

# THE FUTURE OF SMS TECHNOLOGY:DISRUPTIVE TECHNOLOGY

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**Abstract:** - The research illustrates a view on the current trends in the telecommunication industry focusing on the matter of SMS technology. It targets and explains disruptive technology and also introduces disruptive technology in SMS. The methodology of this research is market trend analysis using data on volume of SMS sent and received through a mobile network and a survey that was conducted with questionnaires. The findings are SMS is predicted to become obsolete and be disrupted by OTT messaging application by the third quarter of the year 2020. This was implemented with linear regression prediction. By the survey a new trend of using SMS has emerged but users have certainly moved away from SMS and now prefer texting with OTT messaging applications.

**Key-Words:** - Mobile Communication SMS OTT messaging application Mobile Internet Data linear regression prediction SPSS V.

## 1 Introduction

Disruptive Technology was first introduced by Clayton M Christensen in an article he wrote titled Disruptive Technologies: Catching the wave. To put it simply, disruptive technology is any kind of new technology, regardless of its industry, that will create a new market then to ultimately end up taking over an established market [1]. Nowadays, most are not aware to what a mini-computer is or what a mainframe is? This is the result of a disruptive technology called personal computers. Though disruptive technology is not confined to any type of industry, it is synonymously linked to the computer industry. This is the result of numerous disruptive technologies that have emerged during the personal computer boom in the 80's.

Technologies that are available today are far superior to what it was in the 80's. This though is not only the result of disruptive technology but also efforts and innovation in trying to sustain a technology. Now in 2017, it seems the smartphone boom that started in 2007 when the first iPhone was introduced by Apple is finally phasing out. An analyst firm IDC released data that suggest the market growth of the smartphone industry only grew 1.6% from 2015 to 2016 versus the 10.6% growth it had from 2014 to 2015 [2]. This proves that consumers are finally satisfied with a smartphone capability and the market is slowing down.

With the initial boom of smartphones worldwide in 2007 until today it has resulted in an availability of a rich variety of smartphones with a spectrum of specifications to choose from, and with this a certain technology is endangered to die out. Whichever combination of specification on a smartphone chosen by a consumer, there is one thing that almost all smartphones can support and that is a text messaging application. All of this third-party messaging tools are supported by over-the-top (OTT) technology (via the internet) has threatened the Short Message Service (SMS) industry as a whole.

The first SMS to be sent was a text message from a computer of a test engineer to Richard Jarvis through the Vodafone Cellular network on the 2nd December 1992 [3]. The SMS simply read 'Merry Christmas'. The technology took a long time before it was widely used, but with almost all mobile phones equipped with GSM capabilities it was only time until it would be a profitable industry. The industry is now on rocky waters as consumers are now all shifting to OTT messaging applications.

Though Christensen went on to release a second book called The Innovator's Solution where he replaced the term Disruptive Technology with Disruptive Innovation, many have faulted him not giving a precise and consistent definition on disruptive innovation. Many have disputed him but many have also supported his views with their own contributions to the theory. The first

noteworthy contributions are by Vijay Govindarajan and Praveen K. Kopalle. It is noted that Christensen stated that disruptive technologies are cheaper and simpler and Ron Adner also stated in 'When Are Technologies Disruptive?' that a disruptive technology with its low performance cater to a niche for low-end and low-profit part of the market [4][5].

Govindarajan and Kopalle went ahead and added to the theory that this is not always the case. The simplest example is the emergence of mobile phones. Mobile phones are considered a disruptive technology, but even so mobile phones were neither superior nor the cheaper alternative [4]. Mobile phones entered the market with unsatisfactory cellular service and high price but managed to disrupt the market after cellular coverage was improved and customers found it satisfactory to the high price it yielded [4].

A Reflective Review of Disruptive Innovation Theory by Yu Dan and Hang Chang Chieh states that a disruptive innovation is relative, what is disruptive to one business can be a sustaining one for another [6]. It also highlights that disruptors do not always replace traditional businesses, as an example photographers do not tolerate the inferior quality of digital photos but digital cameras are widely common amongst non-professionals [6]. This results in the niche market that the film industry is in traditional media for photography is widely used. This paper also explains the distinction disruptive innovation versus destructive innovation. Destructive innovation is classified as an innovation that are both improving the technology by a tenfold and is kept low-cost. This kind innovation is destructive but not disruptive because it forces other competitors no other option but to follow suit [6].

### 1.1 Short Message Service VS OTT Messaging Applications

The concept of SMS was first introduced by Friedhelm Hillebrand in the 80's when the framework for GSM was optimized for telephony. The reason behind this is because there was a huge interest in a non-voice service and the initial objective of keeping GSM technology low-cost to appeal to mass consumers [7]. SMS has been one of the most successful telecommunication technologies to date.

Though many are starting to believe SMS technology to be dying out, Brenda Suarez thinks otherwise. In an article she wrote, she outlined three major reasons why message over IP is not going anywhere. The first is what made SMS so attractive it is the communication protocols that are in place

for GSM, every mobile phone has the ability to send a text [8]. Any device with GSM capabilities can send a text. Second is the questionable high-cost for cellular data that is needed to support message over IP [8]. Next is the reliability of message over IP versus SMS because if there is no obvious reason for a mass shift from SMS, consumers will stick to what they traditionally are familiar with [8].

In a report published by an analyst, Chetan Sharma, there was a slight dip in SMS usage in the US in 2012 [9] [10]. Though only hardly any difference, these descend in usage is notable because it has never done that [10]. This is also evident in the trend of business that are taking the advantage of message over IP and cutting SMS usage for cost purposes [10].

Even with many sceptics that doubt SMS will ever be disrupted a report called the future of mobile messaging: Over-the-top competitors threaten SMS by McKinsey & Company paints a different story. Netherlands and South Korea were the first two countries to experience a large dip in SMS volumes when OTT messaging applications were introduced. In 2011 when WhatsApp's penetration level jumped from a mere 5 percent to 85 percent, carriers in Netherlands saw an 11 percent decline in SMS volume per subscriber compared to the 33 percent increase from the last two quarters [11]. Around the same year carriers in South Korea also experience more severe case of dipping when KakaoTalk was introduced. It may have potentially caused a 55 percent dip in the volume of SMS [11].

## 2 Methodology

### 2.1 Market Trend Analysis

In researching the disruption of SMS, trends, the telecommunication market has to be analysed. For this particular topic, the first set of data that will be analysed is the volume of SMS sent and received over a mobile network. The data is sourced from Infocomm Media Development Authority and used under the Singapore Open Data License.

Figure 1 show the process to completing a linear regression test with Pearson's correlation coefficient. By determining the linear regression equation of  $y=mx+b$ , a prediction can be made when SMS will become obsolete. Figure 2 illustrates the formula for the correlation coefficient.

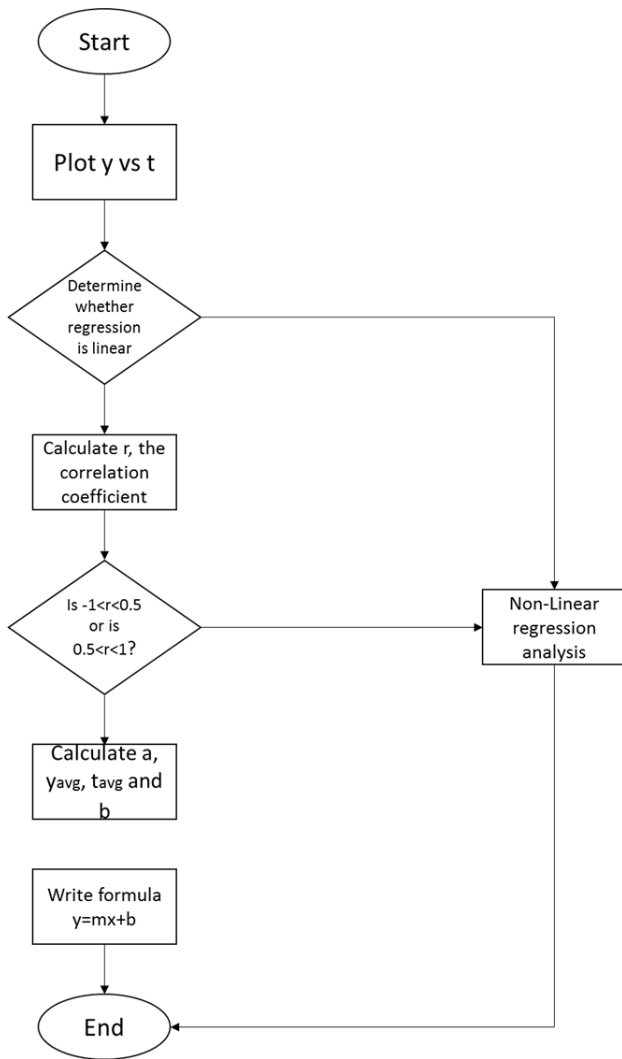


Fig.1 Flowchart of market trend analysis with linear regression and Pearson’s correlation coefficient

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n \sum x^2 - (\sum x)^2][n \sum y^2 - (\sum y)^2]}} \quad (1)$$

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## 2.2 Survey

### 2.1.1 Data Collection

The data for this research was collected by using a questionnaire that was tailored to the research’s

objective. The questionnaires were distributed by using Google forms.

### 2.1.2 Survey Data Analysis

The survey data analysis was analysed using SPSS software program. The variables for the research consisted of the frequency of sent and receive text via SMS, SMS usage, reliability of SMS, frequency of sent and receive text via OTT messaging applications, OTT messaging applications usage and its reliability.

The dependent variables will the score of SMS usage given by the respondents and the rest of the variables will be tested with the reliability and validity test with SPSS.

## 3 Result and Discussion

### 3.1 Market Trend Analysis

#### 3.1.1 SMS Volume

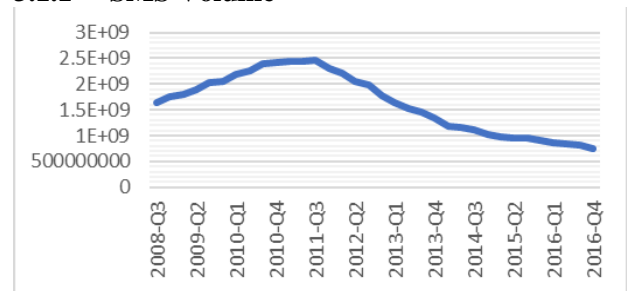


Fig. 3 Data of SMS volume sent and receive over a mobile network

		t	SMSVol
t	Pearson Correlation	1	-.815**
	Sig. (2-tailed)		.000
	N	34	34
SMSVol	Pearson Correlation	-.815**	1
	Sig. (2-tailed)	.000	
	N	34	34

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Fig 4. Output for correlations.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error			
1	(Constant)	2418440913	114677801.5		
	t	-47455350.3	5973936.642	-.815	-7.944

a. Dependent Variable: SMSVol

Fig 5. Output for coefficients

With the coefficients that was calculated, a linear regression equation is as shown in the figure below.

$$y = -47455350.3 x + 2418440913 \quad (2)$$

Linear regression equation.

The equation above was used to predict when SMS volume will equal to zero. This is done by finding the value of x when y=0. The value of x is 50.9 when y=0. This means by the 51th quarter of the year starting from the third quarter of 2008, SMS technology will become obsolete. The predicted volume of SMS in the next four years is as shown below.

Quarter of year	Predicted SMS Volume
2017-Q1	757503652.5
2017-Q2	710048302.2
2017-Q3	662592951.9
2017-Q4	567682251.3
2018-Q1	520226901
2018-Q2	472771550.7
2018-Q3	425316200.4
2018-Q4	377860850.1
2019-Q1	282950149.5
2019-Q2	235494799.2
2019-Q3	188039448.9
2019-Q4	140584098.6
2020-Q1	93128748.3

2020-Q2	45673398
2020-Q3	-1781952.3

Fig 6 Predicted SMS volume

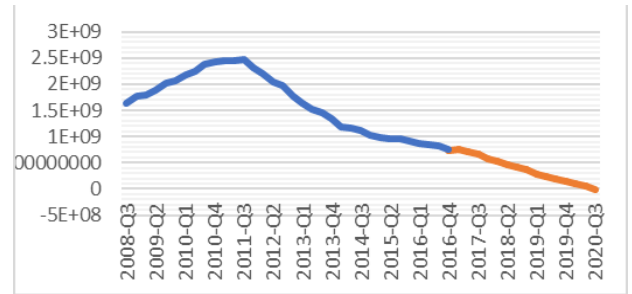


Fig 7 SMS Volume from 2008 to 2020

With the linear regression equation it is predicted that SMS will be disrupted by the third quarter Of 2020. According to Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2016–2021 mobile data, mobile data traffic grew by a whopping 63 percent in 2016 and by 2020 Monthly global mobile data traffic will be at 49 exabytes by 2021, and annual traffic will exceed half a zettabyte [12].

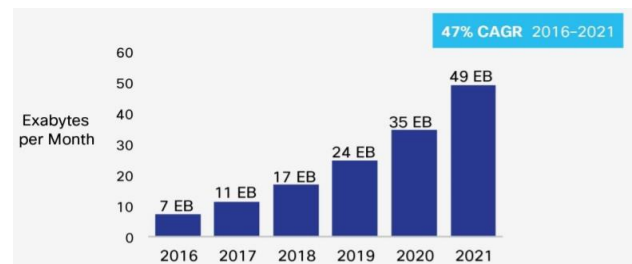


Fig 8. Mobile Data Forecasts by Cisco VNI

With the exponential growth data in the next 5 years can explain the prediction of the disruption of SMS. With data so widely use, OTT messaging application will only grow to be more reliable and popular. With SMS users can only be sending solely text messages to the recipient but with OTT messaging applications so many other added functionality that can be utilized.

Mckinsey & Company listed down a few factors that may have led to the market lean more towards OTT messaging applications. One of the factors listed is technology readiness. Countries that possess 3G, better network and also a higher level of smartphone penetration will have an advantage [11].

Though with mobile usage data trends increasing at this excessive rate, it is no wonder SMS technology will be left behind.

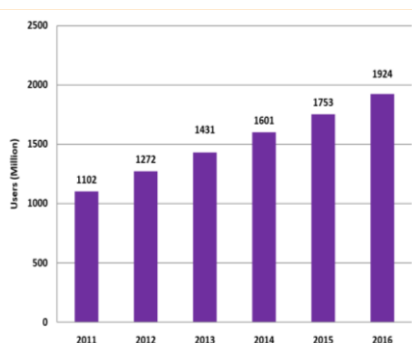


Fig 10. Growth of Mobile Social Networking User Numbers 2011-2016 [13].

This are numbers for the growth of mobile social networking which further solidifies the position of OTT messaging applications. Users for social networking applications only keep increasing.

### 3.2 Survey Analysis

#### 3.2.1 Validity Test

Firstly, the questionnaire was divided into two parts. The first part was for the frequency of send and received SMS, SMS usage and the reliability of SMS. The next part was about the OTT messaging applications on the frequency of send and received texts messages, OTT messaging applications usage and the reliability of OTT messaging applications. Validity test to measure how valid each of the question. Users were instructed to complete a Likert scale questionnaire and the data was then mined in SPSS

		T1	T2	T3	T4	TS
T1	Pearson Correlation	1	.255*	.521**	.314**	.806**
	Sig. (2-tailed)		.010	.000	.001	.000
	N	100	100	100	100	100
T2	Pearson Correlation	.255*	1	.082	.041	.575**
	Sig. (2-tailed)	.010		.419	.684	.000
	N	100	100	100	100	100
T3	Pearson Correlation	.521**	.082	1	.184	.650**
	Sig. (2-tailed)	.000	.419		.067	.000
	N	100	100	100	100	100
T4	Pearson Correlation	.314**	.041	.184	1	.570**
	Sig. (2-tailed)	.001	.684	.067		.000
	N	100	100	100	100	100
TS	Pearson Correlation	.806**	.575**	.650**	.570**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	100	100	100	100	100

\*. Correlation is significant at the 0.05 level (2-tailed).

\*\* Correlation is significant at the 0.01 level (2-tailed).

Fig 11. Correlations of SMS usage

		T1	T2	T3	T4	TS
T1	Pearson Correlation	1	.800**	.664**	.520**	.891**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	100	100	100	100	100
T2	Pearson Correlation	.800**	1	.661**	.442**	.856**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	100	100	100	100	100
T3	Pearson Correlation	.664**	.661**	1	.429**	.817**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	100	100	100	100	100
T4	Pearson Correlation	.520**	.442**	.429**	1	.754**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	100	100	100	100	100
TS	Pearson Correlation	.891**	.856**	.817**	.754**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	100	100	100	100	100

\*\* Correlation is significant at the 0.01 level (2-tailed).

Fig 12. Correlations of OTT usage

All variables have been tested and have achieved a high positive correlation coefficient. With this it can be concluded that the variables are valid to the determinant of both SMS usage and OTT messaging applications usage.

#### 3.2.2 Reliability Test

##### Case Processing Summary

		N	%
Cases	Valid	100	100.0
	Excluded <sup>a</sup>	0	.0
	Total	100	100.0

a. Listwise deletion based on all variables in the procedure.

Fig 13 Case processing Summary

##### Reliability Statistics

Cronbach's Alpha	N of Items
.541	4

Fig 14 Reliability for SMS usage

The reliability test came out poor for SMS usage. This may be due to the fact that even though users rarely use SMS, they receive a lot of unsolicited SMS. They also receive SMS from their respective

banks for banking and some are even from the telecommunications company regarding their bills and payments.

### Reliability Statistics

Cronbach's Alpha	N of Items
.838	4

Fig 15. Reliability of OTT messaging applications

The reliability test for OTT messaging application came out at 0.838 which shows that the data is stable and reliable.

### 3.2.3 Multiple Linear Regression Test

To study the dependency of the dependent variable which is the score for SMS usage from the survey vs all other independent variables, a multiple linear regression must be implemented. This is because there is more than one independent variable.

#### Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.634 <sup>a</sup>	.402	.356	.65872

a. Predictors: (Constant), PreferScoreOTT, sendSMS, receiveSMS, PreferScoreSMS, UsageScoreOTT, receiveOTT, sendOTT

Fig 16. Model Summary of Multiple Linear Regression Test

#### i. Interpretation of Coefficient of Correlation (R)

The coefficient correlation noted as R measures the strength and direction of linear relationship of the dependent variable and all the independent variable. The value of R that was obtained is 0.634. This shows a positive correlation amongst the independent variable vs the dependent variable. This is because a positive relationship is between 0.1 to 1 and negative relationship between -0.1 to 1 but when the value is equal to zero there is no correlation and in turn the closer it is to zero it signifies a weak correlation.

#### ii. Interpretation of Coefficient of Determination (R<sup>2</sup>)

The coefficient of determination will determine how well the fit is with the variables for the regression model. The value of R<sup>2</sup> is equal to 0.402 which suggests the independent variables in this regression model are only influencing the dependent variable by 40.2 percent. 59.2 percent of the dependent variable which is SMS usage is caused by external factors.

## 4 Conclusion and recommendation

Based on the results, it is very likely that the usage of SMS will drastically become obsolete. The prediction of disruption in SMS by the third quarter of 2020 is explained the exponential growth of mobile data usage and its reliability. Users in America where phone plans have included unlimited text messaging since 2010 and have enjoyed free unlimited text messaging before the boom of OTT messaging applications [13].

The finding from the survey showed that it has become a trend for businesses to use SMS as a marketing tool. Despite this user have showed that they much prefer using OTT messaging applications and find them a lot more reliable. Though this has not affected the decrease in SMS volumes from the initial introduction of OTT messaging applications in around 2011. SMS volumes have been steadily dropping since 2011 and it was possible to predict it ending because of this. With mobile data only improving it will be hard for a technology as static as SMS to compete.

For future work, it is recommended to also analyze the market for OTT messaging applications and predict to what pace it will take to overcome the SMS market and ultimately replace it and disrupt the SMS technology. The market for OTT is expanding rapidly; it would give more insights to the topic if it was also analyzed.

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