

# Improvement of the Mobile Authentication System towards the Eradication of Counterfeit Products for Nigerian Consumers

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**Abstract** - Authorities have been plagued with detecting counterfeit drugs before they reach patients. Fake drugs are a major issue in Nigeria with thousands losing their lives every year to fake and adulterated drug in the country. The Mobile Service for Food and Drug Authentication is a system that ascertains the validity of drugs and foods using mobile phones. The National Agency for Food and Drug Administration and Control (NAFDAC) already has a Mobile Authentication Service (MAS) that enables consumers verify few drugs with mobile phones, but this current system is faced with usability issues and lacks an interface for the prompt report of drug counterfeiters, thus the essence of the proposed system. Using the Dynamic System Development Methodology (DSDM), a more technically robust, cost-effective and portable real-time device was created, so that during a query session, the C program codes on the embedded system triggers the SIM808 to make an internet connection to the central database (MySQL server) containing valid products data, in order to confirm products authenticities. This new device thus re-formatted the existing system user interfaces in other to make it easier for users to interact with the system and hereby creating a device (that can be singly manned by NAFDAC instead of outsourced to third party agents) to validate products with ease and as well enable prompts for the report of invalid products which where all the former lacks.

**Keywords** - Authentic Product, Counterfeit Product, Mobile Authentication System, NAFDAC

## 1.1 INTRODUCTION

The problems of fake drug proliferation in Nigeria have affected the credibility of the Healthcare system and can exert very harmful effects on the consumer resulting to illness; disability and even death, as anyone can be a victim [3]. This is because most times the consumers do not know the quality of what they are buying or taking. This makes it imperative that there is need to intensify effort in fake drug eradication. National Agency for Food and Drug Administration and Control (NAFDAC) is the government agency in Nigeria that is fully empowered to regulate and control the importation, exportation, manufacture, advertisement, distribution, sale and use of drugs/foods in

order to ensure that safe and quality products are available to the public, the agency has resorted to the fight against counterfeiting of medicines through the adoption of cutting edge technologies, such as the Truscan, Black eye, and Radio Frequency Identification (RFID), but considering some of the challenges (such as costs, ease of usability issues etc.) faced in the use of the above stated technologies to fight counterfeits [10], the agency therefore developed and launched Mobile Authentication Service (MAS), that will enable consumers check whether a drug is original or fake with your mobile phone, using technology from Third party companies such as Sproxil, mPedigree, etc. [9]. This choice of SMS and USSD as the

means of interaction with the system makes it available to mobile users' irrespective of their phone's capacity and data availability [1].

### 1.2 Weaknesses of Current Solution:

The existing systems, MAS, allows consumers to verify product status through the short code under the silver cover that can be easily counterfeited or copied by counterfeiters with the aid of technological equipment [13]. For years now we have not had a record of any fake or not unregistered product through the Mobile Authenticity Service; all messages have responded OK. If we think about this, does it mean that all products with Mobile Authenticity Service are authentic?

If this system is a manufacturer's designed system, which means it's a system designed for manufacturers use only, no centralized authenticating system with a centralized database to authenticate food and drugs in the country (as this system is not singly whole manned by NAFDAC). For Mejabi [8], it makes it easy for counterfeiters to use this same similar system to design same product or new product in which consumers will still get the same OK reply when they send the short code on the counterfeited product.

Another point is that if the system is not authentic, for example, what happens to the product and the manufacturer? How will the seller or consumer make complains to appropriate firm for necessary action? This existing system does not give an interface that prompts for order to report the fake product direct to the appropriate authorities (because all complains must be directed to NAFDAC office at Lagos). According to Eronmhonsele [6],

another key challenges Identified by Users of MAS Application are: Response time of text message delivery is slow and this service supports only few drugs instead of the whole drugs/foods products.

Thus the redesign of a new real-time system that will not only verify and authenticate users but also provide an interactive interface, for a faster and reliable communicating platform with the appropriate bodies for any complaints and ways on how to capture the counterfeiters.

### 1.3 Statement of Problem:

The creation of the proposed (F&D AUTH) system was entertained, because the existing (MAS) has got some lapses which include:

- Lack of a Central Administration and Control
- Supports only Few Drugs
- Lack of an Interface/Module for Reports

### 1.4 Aim of the Study:

The aim of this research is to develop an improved Real-time Food and Drug Authenticating and Interacting Device (F&D AUTH Device) that will:

- i. validate and authenticate number, if registered.
- ii. prompt an interface for reporting fake products
- iii. provide for adequate monitoring and control of valid products

## 2 LITERATURE REVIEW

In 2010, NAFDAC deployed the Mobile Authentication Service (MAS) scheme as one of the anti-counterfeiting strategies to detect substandard and falsified (SF) medical products [7]. The scheme uses scratch codes and Short Messaging Service (SMS) to empower consumers to verify the authenticity of medicines at the point of purchase: (putting the power of detecting counterfeit in the hands of consumers) the consumer scratches a panel on the product which reveals a unique, one-time use PIN. The PIN is sent toll-free to a short code using any of the GSM operators and the consumer receives a response in form of a text message (SMS) stating that the product is either genuine or suspected fake. Following the success of the pilot study, NAFDAC deployed the MAS Scheme in January 2012, across **anti-malarial** and **antibiotic medicines** imported or manufactured in Nigeria.

Currently the following five (5) MAS Providers offer MAS technology to Holders of Certificate of Registration (HCR). The Service Providers and their corresponding codes are as follows: The choice of SMS and USSD as the means of interaction with the system makes it available to mobile users' irrespective of their phone's capacity and data availability [9].

2	Sproxil	38353
3	Savanté	38120
4	UBQ-t/Kezzler	20966
5	M-Pedigree	1393

### 2.2 MAS (Mobile Authentication System):

The Mobile Authentication System is a pin printed under the silver panel on the drugs that is currently registered under mobile authentication service. All manufacturing firms using this system must get NAFDAC registration number first before using this system on their manufactured product. NAFDAC enables consumers in Nigeria to confirm whether the drug they are about to buy is genuine using a mobile phone. The consumer simply sends an SMS to 38353 to confirm the genuineness of the drug. Every MAS-enabled drug comes with a unique 10-digit number covered by a panel. All the consumer needs to do is to scratch off the panel to reveal the 10-digit number. Then the consumer texts the 10-digit number to 38353 and in a few seconds they will receive an SMS with OK to confirm the authenticity. This system is a toll free system which is available on drugs Ampiclox and Lonart but not on all other manufactured products.



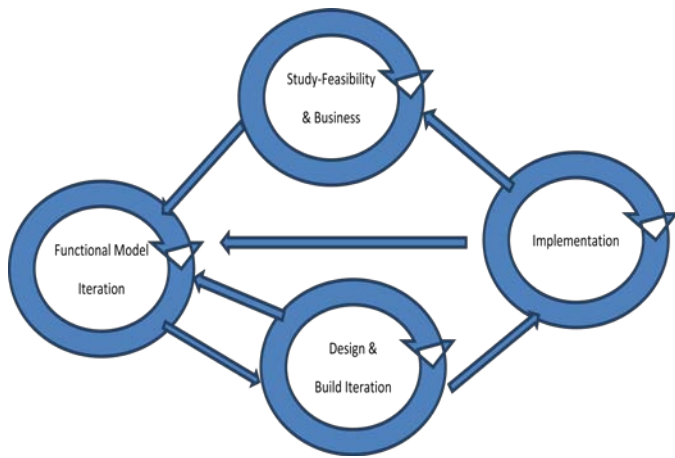
Fig 1. Mobile Authentication System (MAS) (Source: [10])

Table 1: LIST OF SERVICE PROVIDERS

	Service Provider	Short Code
1	PharmaSecure	38351

## 3 METHODOLOGY:

The Dynamic System Development Method (DSDM) was the development methodology platform adopted for the analysis and design of the new system



**Fig 2: The Dynamic System Design Methodology**

### 3.2 Analysis of the New System

Once a registered food or drug is purchased by a consumer, he/she simply authenticates the genuineness of the food or drug by inputting the unique code into its phone's SMS and clicking the send button on its phone system. Immediately the button is clicked, the system checks the database to know the availability of the code and the status of the code.

If the code is not in the database, an invalid code response is given, but if it is in the database with the status as used, then the response is: unique code has been previously used. A unique code in the database that has not been previously used gives a response comprising of the drug/food NAFDAC registration number, its manufacturing date and its expiry date.

From the observation, interview and other methods used for research, the new system has been designed to minimize and/or totally deal with the shortcoming of the present system. The introduction of a report/complaint

module in this new system has helped to facilitate the investigation of alleged counterfeiters, prosecution of counterfeiters and destruction of counterfeits. Hence the introduction of this new system will give birth to a lot of positive changes.

### 3.3 System Design:

The below UML diagram (the component diagram) specifies the visualization and construction of the artifacts of the new system



**Fig 3: The Component Diagram (Source: Authors)**

### 3.4 System Specifications:



**Fig 4: Snapshot Of System Specifications (Source: [5])**

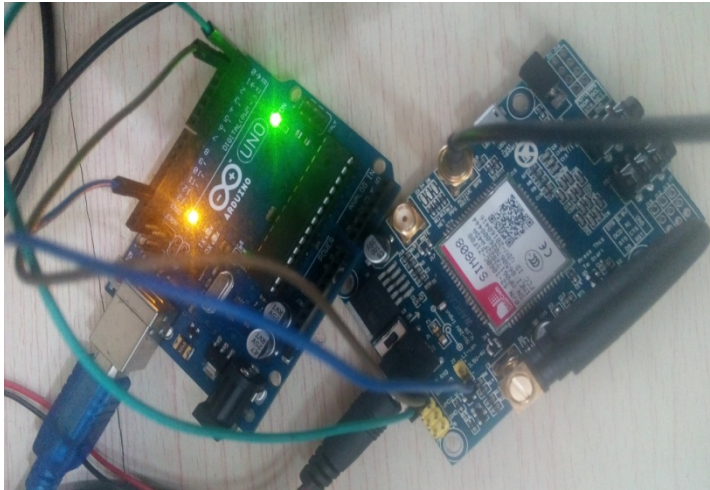


Fig 5: Sim 808 and Arduino Connection (Source: [5])

### 3.5 Snapshot of the Online Database (ON THE WEB SERVER- [www.slady.com.ng/cpanel](http://www.slady.com.ng/cpanel))

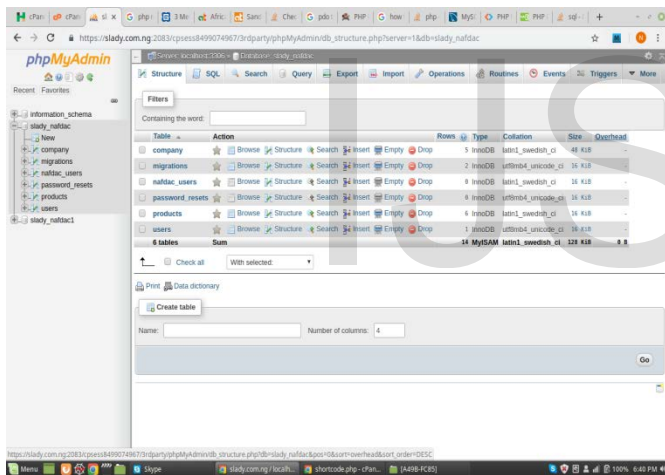


Fig 6: Snapshot of Database (Source: Authors)

### 3.6 System Encoding:

- Assemble the hardware components as shown above
- Using C programming language, upload source codes necessary to trigger the SIM808 to start sending and receiving SMS, on the Atmega 328P microprocessor from the Arduino Uno [4].

- Create a centralized online database on MySQL ([www.slady.com.ng/cpanel](http://www.slady.com.ng/cpanel)) that is interfaced with an application built with a PHP framework (Laravel) for easy Management.
- Burn into the Arduino Uno, exact source codes, that enables the SIM808 to connect, assess and retrieve data on/from the Web Server, depending on the query session [2].

### 3.7 Algorithm of the proposed F&D Auth System:

- Step 1: Start the F&D AUTH: By sending in the smart code \*347\*354#, so that the F&D AUTH application on your mobile phone pops up.
- Step 2: press1 to open interface to enter - Scratched PIN
- Step 3: Click on the "SUBMIT" button.
- Step 4: If Scratched PIN is true DO step 5 ELSE step 6.
- Step 5: Output "OK, Drug EXISTS" then DO step 10.
- Step 6: Output "This Drug Does Not Exist, Report this drug".
- Step 7: If Report is true, go to step 8 else go to step 10.
- Step 8: Input Report.
- Step 9: Click the "Send' button.
- Step 10: Exit F&D AUTH

## 4 SYSTEM IMPLEMENTATION AND RESULT

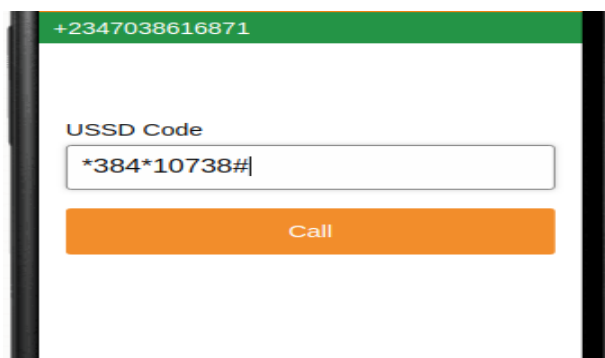
The proposed system is implemented as a mobile authenticating and interacting system that a mobile phone can communicate or interact with via SMS, providing a much responsive/faster system, and therefore a delight to users. The proposed system will feature a centralized online MYSQL database that is interfaced with an application that is built with PHP framework (Laravel) for easy drug/food-data management.



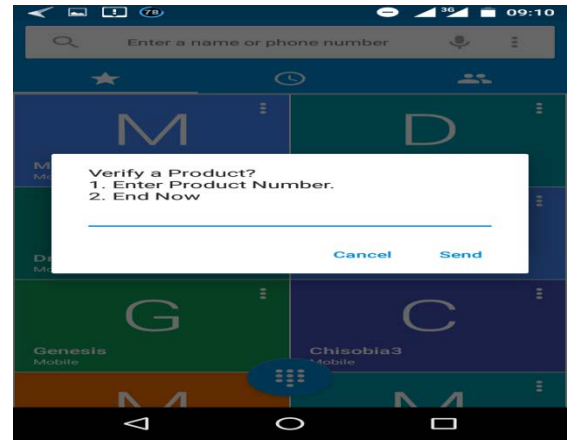
Being a mobile authenticating service via SMS, the proposed system features hardware and software components that are rich and intuitive for users to interact with the system. When a user tries to authenticate a drug/food, the SIM808 makes an internet connection with the central database (SQL server) containing valid drug/food data; it then compares the details of the product being validated with existing valid drugs/foods record to confirm its authenticity. If a match is found, the user is presented with more details about the product to aid its usage and consumption. However, if a match for a valid drug/food is not found, then the product being checked is displayed as an invalid product and the user is prompted to report the product and place of purchase for action by organized authorities.

#### 4.2 Snapshots of the Stages of the Implementation of the New Food&Auth System:

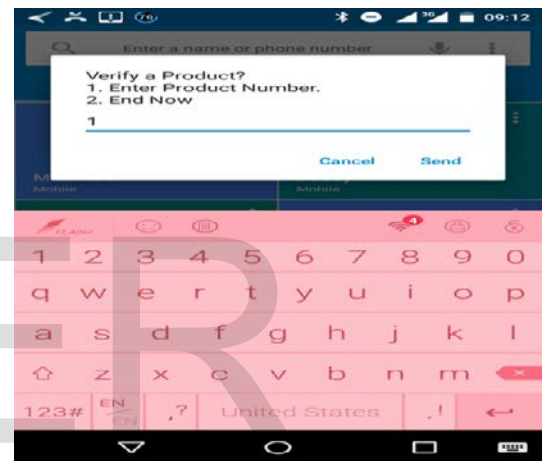
The user interface is the communicating part of the system. It describes how the user interacts with the system and how the software communicates within itself. Stages 1-8 (source: Authors) shows the screenshots captured from the implementation of the developed system:



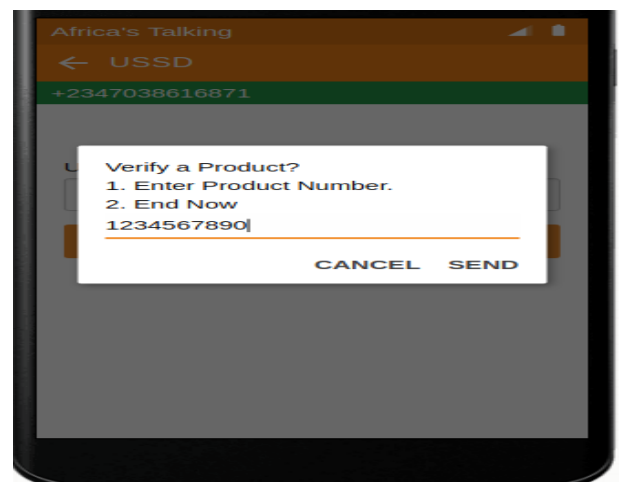
STAGE 1



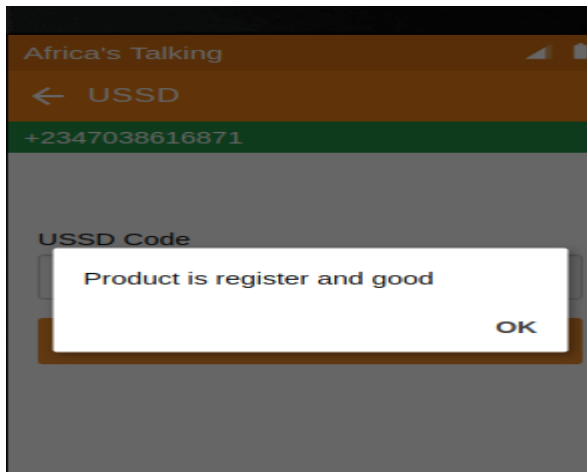
STAGE 2



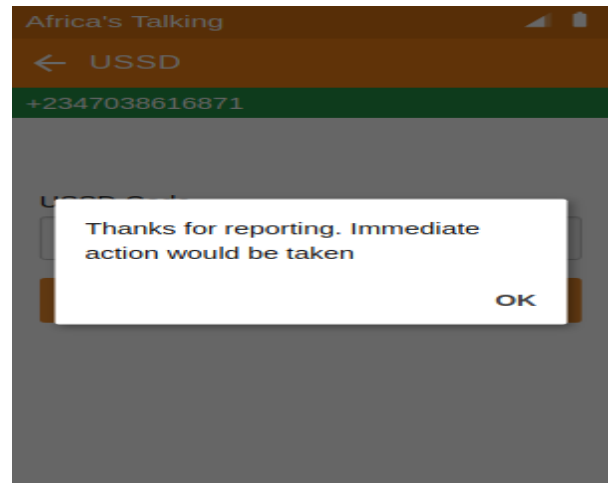
STAGE 3



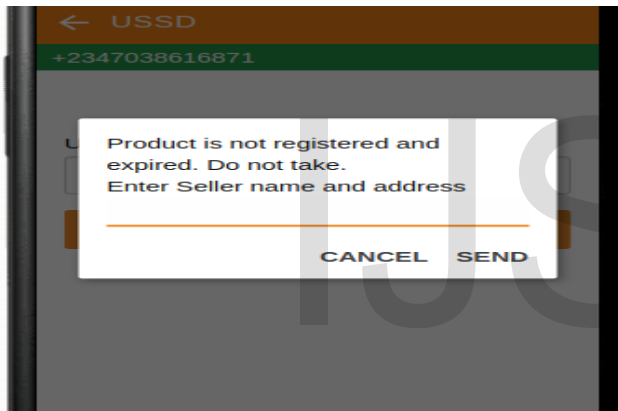
STAGE 4



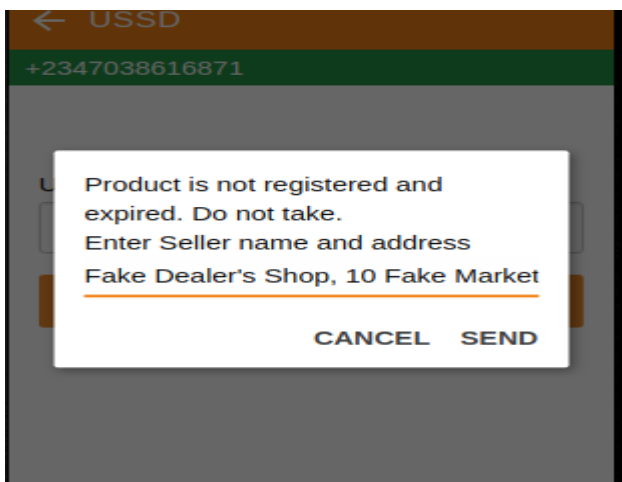
STAGE 5



STAGE 8



STAGE 6



STAGE 7

## 5 CONCLUSION AND RECOMMENDATION:

The significance of good health in human triggered the saying, "Health is wealth". The aim of this research exercise is to build and implement a consumer verification system for authentic product in Nigeria. It is an attempt to add value into our society on consumption of manufacturer products through authenticating all products with this system; in other words, to stop the consumption and eradicate fake products in our society. The system developed has proved functional and very effective in achieving the set goals and objectives.

The performance of this work is no doubt a good means for reference and research work. This piece of software can be expanded and more robust if NAFDAC can implement and the research work, single handily man and control this system (instead of third party agents). This system can be used to promote consumers right, reduce death caused from use of fake manufactured products and to apprehend Counterfeiters, so as to

ensure that defaulters reported are punished. This work has actually provided a platform for further studies in the area of fighting counterfeiters of drugs/foods out of Nigeria.

## 6 REFERENCES:

- [1] Aisagbonhi, J., Ilomuanya, M. (2016). Securing Pharmaceutical Supply Chain: A study of the Use of Mobile Authentication Service (MAS) among the Nigerian Populace. *African Journal of Pharmacy and Pharmacology*. <http://www.academicjournals.org/AJPP>.
- [2] Ajish, A. (2018). How to Receive SMS using GSM Module with Arduino. *www.engineersgarage.com*. Accessed 15 August, 2018.
- [3] Akunyili, D. (2008). *Counterfeit and Sub-standard Drugs, Nigeria's Experience: Implications, Challenges, Actions and Recommendations*. A paper presented at a meeting for key interest groups on health organized by the World Bank in Washington D. C. 10th -11<sup>th</sup> Mar.
- [4] Boian, M. (2017). Send and Receive Text Messages (SMS) with GSM SIM900 shield. <http://www.hackster.io>
- [5] Daniel, K. (2018). How to Interface GSM Module to Arduino- Send and Receive SMS. <http://www.circuittoday.com>
- [6] Eronmhonele, I.J. (2015). Detecting Counterfeit Drugs through Mobile Authentication Service (MAS): Users Challenges. *International Journal of Pharmaceutical Science Invention*. [www.ijpsi.org](http://www.ijpsi.org). vol 4. Issue 9.
- [7] Factsheet, (2013). Factsheet medicrime Convention. Retrieved 27th March from [www.coe.int/medicrime](http://www.coe.int/medicrime).
- [8] Mejabi, L. (2015). All you need to know about NAFDAC's SMS Short Codes. *smartmssolutions.com/blog*, accessed 21 July, 2015
- [9] NAFDAC, (2018). Guidelines for National Procurement and Management of Mobile Authentication Service Scheme in Nigeria. Available at [www.nafdacnigeria.org/drugs.html](http://www.nafdacnigeria.org/drugs.html)
- [10] Oladosu, J., Damiola, T.A., Oyeleye, C.A. (2016). Consumer Verification System for Authentic Product: Case study of manufactured product. *CoRI'16, Sept 7-9, 2016, Ibadan, Nigeria*.
- [11] Ufuoma, A. (2013). 10 Simple ways you can protect yourself from counterfeit drugs in Nigeria. *Nigerian Law Intellectual Property Watch Inc. (NLIP July 6, 2013)*.
- [12] Ukaoha, K.C., Dim, C.N., Daodu, S.S., Odikayor-Ogbonna, F.I. (2015). Towards A Mobile Drug Authentication System for Nigerian Users. *Computing; Information Systems, Development Informatics and Allied Research Journal*. Vol.6. No. 1. September, 2015.
- [13] Uzochukwu, C.E., Chinedu-Okeke, C.F. (2017). Audience Awareness and use of Mobile Authentication Service (MAS) in Identifying Fake and Substantial Drugs in Nigeria. *Mgbakoigba, Journal of African Studies*. Vol 7. No.1. July, 2017.
- [14] WHO, (2013). What are Counterfeit medicines. Retrieved 30th March from [www.who.int/medicines/services/counterfeit/faqs/03/en/](http://www.who.int/medicines/services/counterfeit/faqs/03/en/)