ins and any resulting bad

publicity. Not only must e-commerce sites and consumers judge security vulnerabilities and assess potential technical solutions, they must also assess, evaluate, and resolve the risks involved. There are many points of failure, or vulnerabilities, in an e-commerce environment. Even in a simplified e-commerce scenario – a single user contacts a single web site, and then gives his credit card and address information for shipping a purchase – many potential security vulnerabilities exist. Indeed, even in this simple scenario, there are a number of systems and networks involved. Users also often fear misuse of their credit card information provided in online transactions. However, the concern for abuse of credit cards for the transfer of money is weak since all credit cards have a maximum credit limit (Hossain, 2000).

Appeal and Attractiveness: A site must be visually appealing, polished and professional; it's reflecting a company, its products and its services. The website may be the first, and only, impression a potential customer receives of a company. An attractive site is far more likely to generate a positive impression and keep visitors on the site once they arrive. As businesses large and small continue to populate the web, the main challenge is to attract and keep users' attention. Some guidelines considered crucial in creating the desired appeal and attractiveness, are given below:

Good use of color: An appropriate color scheme will contain 2 or 3 primary colors that blend well and create a proper mood or tone for a business. But overdoing of this color usage can distract the visitors from the written contents.

Text that is easily read: The most easily read combination is black text on a white background, but many other color combinations are acceptable if the contrast is within an appropriate range. Use of fonts that are easy to read and are found on most of today's computer systems are recommended. Depending on the audience, text should keep font size for paragraph text between 10 and 12 pts.

Meaningful graphics: Graphics are important, as they lend visual variety and appeal to an otherwise boring page of text. However, but shouldn't over-use them, and should make sure that add meaning or context to your written content. They e-commerce sites shouldn't overload any one page with more than 3 or 4 images.

Quality photography: A simple way to increase visual appeal is to use high quality photography. High quality product images are especially important for online retailers.

Simplicity: It should keep simple and allow for adequate white space. Uncluttered layouts allow viewers to focus on a message. The sites shouldn't overload with overly complex design, animation, or other effects just to impress the viewers

Interactivity of the site: Multimedia elements such as video can help shoppers understand how to use a product or help sell a lifestyle. Images say a thousand words and can stimulate shoppers to fall in love with your products. Audio files such as MP3s can also have a valid place if ecommerce websites are selling audio content or want to make it easy for shoppers to listen to website information in a more passive environment.

Quality of services: This is the measure of the overall customer evaluations and judgments regarding the excellence and quality of service delivery by service providers. This is conceptualized in the marketing literature as the relative perceptual distance between customer expectations and evaluations of the service experiences. Researchers have for many years recognized the importance of service quality as a measure of IS performance.

Objectives of the Study

The study is conducted to attain following objectives.

- i. To find out which sites are being mostly visited by the users.
- ii. To identify the purpose of surfing the e-commerce sites.
- iii. To assess the presence of value drivers.

Methodology of the Study

Researchers follow survey method to collect primary data. To satisfy the objectives, both primary and secondary sources of data have been exploited. A well-structured and pretested questionnaire has been used to collect primary data. Most of the questions are asked to the respondents in five point Likert scale, where 5 indicates strongly agree and 1 indicates strongly disagree. Target population of the study is the users of B2C e-commerce in Khulna city. As the population size is unknown, the following formula has been used to determine the sample size. The formula used to calculate the sample size is $n = z^2 \sigma^2 / e^2$. The notion of this formula is explained below:

n =Sample size

z =No of standard deviation

e =Tolerable error

In order to compute the standard deviations, a small scale survey was conducted among 25 consumers with the final questionnaire. They were asked to score each of 10 statements. Confidence level for the study is 95% which means z score 1.96. Allowable error is assumed as 5%. Thus, the calculation of sample size would be $(1.96^2 * 0.09747^2 / .05^2) = 120$. Therefore minimum number of sample would be 120 to get a reliable result in 95% confidence interval. Collected data have been edited, coded and classified by the researchers during analysis. Different statistical tools like z -test and simple statistical tools with the help of MS excel have been used to analyze data.

Result and Discussion

First of all, users have been asked about the type of site they visit. The result shows that consumers visit content base sites (i.e. prothom-alo, bdnews), service provider i.e. Google and portal like yahoo, more than other types of business to consumer (B2C) sites. The table shows the overall picture of the users.

Table 01: Number of consumers visiting different B2C Sites

Name of B2C site	No. of Respondents	Name of B2C site	No. of Respondents
1. mislbd.com	06	2. prothom-alo.com	112
3. bijoy.com	30	4. bdnews24.com	109
5. unicorn.com	14	6. z-softbd.com	14
7. webbangladesh.com	28	8. Velki.com	02
9. bdstall.com	16	10. the dailystar.net	58
11. datasoft.com	18	12. ankur.bd.com	05
13. prescription.net	03	14. musicbd.com	84
15. clickbd.com	60	16. webbangladesh.com	03
17. web.com.bd	10	18. desbd.org	68
19. bizbangladesh.com	28	20. cellbazaar.com	74
21. Google.com	119	22. Yahoo.com	116
23. aol.com	05		

Second question was about the reasons of surfing the sites. The answer is mixed but most respondent visit the site for information/news, entertainment and academic purpose. The following graph shows the reasons of using business to consumer e-commerce at a glance.

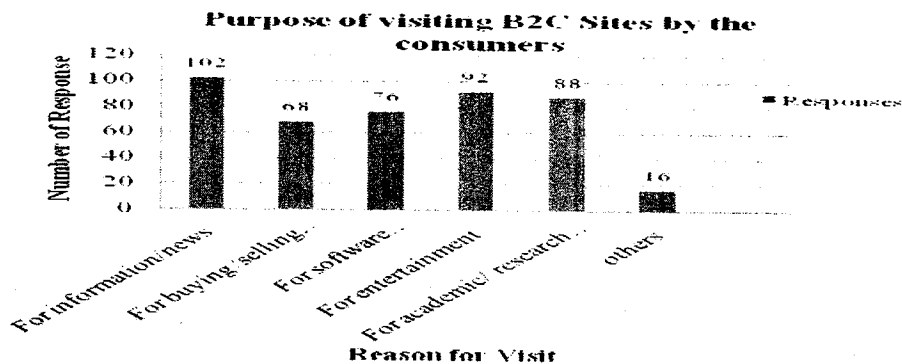


Figure 01: Purpose of B2C Sites visit by the consumers.

Result of Value drivers: To know the presence of value drivers in business to consumer e-commerce sites 10 hypotheses (regarding the value drivers) are formulated. They are as follows:

- H_{a1}: The sites' availability of data satisfy users
- H_{a2}: Timeliness and accuracy of the sites are very good
- H_{a3}: Functionality and reliability of business to consumers sites are good.
- H_{a4}: Customizability of sites meet customer need.
- H_{a5}: Speed and performance are very good
- H_{a6}: Completeness are present
- H_{a7}: Security and privacy of the sites are good
- H_{a8}: Appeal and attractiveness of the sites are very good.
- H_{a9}: The sites are interactive and dynamic.
- H_{a10}: Service quality of sites is very good.

Hypotheses have been analyzed in 5% level of significance and assumed the null hypothesis as the average response of the population which is 3 or less and it has not been increased unless it is proved, thus it can be written as:

$$H_0: \mu \leq 3$$

$$H_a: \mu > 3$$

As H_a is one sided, we shall determine the rejection region applying one-tailed test (in the right tail because H_a is of more than type) at 5 % level of significance and it comes to as under, using table of t/z-distribution.

Data Availability: The observed value of z is 35.7847 which is in the rejection region, since $R: |z| < 1.96$ and thus based on sample evidences H₀ can be significantly rejected and it can be concluded that the sample data indicate that business to consumer e-commerce sites' performance regarding data availability is well beyond the hypothesized mean.

Timeliness and Accuracy: In case of this value driver the calculated value of z is 24.8188 and it is well beyond acceptance region since $R: |z| < 1.96$. Therefore we can significantly reject H₀ considering sample data. Consequently it can be concluded that the sample evidences imply that B2C performance in timeliness and accuracy is above expectation to satisfy consumers.

Functionality and Reliability: The derived value of z in this case is 25.0385 which is in the rejection region since it is far more than the table value of z (1.96) at 5% significance level and thus H_0 is significantly rejected based on sample evidences. We can conclude that the sample data indicate that B2C performance regarding functionality is well above the average.

Customizability: Here the calculated value of z is -5.3268 and it is in the acceptance region since $R: |z| > 1.96$. Thus we do not have adequate sample evidences to reject H_0 . Therefore it can be inferred based on sample evidences that business to consumer performance regarding customizability is far less than assumed hypothesized mean (i.e. 3).

Speed and Performance: The observed value of z is -0.6298 which is in the acceptance region since $R: |z| > 1.96$ and therefore we do not have adequate evidences to reject the null hypothesis. Consequently it can be assumed that perceived speed and performance of B2C sites are less than expected or below the satisfaction level.

Completeness: Here the calculated value of z is 13.6975 and it lies in the rejection region since $R: |z| < 1.96$. So based on sample evidences we can reject H_0 and it can be concluded that this value driver is highly present in business to consumer e-commerce site.

Security and Privacy: The observed value of z for this value driver is 17.5471 which is well beyond the acceptance region since $R: |z| < 1.96$ and thus H_0 is rejected significantly based on sample data. As a result we can assume that the B2C e-commerce sites security and privacy meet or exceed the consumers' expectation.

Appeal and Attractiveness: Here the calculated value of z is 15.1013 which is in the rejection region since it is far more than the table value of z (1.96) at 5% significance level and thus H_0 is rejected significantly based on sample evidences. Therefore it can be inferred that B2C sites' appeal and attractiveness fulfill the expectation of the customers.

Interactivity of the sites: For this value driver the observed value of z is 15.6556 and it lies in the rejection region since $R: |z| < 1.96$ and thus H_0 is rejected and we can conclude that the sample data indicate that B2C performance regarding interactivity have been perceived to be satisfactory.

Quality of the service: Here the calculated value of z is 22.5528 which is far more than the table value of z (1.96) at 5% significance level and consequently it is in the rejection region. Thus based on sample evidences we can reject H_0 significantly and it can be said that the consumers are satisfied with the quality of services of the B2C sites.

Conclusion

The research result shows that consumers of Khulna visit almost all category of business to consumers (B2C) sites. The reasons of surfing the sites are many such as seeking information, entertainment, buying goods and service, education and research purpose. The result also reveals that different value drivers of different sites meet or exceed consumers' expectation. To be specific, eight out of ten value drivers are satisfying the need of the users. Only customizability and speed and performance of the sites fail to meet consumers' expectations. Therefore business to consumer (B2C) sites should be more careful about the improvement of these value drivers. However these results should not be generalized as it represents small portion of total population and the study is conducted only in a divisional city. Despite the shortcomings this research might help to conduct further studies in broader periphery like presence of value drivers in different categories of e-commerce or a comparative study about the presence of value drivers between domestic and international business to consumer (B2C) e-commerce sites.

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Appendix

Factor-1 Data Availability					
	Values(x)	Frequency(f)	f×x	Xi-X	(Xi-X) ²
SA	5	47	235	0.725	0.52562
A	4	62	248	-0.275	0.07563
N	3	8	24	-1.275	1.62563
D	2	3	6	-2.275	5.17563
SD	1	0	0	-3.275	10.7256
	Total	120	513		18.1281
		Mean (X)	4.275		

Here $\bar{X} = 4.275$

$\sigma^2 = 0.1523$, $\sigma = 0.3903$

$\sqrt{n} = \sqrt{120} = 10.95$

$\sigma/\sqrt{n} = 0.0356$

$\bar{X} - \mu = 1.275$

$z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}} = 35.78473825$

Factor-2 Accuracy and Timeliness					
	Values(x)	Frequency(f)	f×x	Xi- \bar{X}	(Xi- \bar{X}) ²
SA	5	18	90	1.2584	1.58357
A	4	64	256	0.2584	0.06677
N	3	28	84	-0.7416	0.54997
D	2	9	18	-1.7416	3.03317
SD	1	1	1	-2.7416	7.51637
	Total	120	449	1.2584	1.58357
		Mean (\bar{X})	3.7416		

Here $\bar{X} = 3.7416$

$\sigma^2 = 0.1071$, $\sigma = 0.3273$

$\sqrt{n} = \sqrt{120} = 10.95$

$\sigma/\sqrt{n} = 0.02988$

$\bar{X} - \mu = 0.7416$

$z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}} = 24.82$

Factor-3 Functionality and Reliability					
	Values(x)	Frequency(f)	f×x	Xi- \bar{X}	(Xi- \bar{X}) ²
SA	5	21	105	1.25	1.5625
A	4	52	208	0.25	0.0625
N	3	43	129	-0.75	0.5625
D	2	4	8	-1.75	3.0625
SD	1	0	0	-2.75	7.5625
	Total	120	450	1.25	1.5625
		Mean (\bar{X})	3.75		

Here $\bar{X} = 3.75$
 $\sigma_s^2 = 0.10767$, $\sigma_s = 0.3281$
 $\sqrt{n} = \sqrt{120} = 10.95$
 $\sigma_s/\sqrt{n} = 0.02995$
 $\bar{X} - \mu = 0.75$
 $z = \frac{\bar{X} - \mu}{\sigma_s/\sqrt{n}} = 25.0385$

Factor-4 Customizability					
	Values(x)	Frequency(f)	f×x	$X_i - \bar{X}$	$(X_i - \bar{X})^2$
SA	5	3	15	2.14167	4.58673
A	4	28	108	1.14167	1.30340
N	3	56	165	0.14167	0.02007
D	2	27	52	-0.8583	0.73674
SD	1	6	3	-1.8583	3.45340
	Total	120	343	2.14167	4.58674
		Mean (\bar{X})	2.8583		

Here $\bar{X} = 2.8583$
 $\sigma_s^2 = 0.08488$, $\sigma_s = 0.29134$
 $\sqrt{n} = \sqrt{120} = 10.95$
 $\sigma_s/\sqrt{n} = 0.026595248$
 $\bar{X} - \mu = -0.14167$
 $z = \frac{\bar{X} - \mu}{\sigma_s/\sqrt{n}} = -5.3268$

Factor-5 Speed and Performance					
	Values(x)	Frequency(f)	f×x	$X_i - \bar{X}$	$(X_i - \bar{X})^2$
SA	5	3	15	2.016666667	4.066944444
A	4	35	140	1.016666667	1.033611111
N	3	47	141	0.016666667	0.000277778
D	2	27	54	-0.983333333	0.966944444
SD	1	8	8	-1.983333333	3.933611111
	Total	120	358	2.016666667	4.066944444
		Mean (\bar{X})	2.98333		

Here $\bar{X} = 2.98333$
 $\sigma_s^2 = 0.08405$, $\sigma_s = 0.28991$
 $\sqrt{n} = \sqrt{120} = 10.95$
 $\sigma_s/\sqrt{n} = 0.02646$
 $\bar{X} - \mu = -0.0167$
 $z = \frac{\bar{X} - \mu}{\sigma_s/\sqrt{n}} = -0.6298$

Factor-6 Completeness					
	Values(x)	Frequency(f)	f×x	Xi- \bar{X}	(Xi- \bar{X}) ²
SA	5	15	75	1.625	2.640625
A	4	36	144	0.625	0.390625
N	3	51	153	-0.375	0.140625
D	2	15	30	-1.375	1.890625
SD	1	3	3	-2.375	5.640625
	Total	120	405	1.625	2.640625
		Mean (\bar{X})	3.375		

Here $\bar{X} = 3.375$
 $\sigma^2 = 0.08994$, $\sigma = 0.2999$
 $\sqrt{n} = \sqrt{120} = 10.95$
 $\sigma/\sqrt{n} = 0.02738$
 $\bar{X} - \mu = 0.375$
 $z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}} = 13.6975$

Factor-7 Security and Privacy					
	Values(x)	Frequency(f)	f×x	Xi- \bar{X}	(Xi- \bar{X}) ²
SA	5	18	90	1.5084	2.27527056
A	4	38	152	0.5084	0.25847056
N	3	52	156	-0.4916	0.24167056
D	2	9	18	-1.4916	2.22487056
SD	1	3	3	-2.4916	6.20807056
	Total	120	419	1.5084	2.27527056
		Mean (\bar{X})	3.4916		

Here $\bar{X} = 3.4916$
 $\sigma^2 = 0.09419$, $\sigma = 0.3069$
 $\sqrt{n} = \sqrt{120} = 10.95$
 $\sigma/\sqrt{n} = 0.02802$
 $\bar{X} - \mu = 0.4916$
 $z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}} = 17.5471$

Factor-8 Appeal and Attractiveness					
	Values(x)	Frequency(f)	f×x	Xi- \bar{X}	(Xi- \bar{X}) ²
SA	5	12	60	1.5834	2.50715556
A	4	42	168	0.5834	0.34035556
N	3	54	162	-0.4166	0.17355556
D	2	8	16	-1.4166	2.00675556
SD	1	4	4	-2.4166	5.83995556
	Total	120	410	1.5834	2.50715556
		Mean (\bar{X})	3.4166		

Here $\bar{X} = 3.4166$
 $\sigma^2 = 0.09133$, $\sigma = 0.3022$

$$\begin{aligned}\sqrt{n} &= \sqrt{120} = 10.95 \\ \sigma_s/\sqrt{n} &= 0.02759 \\ \bar{X}-\mu &= 0.4166 \\ z = \frac{\bar{X}-\mu}{\sigma_s/\sqrt{n}} &= 15.1013\end{aligned}$$

Factor-9	Interactiveness				
	Values(x)	Frequency(f)	f×x	$X_i-\bar{X}$	$(X_i-\bar{X})^2$
SA	5	8	40	1.5667	2.45454889
A	4	57	228	0.5667	0.32114889
N	3	39	117	-0.4333	0.18774889
D	2	11	22	-1.4333	2.05434889
SD	1	5	5	-2.4333	5.92094889
	Total	120	412	1.5667	2.45454889
		Mean (\bar{X})	3.4333		

$$\begin{aligned}\text{Here } \bar{X} &= 3.4333 \\ \sigma_s^2 &= 0.09192, \sigma_s = 0.30319 \\ \sqrt{n} &= \sqrt{120} = 10.95 \\ \sigma_s/\sqrt{n} &= 0.02768 \\ \bar{X}-\mu &= 0.4333 \\ z = \frac{\bar{X}-\mu}{\sigma_s/\sqrt{n}} &= 15.6556\end{aligned}$$

Factor-10	Service Quality				
	Values(x)	Frequency(f)	f×x	$X_i-\bar{X}$	$(X_i-\bar{X})^2$
SA	5	11	55	1.3417	1.80015889
A	4	63	252	0.3417	0.11675889
N	3	40	120	-0.6583	0.43335889
D	2	6	12	-1.6583	2.74995889
SD	1	0	0	-2.6583	7.06655889
	Total	120	439	1.3417	1.80015889
		Mean (\bar{X})	3.6583		

$$\begin{aligned}\text{Here } \bar{X} &= 3.6583 \\ \sigma_s^2 &= 0.102242, \sigma_s = 0.31975 \\ \sqrt{n} &= \sqrt{120} = 10.95 \\ \sigma_s/\sqrt{n} &= 0.02919 \\ \bar{X}-\mu &= 0.6583 \\ z = \frac{\bar{X}-\mu}{\sigma_s/\sqrt{n}} &= 22.5528\end{aligned}$$