

Fifteen Years of GSM Services: Technological Issues, Advantages, and Socio-Economic Impact on the Nigerian Economy

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Abstract

The Global System of Mobile Communication (GSM) which debuted in Nigeria in August 2001 was greeted with much celebration as the country finally joined the League of the GSM nations, though after less economically buoyant African countries such as Botswana, Mozambique, Uganda and Tanzania. Fourteen years after the introduction, Issues and challenges has been raised on why subscribers are been ripped of their money and short changed with epileptic services. This arises from the myriad of problems ranging from congestion to the poor network delivery. This paper discusses the evolution of GSM services in Nigeria, the range of services available and the issues involved in its operation in the last fourteen years. Not forgetting the benefit it has brought to the Nigerian economy. Suggestions are also made on how Nigeria can reap more benefits of the GSM communication.

1. Introduction

Over the past two decades, the mobile telecommunications industry has grown exponentially on a global scale. For any individual country, the mobile sector has become a critical indicator of economic development [1]. In all countries, the mobile telecommunications market has been transforming continuously. This transformation is characterised by the adoption of innovative technologies by the operators, the availability of new services to the users, and the involvement of various governmental institutions in the market at different times [2]. Thus, we define the mobile telecommunications market as a socio-technical system composed of two sorts of elements: mobile standards and services in the technological domain, and market players in the social domain that determine their usage [3]. Before its eventual roll-out in Nigeria in August 2001, GSM was already in use in more than 140 countries with more than 4000 operating member companies worldwide. In Nigeria, the first GSM licence was issued in 1993 to EMIS, but nothing was heard of the company until 1998 when it installed about 3000-line, analogue fixed wireless telephone system in Lagos. With the release of the new Telecommunication policy in October 26 1999, new GSM rules were introduced and in December of the same year 1999, an advertisement inviting expression of interest in securing National Mobile GSM Cellular licence was made available to interested operators through the Bureau of Public Enterprises (BPE), and the Nigeria Communication Commission (NCC) [4]. Eventually, only four intending operators were successful. These are ECONET Nigeria Limited (now AIRTEL), MTN, Nigeria Communications Limited (MTEL), and Communication Investment Limited (CIL). However, CIL was subsequently disqualified for their inability to meet the two-week deadline for the payment of licence fee. Later, a Second National Operator (SNO), GLOBACOM Nigeria Limited, was licensed to offer both fixed and wireless GSM services. With the arrival of the fourth operator, GLOBACOM in 2003, the journey seems to have just started regarding transformation of Telecommunication industry in Nigeria. However, in 2008 ETISALAT (*9 mobile*) enter into the industry which brings about more competition till date. Although, MTEL has since collapsed.

1.1. Statement of Problem

Having looked into the activities of GSM operators in Nigeria since their operation commenced about fourteen years ago, how are the services beneficial to Nigerians, and what are the recommendations for the Government and regulatory agencies for the improvement of GSM services to Nigerians.

2. The Nigerian GSM Market

One of the objectives of establishing Nigeria Telecommunication Limited (NITEL) was to provide accessible, efficient and affordable telephone services. NITEL, the only national monopoly operator in the

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sector was synonymous with epileptic services and bad management which made telephone then to be unreliable, congested, expensive and customer unfriendly. The years 1992 to 1999 was tagged the liberal liberalization era when government embarked on marketoriented, partial liberalization of the Nigerian telecommunication sector via the Nigeria Communication Commission (NCC) Decree 75 of 1992 [5]. There is no doubt that the telecommunication system in Nigeria has undergone a revolution since the deregulation of the market. Ever since then, there has been astronomical growth in the acquisition of cell phones by the youths, the grown-ups and even teaged. Similarly, the Nigeria Communication Commission NCC, seeing the robust growth in the sector, encouraged the entry of more mobile operators into the market in the year 2001. This has influenced the Teledensity growth from 0.73% in December 2011 to 26.77% in August 2007 and the market witnessed increased records of investment on daily basis. In year 2001, the NCC held an open auction for G.S.M licenses which were issued to MTEL, operating as M-TEL, South African Telecoms Company, operating as MTN and a consortium led by Zimbabweans as ECONET Wireless. The entry of the mobile operators immediately changed NITEL's control of the market. Consumers saw that mobile phones offered better opportunities than the limited fixed line infrastructure offered by NITEL [5]. The Nigeria mobile market comprises four GSM operators who hold virtually the entire telecoms subscriber base. MTN, Nigeria's largest telecoms player in terms of customers, has been operating in the country since February 2001, when it won a 15-year digital mobile licence from the NCC. MTN is a subsidiary of South Africa's MTN Group, which is one of the largest telecoms multinationals in Africa and the Middle East. In the first four months of 2014 the MTN Group as a whole reported an overall subscriber increase of 2%, driven in large part by MTN Nigeria, which added 1.1m new users during this period. By January 2017 MTN Nigeria had over 53 million subscribers, which was equal to 37.21% of the country's overall mobile subscriber base. MTN has invested heavily in Nigeria in recent years. In 2012 the company spent \$1.5bn on capacity building in the country, followed by a similar amount in 2013, and it has spent \$3bn on additional upgrades through to 2016. "We will continue to invest at this rate in the medium term, and make sure the quality of service is acceptable," Sifiso Dabengwa, MTN's group president and CEO, told local media (Oxford, 2015). Nigerian-owned Globacom has been active in the country since 2003. As of January 2015 it had 28.49m subscribers, which represented 21% of the total domestic mobile market.

Like its competitors, Globacom has invested heavily in its home market in recent years. In 2013 and 2014 it carried out a complete infrastructure overhaul, upgrading more than 3000 existing base stations to boost both voice and data coverage. "Currently, 43% of our telecoms sites are 3G," Bisi Koleosho, Globacom's head of operations, said in May 2014. "Presently we have 90% 3G coverage in Nigeria." In 2014 Globacom announced that it planned to sign a \$100m contract with an original equipment manufacturer to add 1500 new base stations throughout the country. (Oxford, 2015) Airtel is Nigeria's third-largest player, with over 34million subscribers in January 2017. Airtel Nigeria is a subsidiary of

Indian telecoms conglomerate Bharti Airtel, which entered the market in 2010 after buying all of Kuwaiti telecoms firm Zain's African assets for \$10.7bn. Since then Airtel has steadily gained market share in Nigeria, on the back of infrastructure investments worth more than \$1.7bn between 2010 and 2014. At the World Economic Forum on Africa, held in Abuja in May 2014, Sunil Mittal, BhartiAirtel's chairman, said that Nigeria remained a key market for the firm, despite the competitive domestic operating environment. "The taxes are very high. They need to come down," he told local media. "We don't have designs to expand at the moment, but in the countries that we operate we are strengthening our position." UAE-based telecoms firm Etisalat (now 9mobile) acquired a Nigerian digital mobile licence in 2007. As of January 2017 the company had 18 million subscribers in the Nigeria, making it the fourth-largest provider, with 12.63% of the market. Between 2007 and 2017 Etisalat (now 9mobile) invested over \$1bn into its Nigerian operations. As of January the company reportedly managed a national network of more than 4500 base stations and over 3000 km of fibre-optic cables, much of which has recently been upgraded. Etisalat Nigeria (now 9mobile) has benefitted from number porting since the NCC introduced mobile number portability (MNP) in 2013. It has benefitted most in the porting-in activities accounting for over 75% subscribers who has port in into the Network. (Incoming (Inward) porting means the number of numbers ported from another service provider's network into a service provider's own network.). Nigeria's digital mobile network has grown significantly since the three companies, awarded the Global System for Mobile Communications (GSM) licence in January 2001, began operating in August. According to the Nigerian Communications Commission (NCC) the GSM network achieved 350,000 connections within six months of their launch. The new operators have also reduced their start-up prices, though customers still complain that their tariff is too high. Using GSM mobiles to connect with fixed lines is still hampered by the limited number of interconnectivity lines provided by Nigerian Telecommunications, which is also a GSM operator but lags behind the private firms – MTN Nigeria Communications and Econet Wireless – in expanding its mobile services. (Oxford 2015). This growth has been credited to the influx of Foreign Direct Investment (FDI), aggressive liberalisation and deregulation of the sector. The GSM has since transformed the economic terrain, creating employment and oiling the operations of businesses in Nigeria. Compared to 1999 (with 300,000 subscribers), the number of GSM subscribers in Nigeria today stands at over 154 million, while the credit crisis persists, there are no indications that subscription has been adversely affected. However, major problems in the industry are the high drop calls, call set up problems, connection problems, inability to recharge and economic sabotage among the major players. This led the regulatory body (NCC) to issue a frequency or spectrum allocation and SIM registration as well as the number portability which was scheduled to take effect from May and June 2009 respectively.

3. Technical Issues Arising

The following evaluations were arrived at after a thorough study on GSM performance in Nigeria since its debut in 2001 especially the recent grow from 2002 to 2016 and the Technical issues arising from this. The table 1 above indicates the annual subscribers data from 2002-2016. Figure 1 however, interpreted the Number of subscribers (*in Millions*) and the steady increase in the Teledensity (a measure of the number of subscribers per 100 people in a given market). Also Table 2 shows the present data of the GSM Market in Nigeria as at September 2017 according to data from the NCC MTN holds the largest share of the mobile market, accounting for 37.22% of total mobile subscribers, followed by Globacom, with 26.62%, Airtel, with 23.92% and Etisalat, (*now 9 mobile*) with 12.63%, according to the NCC (see figure 2). A growing number of Nigerians access the internet via their mobile phones, which is helping to improve operator revenues. Nigeria accounts for 29% of all internet usage in Africa, and most Nigerians access the internet via their mobile handsets.

3.1. Congestion

Although the government has been able to regulate the influx of operators into the GSM industry in Nigeria, the major problem encountered by

GSM subscribers is the inability to access the network when initiating a call. This is worrisome to the extent that subscribers often have to dial several times before getting connected. Worse still, there might be total network failure sometimes. This has been majorly traced to congestion on the various network of the GSM operators

Table 1. Annual Subscriber Data, (2002-2016)

YEAR	Number of Subscribers	Teledensity
2016	154,529,780	110.38
2015	151,017,244	107.87
2014	139,143,610	99.39
2013	127,606,629	91.15
2012	113,195,951	80.85
2011	95,886,714	68.49
2010	88,348,026	63.11
2009	74,518,264	53.23
2008	64,296,117	45.93
2007	41,975,275	29.98
2006	33,858,022	24.18
2005	19,519,154	16.27
2004	10,701,728	8.5
2003	4,021,945	3.35
2002	2,271,050	1.89

[Source: www.ncc.gov.ng.]

3.2. Causes of Congestion on GSM Network

In October 1986, the internet had the first of what became a series of collapses in America [6]. Presently, Nigeria is facing congestion the same GSM congestion problem and having the following as the likely causes of the problem

• Lack of Adequate Base Stations

On December 29, 2003 Vanguard published a report where Adrian Wood, former MTN managing director, made a declaration that they have one million; five hundred thousand subscribers and that they had only six hundred and seventy base stations all over the country. That gave an average of 2,238 subscribers to a base station, which is highly inadequate. By now the number of GSM subscribers has increased considerably due to landslide reduction in the prices of GSM lines and network recharge cards. It is doubtful if their present ratio can meet the current active lines capacity.

• Lack of Adequate Channels

Since there are inadequate base stations, it therefore implies that there will be a lack of adequate channels to support the subscribers and the service rolled out by these operators. The number of channels determine the total number of subscribers that can be allowed to use a base station simultaneously at any point in time (NCC, 2003). This trend remain the same because any time a base station is added to their network, a high level of promotion is usually rolled out in order to attract more customers, thereby returning the system to status quo.

Competition for Subscribers among the Operators

It seems the highest priority of the GSM operators in Nigeria is the total sum of money they make from the subscriber and not the overall quality of service. Subsequently they have catching advertisements and often make false declarations to attract customers to their network, but they don't have the infrastructure to satisfy customer's demands [6].

• Lack of Adequate End to End System

The GSM operators in Nigeria are still depending on radio waves to transfer speeches and data from one base station to the mobile switching centres. Radio wave signals are subject to interference from other electromagnetic wave generating system such as radio and television.

When such interference occurs, it could lead to call setup failure, call drop or other distortions [6].

congestion. This traffic congestion identifies a block of GSM network otherwise known as the cell. One cell is a geographical area covered by one Base transceiver station (BTS). The actual size of a cell depends on several factors such as environment, number of users etc. Cells are grouped within a base station controller (BSC). Dimensioning a cell means finding answers to two fundamental questions:

- How many traffic channels (TCH) does the cell need to handle?
 - How many traffic channels are necessary or required?
- To solve the above question, we need to determine the traffic capacity measured in Erlangs, as:

$$1 \text{ Erlang} = \frac{\text{Calls per Hour} \times \text{Average Conversation Time}}{3600 \text{ seconds}}$$

Having discussed the meaning of congestion, one need to find out how some researchers tackled congestion problems. In GSM control, a key operation should be a technique that creates a congestion free network. This implies congestion avoidance. An adage says that prevention is better cure; therefore, it is better to avoid congestion in GSM network rather than allowing it.

Nokia 2002 worked out plans for GSM congestion avoidance as indicated below.

Network dimensioning based on coverage and capacity requirements. The main objective here is to optimize the network in a cost- effective manner. In order to succeed, detailed information about the network is needed, such as growth estimates, protection, available and required infrastructure. Also necessary are the goals for the attainment of a good quality and high performance network. The out-come is an integrated network architecture design that shows how the different services will be implemented as well as what equipment will be needed at each point. Also, a preliminary roll out plan should be included. Selection of a Mobile Service Switching Center (MSC), Base Station Controller and base station site and a base station site in this stated order. Detailed network planning. Computer aided design system and tools are used for coverage prediction, interference analysis, frequency planning, microwave link planning, documentation etc. The following activities are important for a proper network planning.

- Cellular Transmission Network planning
- Radio network planning
- Switching Network Planning

4. Socio-Economic Issues, Advantages and Challenges

The expectations and enthusiasm that greeted the arrival of GSM services in Nigeria were overwhelming despite the late entry by the country after that of some less economically vibrant countries such as Botswana, Uganda, Zambia and Mozambique. The joy did not, however last due to the inadequacies and irregularities identified with the GSM operation in Nigeria. Subscriber’s complaints have been hinged on factors such as:

- High Tariff
- Charging for SMS text not sent.
- Poor interconnectivity.
- Poor grade of Service
- Frequent Network Failure
- Constant drop calls (which may be due to radio interface message failure, equipment failure, protocol error. e.t.c)
- Unsolicited Messages.

GSM operators on the other hand have also put the blame of the inadequacies on:

- High cost of entry into the market.
- High cost of power supply to their various base station equipment.

Nonetheless, GSM operation has brought a lot of changes on the socio-economic life of Nigerians. More and more Nigerians are benefiting in form of:

- Availing Nigerians the opportunity to make use of latest technology despite non contribution.
- Sale/marketing of GSM products.

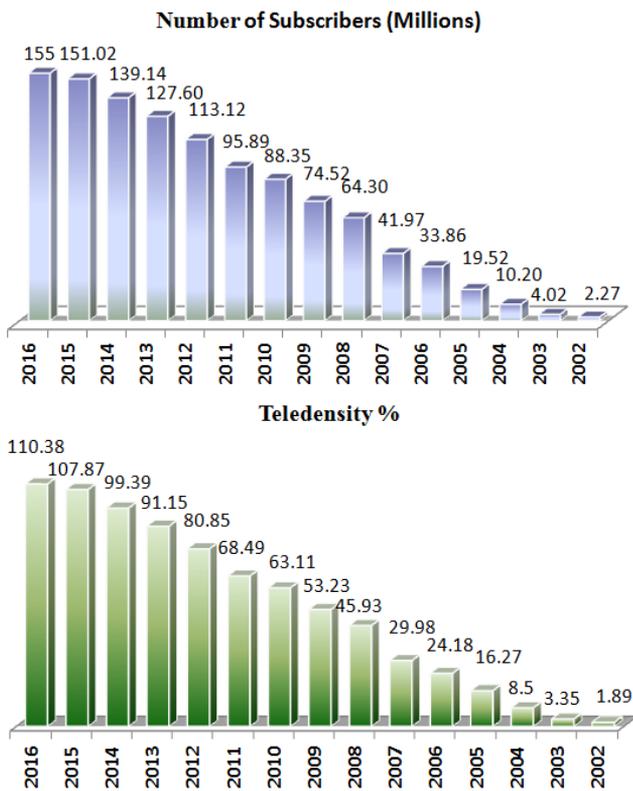


Fig. 1. Annual Subscriber Chart (in millions) (2002-2016)

• Lack of Good Quality Phones

In any radio link communication, it is the radio link between the handset and the base station that remains the weakest part of the communication system. If conditions are unfavourable or the user moves into a tunnel during a call, connection is lost. Good quality handsets with higher frequency wave characteristics makes calls and data services more stable as they reduce interference amongst callers especially with the advent of the present 3G services. This is justified by the regulation of the power control that transmits power between the terminal and the base station. It is very important to have efficient power control in order to keep interference at a minimum [6].

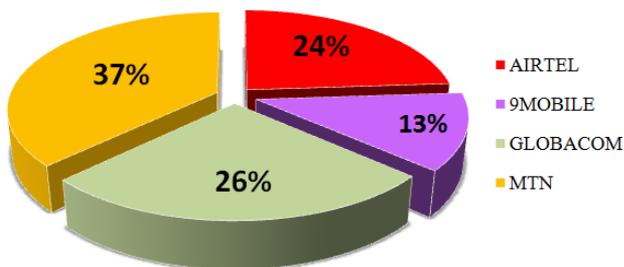


Fig. 2. Nigeria GSM mobile Market (as at September 2017)

Table 2. Data for the Nigeria GSM Market (as at September 2017)

Operator	Airtel	9mobile	Globacom	MTN
Number of Subscribers	34,126,901	18,022,674.00	37,411,407.00	53,093,756.00
Percentage %	23.92	12.63	26.22	37.21

3.3. Congestion Control in the GSM Network

Congestion is the unavailability of the network to the subscriber at the time of making a call. Congestion occurs when there are limited resources at the service point. This type of congestion is known as traffic

- Maintenance and repair of handsets
- New and dynamic investment opportunity by foreigners.
- Higher Teledensity (more mobile lines now than total NITEL landlines of 400,000) which as at December 2016 stood at 110.38. (Teledensity/ Telephone density is the number of Telephone connections for every hundred individuals living within an area.)

- Employment generation
- Sponsorship/promotion of sports competition.

The concept, importance and economic implications of GSM have been discussed severally and widely. Balogun, [7] opined that the advent of GSM facilitates economic development as it provides easy and effective communication needed to stimulate and promote trade between Nigerians and its foreign partners in the world.

According to Tella et al [8], GSM has emerged as an integral and essential part of the culture and life of Nigerians. It had played and still currently playing a significant role in communication and also helps in encouraging investment. Okereocha [9] found that over 1,000,000 Nigerians have been directly and indirectly employed by the operators. While supportive enterprise and service organization like banking, consultancies, insurance etc. have themselves blossomed. According to Soyinka [10], mobile phone has continued to empower the poor by opening up veritable windows of wealth generation for them to get out of the scourge of poverty.

Soyinka [10] and Ndukwe [11] reported that the GSM business has contributed to the economy in the area of GSM recharge card printing. This has had the effect of saving Nigeria of about \$150 million monthly while providing employment and new skill to the dealers. It has also improved entertainment and networking among Nigerians, using short message services, SMS and the signal calls. This view has been corroborated by Okerecha [9], According to him; the telecommunication sector has become a major tool for empowering Nigerians and with the continued inflow of massive investment and the doggedness of the industry regulator, the future looks bright.

The rapid growth of the telecoms industry over the past decade or so has had a major impact on the country's economy. As of December 2016 the sector accounted for 9.80% of Nigeria's GDP, up from 7.40% in 2011 and just 1.1% in 2003, according to the NCC. Reasons for the Introduction of GSM in Nigeria GSM in Nigeria, introduced by the government of president Obasanjo in 2001 has helped in its economic development in various ways. The reasons for its introduction are stipulated below:

(i) To Generate Employment GSM aid in creating employment opportunity in the country in different angles or ways such as GSM dealer i.e, those that sell GSM phone, GSM accessories, GSM repairs, those selling card, those making calls etc. In Nigeria GSM has helped to reduce the level of unemployment in the nation and thereby helping the government to develop the Nigerian economy.

(ii) To create a means of efficient communication Today people can stay in Lagos or any other part of the world to communicate unlike in the older days of NITEL cable, when the means the communication is somehow restricted and not every individual can afford to buy NITEL phones.

(iii) To reduce congestion of vehicles on the road Before the introduction of GSM people travel daily on the road trying to deliver information or messages here and there and individuals spend their time and money in transportation for the purpose of delivering information. However, the issue of GSM has helped to reduce such congestion on the high way thereby enabling individual to stay at home and deliver information from one place to another (Asouzu: 1995).

(iv) To serve as a source of revenue to the government Taxes are paid by company owners, operators and all employees who are employed either directly or indirectly to the state and federal government.

(v) To enhance banking services the introduction of GSM also increased the volume of services rendered by banks. Recharge cards are stored and sold in bulk by banks thereby enabling them to charge commission and also invest the money and make little profit before submission or making returns for sales.

(vi) To reduce fraud in the banking industry One can use GSM to monitor his/her account.

(vii) To promote global marketing GSM also help to promote global marketing. This is done by transacting business globally or with other foreign countries through GSM phone call.

(viii) To promote International Trade GSM also enhance ordering of goods and services through making GSM phone calls.

(ix) To Enhance Security Police can easily be contacted at any point in time in case of any problem of robbery or other related cases which may arise.

(x) To improve the services of fire services/brigade Through GSM communication, the fire brigade and other agencies involved would be timely informed about any fire accident which may arise at any point in time.

(xi) To contribute to the development of rural areas thereby making it possible and easy for those who are in rural areas to communicate immediately with those in urban areas, in other words aid the development of rural areas.

4.1. The Positive Impact of GSM on Nigeria Economic Development

- Immediate dissemination of information: GSM encourages fast dissemination of information to protect some event which may happen within a limited or short period of time.

- It facilitates business transaction: Another positive impact of GSM is that it facilitates the means of transacting business. A customer or buyer of a particular product may be at his business premises and order for goods for immediate distribution.

- Assessment of Information: information can be assessed through making calls, police and other force can also access information about a particular event through phone calls.

- Cost Saving advantage: Transportation cost which individual may incur by moving from one place or area to another is eliminated through making a minute call or sending SMS message which cost little amount which is below what could have been spent on transport.

- With the introduction of GSM, there has been improved police service delivery as security is more guaranteed-through quicker dissemination of information.

- GSM has also improved the services of fire brigade and therefore reduce excessive fire waste which has been recorded in Nigeria years gone by.

- Saving of life and property in case of accident. Usage of ambulance has been enhanced through the introduction of GSM.

- Encourages Economic Stability: Equally important feature of the GSM is the ability to connect to the internet with the Blackberry. This has made communication a lot easier for business men and others who require the internet to do their work. The GSM enables access to the World Wide Web in any location within or outside the work environment. This has helped in making more business opportunities available.

5. Conclusions

The Fifteen year journey of GSM in Nigeria has been too rough, even though, from the high cost of GSM lines, and mobile phones at the debut of the GSM operators in Nigeria, to high tariffs and poor services to the innocent Nigerians. However, it has also brought prosperity to some homes: mobile subscribers can now contact family members much easier, particularly in case of any eventualities. But in order to reap the full benefits and harness the potentials of GSM communication, the following recommendations are made:

- Security agents need more collaboration from the GSM operators in combating crimes especially kidnapping and terrorism which has become an endemic issue in the country.

- The GSM users should find ways of protesting against exorbitant charges rather than dancing to the tune of GSM service providers who may want to influence the quality of service made available to the public.

- Build additional switching centre across the country to increase the traffic carrycapacity.

- Operators should invest heavily in transmission network development and have proper radio planning. This would ensure increased network resilience improved bandwidth utilization and elevated capacity bottleneck.
- GSM operators should upgrade and optimize all the exiting base stations. Install additional base stations across the country. This would create room for the network to handle more traffic.
- All political leaders at local, state and federal level of governance should regulate the power of GSM service providers in order to promote the contribution of GSM service providers in activities of GSM users.
- The Nigerian government at local, state and federal levels should improve the impoverished socio-economic conditions that serve as the inhibiting factors that prevent some people from using GSM.
- Above all, practical steps should be taken towards developing the political environment in Nigeria so that the politics of exploitation of GSM users would drastically reduce or totally eradicated.

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