

Applying IT to Create a Business Environment and Digital Transformation of Green Economy and Sustainable Development of Regions and Localities—IT Section

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How to cite this paper: Minh, T.Q., Hue, T., Lan, N.T., Tung, B.X., Cuong, N.C., Phuong, L.T., Tan, T.M. and Hieu, N.M. (2025) Applying IT to Create a Business Environment and Digital Transformation of Green Economy and Sustainable Development of Regions and Localities—IT Section. *Journal of Computer and Communications*, 13, 1-16. <https://doi.org/10.4236/jcc.2025.134001>

Received: February 18, 2025

Accepted: April 13, 2025

Published: April 16, 2025

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Open Access

Abstract

Applying numbers, digitizing information, converting data from physical to digital form—digital transformation in the business environment with digital signatures, registering a bank account on an application installed on a mobile phone using facial recognition and scanning the citizen ID chip card and taking a photo of the front and back of the citizen ID card, momo application, zalo pay to pay electricity, water, tax bills online, cable TV bills, buy movie tickets online and receive tickets at the counter via QR code check created on the ticket purchase phone application, research on software for submitting documents in business registration. Applying programming code from nganluong.vn, jetpay.vn, onepay.vn, ... when integrating online payment, integrating payment, checkout versions (standard v2.0), advanced checkout version Ver 3.1, Seamless checkout version Ver 3.2, ... helps the Unit process global payment transactions safely with the support of the FDM System (Fraud Detection Management system) and provides a complete set of payment automation solutions, integrated with websites and software, helping your business optimize resources, costs, save time, and manage easily. Payment terminal dial up payment data transmitted via telephone. With the license to provide Payment Intermediary services from the State Bank of Vietnam, providing payment integration codes for other application programs. Patent protection for electronic payments, smart payments over time.

Keywords

Digitizing, Facial Recognition, Integrating Online Payment, Payment Data Transmitted

1. Introduction

Providing a complete set of payment automation solutions, integrating with websites and software, helping your business optimize resources, costs, save time, and manage easily.

Smart Operational Solution:

- a. Efficient—Integrate with website system and management software, sales software to automate operations, manage cash flow effectively.
- b. Safe—Integrate all forms of payment flexibly, easily, quickly and safely.
- c. Smart—Integrate smart, convenient payment devices.
- d. Suitable for all types—Suitable for all types of business.

2. Methodology

The method of analyzing documents to synthesize and conclude with modern technology is the basic factor that determines the digital transformation process in the enterprise. Reshaping thinking and management methods, aiming for a streamlined, modern and optimal operating system with automation for each IT project. The method of comparing and contrasting open source software to find ways to get optimal algorithms in the earliest conditions that the programming community has shared the presentation and the author seeks to supplement the better integrated solution for common use.

3. Results and Discussion

The market environment and business environment are the factors and forces that influence a company's ability to build and maintain successful customer relationships [1]. Consumer markets are individuals who buy goods and services for personal or household use. Business markets include those who buy goods and services for use in the production of their own products for sale. Dealer markets include non-business activities that buy goods to resell as-is at a profit. Government markets include government agencies that buy goods to produce public services or transfer goods to others who need them. International markets include buyers in other countries and include customers from previous categories. This leads to the integrated technology business environment that includes the development of new technology, how people interact with technology, and the impact of technology on the environment [2]. Technology can impact a company's internal and external environments. Internally, technology can impact things like the cost of manufacturing or how you can automate certain tasks. Externally, technology can impact how consumers communicate with each other and how quickly they adapt to advances in the field.

Green Economy is an economy that aims to reduce environmental risks and ecological scarcities, towards sustainable development without environmental degradation while maintaining the principles of climate change mitigation and Just Transition. Business (intra-industry) and collaborative actions for the transition to a green economy are Open and competitive markets, Data, accounting and

reporting, Finance and investment, Awareness, Life cycle approach, Resource efficiency and decoupling, Employment, Education and skills, Governance and partnerships, Integrated policies and decisions, demonstrating Green Economy approaches focusing primarily on access to finance, technology and green investment [3].

Blockchain databases store data in blocks that are linked together in a chain with a database management system. The data is chronologically consistent (encrypted) because you cannot delete or modify the chain without consensus from the network. Therefore, you can use blockchain technology to create an immutable or unchangeable ledger to track orders, payments, accounts, and other transactions [4]. The system has built-in mechanisms to prevent unauthorized transaction entries based on decentralization with digital signatures of each user. A distributed ledger technology system will use blockchain technology to verify that all goods sold on the platform are authentic and a post-audit feedback mechanism on a customer feedback list to score the reputation of the seller over time by product and by order with the required quantity. Distributed ledger technology has strict rules about who can edit and how (accountants, IT staff, network administrators, and blockchain project managers work independently and sign off on data). You cannot delete entries once they have been recorded. Digital signatures on decentralized passwords with Public Key Cryptography are a security feature that uniquely identifies participants in a blockchain network. Private and public keys work together to unlock data in the ledger with sign-off (Who, Whom, Where, When, Why, What). Corda (e.g. github.com/corda/corda) is an open source blockchain project, designed for business from the ground up. With Corda technology, you can build interoperable blockchain networks, transacting in strict privacy. Corda's smart contract technology allows businesses to transact directly, with value [5].

Digitalize your business with a reliable payment method. Apply the latest security standards such as 3D-Secure, TLS. Easy to deploy and support website platforms and mobile applications. Smart online management system and automatic revenue recognition. Support many different payment channels on the provided flexible platform, always have email to send transaction invoices. Support Android and iOS operating systems. In-App payment interface. Create payment links and send them to your customers via email, chat application. Accept global card payments, complete orders with customers anywhere. International cards accept cards with the brand Visa, MasterCard, JCB, American Express, UnionPay. Domestic cards, accept domestic payment cards issued by more than 40 domestic banks. Ebanking software manages very effectively the collection/payment transactions. Scan QR code to pay, accept multiple channels to increase revenue Website, Application, Invoice, Store. Postpaid payment with only invoice code, connecting payment data on multiple payment channels at ATM, Internet banking Log in and pay via internet banking, Transaction counter pay by cash or transfer at bank counter, mobile banking easy payment through mobile banking applications. Increase revenue with multi-term installment payment, bank supports pay-

ment by most banks. Flexible payment terms. Promote sales to increase orders. Optimize sales revenue. Simple procedures confirm transactions immediately without paperwork. Open credit cards or loans on e-wallets by scanning personal documents, fast and convenient with small loans usually equal to half a month's salary. Postpaid payment with only invoice code connecting payment data on multiple channels, transferring money to your customers easier than ever, transferring money 24/7 to any bank with just one command. Apply flexible fees for all banks. With PayOut solution, we save you time and avoid mistakes compared to manual methods. Counter payment modern payment solution at the counter, card payment helps customers pay one-touch with all types of bank cards, Mobile application payment by QR code by e-wallet and mobile banking applications. Accept all payment methods ATM card payment, international card payment, QR-Code payment, 0% interest installment payment. Centralized management—flexible integration Easily integrate with your management system or device such as ERP, CRM, POS, Kiosk, PC ... through API documents. Manage online business more effectively and securely search for transactions to check, confirm, support your customers, search for transactions by date, order code, transaction report transaction data by time and classify and statistics transactions. Reconciliation supports daily reconciliation and provides refund function. Set up your operations, we support you to decentralize system functions for each department such as: accounting, business, customer care, business analysis. Global payment transaction processing unit safely with the support of FDM (Fraud Detection Management system). Automatic scanning and daily warning of suspicious fraudulent transactions. Automatic classification to assess the risk level for each transaction. Safe with card information encryption and card token creation for safe payment. Enhance user experience by linking the card to the customer's account, a bank account connected to both domestic and international cards, so when maintenance is not stopped, payment transactions are always not stopped. Automatically collect fees periodically according to pre-set commands, safely ensuring card authentication. Faster payment with Apple Pay, Apple Pay is a payment method that can replace physical cards or cash with easier, safer, more secure and private operations. When a customer makes a payment, Apple Pay uses the device's unique number and a unique transaction code. The customer's card number is not stored on the device or on Apple's servers, nor is it shared with the merchant. Apple Pay ensures customer privacy by not storing transaction information that could be linked to personal data. You can link your ATM card or e-wallet to Apple Pay on your iPhone mobile device.

Website channels supporting the integration of digital transformation software in business applying IT applications, technical support information integrating payment gateways supporting many Open Sources include: **Joomla, CsCart, Prupal, Magento, PrestaShop, OsCmax, Tomato**. To download source code and Open Source integration documentation, please select the Open Source type.

Order of implementation steps:

a. **Step 1:** Integrate the payment gateway on the TEST environment to run the

- test. Information MERCHANT ACCOUNT TEST, CREDIT CARD TEST, DEBIT CARD TEST: (Domestic | International)
- b. **Step 2:** TEST the website of the Card Accepting Unit, the Card Accepting Unit notifies the website address that has completed the integration of the payment gateway to the email TECH@ONEPAY.VN [6].
 - c. **Step 3:** Accept the payment gateway, the Card Accepting Unit signs a contract with the payment integration service provider and the Hanoi Transaction Office Branch—Vietnam Foreign Trade Bank, then download the acceptance report here: (Domestic | International). The Card Accepting Unit signs a contract with the payment integration service provider and the Ho Chi Minh City Branch—Vietnam Foreign Trade Bank, then download the acceptance report here: (Domestic | International). Card accepting units that do not sign a contract with the Ho Chi Minh City Branch or Hanoi Transaction Office can download the acceptance report here: (Domestic | International). Card accepting units download the payment gateway acceptance report file, fill in all the information in the Card accepting unit section, print out 3 copies of the acceptance report, get the stamp, signature and send it to the payment integration company at the address on the acceptance report.
 - d. **Step 4:** Issue a real MERCHANT ACCOUNT, the technical department of the payment integration service provider will send the MERCHANT ACCOUNT information file to the Card accepting unit when the payment integration service provider receives the acceptance report.
 - e. **Step 5:** Issue an online transaction management account, the customer support department of the payment integration service provider will send the transaction management account file to the Card accepting unit on the same day the MERCHANT ACCOUNT is issued.
 - f. **Step 6:** Thank you, During the deployment and actual running, if the card accepting unit has any unclear issues or needs to upgrade, please contact the payment integration service provider's list.

International Payment Gateway

Accept payment of international branded cards: Visa, Master, JCB, Amex

International payment gateway test account parameters:

Payment URL: <https://mtf.onepay.vn/vpcpay/vpcpay.op>

Payment in VND currency:

MerchantID: TESTONEPAY

Accesscode: 6BEB2546

Hashcode (Other name is SECURE_SECRET):

6D0870CDE5F24F34F3915FB0045120DB

Test card information:

Account type: Visa

Card number: 4000000000000002 or 5313581000123430

Date Exp: 05/21

CVV/CSC: 123

Street: Tran Quang Khai

City/Town: Hanoi

State/Province: North
 Postcode(zip code): 1234
 Country: VietNam
Real account parameters of the international payment gateway:
 Payment URL: <https://onepay.vn/vpcpay/vpcpay.op>
 MerchantID: YOUR MERCHANT ID
 Accesscode: YOUR ACCESS CODE
 Hashcode (Other name is SECURE_SECRET): YOUR SECURE SECRET

Domestic Payment Gateway (Figure 1)

Accepts payment of ATM cards of banks: Vietcombank, Vietinbank, VIB, Dong A, HD Bank, Techcombank, Tien Phong Bank, Viet A, Nam A, MSB, SHB, Eximbank, MB...

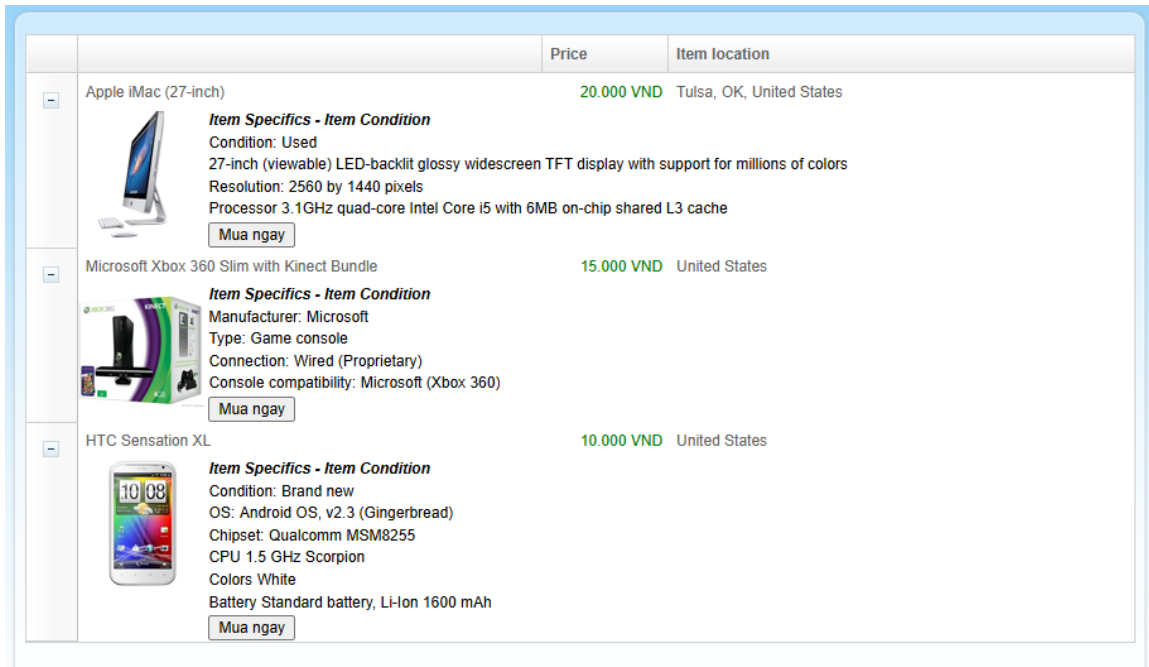
Domestic payment gateway test account parameters:

Payment URL: <https://mtf.onepay.vn/onecomm-pay/vpc.op>
 MerchantID: ONEPAY
 Accesscode: D67342C2
 Hashcode (Other name is SECURE_SECRET): A3EFDFABA8653DF2342E8DAC29B51AF0
 ABB card:
 Card number: 9704250000000001
 Issued month/year: 01/13
 Name: NGUYEN VAN A
 OTP code: 123456

Domestic payment gateway real account parameters (Figure 3):

Payment URL: <https://onepay.vn/onecomm-pay/vpc.op>
 MerchantID: YOUR MERCHANT ID
 Accesscode: YOUR ACCESSCODE
 Hashcode (Another name is SECURE_SECRET): YOUR SECURE SECRET

https://mtf.onepay.vn/developer/?page=demo_noidia.



https://mtf.onepay.vn/developer/?page=demo_quocte.

Figure 1. Domestic demo.

	Price	Item location
<p>Apple iMac (27-inch) Item Specifics - Item Condition Condition: Used 27-inch (viewable) LED-backlit glossy widescreen TFT display with support for millions of colors Resolution: 2560 by 1440 pixels Processor 3.1GHz quad-core Intel Core i5 with 6MB on-chip shared L3 cache <input type="button" value="Mua ngay"/></p>	2000 VND	Tulsa, OK, United States
<p>Microsoft Xbox 360 Slim with Kinect Bundle Item Specifics - Item Condition Manufacturer: Microsoft Type: Game console Connection: Wired (Proprietary) Console compatibility: Microsoft (Xbox 360) <input type="button" value="Mua ngay"/></p>	1500 VND	United States
<p>HTC Sensation XL Item Specifics - Item Condition Condition: Brand new OS: Android OS, v2.3 (Gingerbread) Chipset: Qualcomm MSM8255 CPU 1.5 GHz Scorpion Colors White Battery Standard battery, Li-Ion 1600 mAh <input type="button" value="Mua ngay"/></p>	1000 VND	United States

Figure 2. International demo.

Enter your transaction information to try the query (merchant id, access code, merchant transaction reference) function (Figure 2), https://mtf.onepay.vn/developer/?page=demo_query.

Query

Sử dụng hàm query để kiểm tra trạng thái của một giao dịch qua cổng thanh toán OnePAY. Nhập thông tin giao dịch của bạn để dùng thử hàm query(merchant id,access code,merchant transaction reference). Nếu chưa có thông tin giao dịch để dùng thử hàm query bạn cần vào chức năng thanh toán thử để tạo một giao dịch test.

Type	Content
▲ Query giao dịch cổng nội địa môi trường test	
Uri query	https://10.36.74.105/onecomm-pay/Vpcdps.op
Merchant ID	<input type="text" value="ONEPAY"/>
Access code	<input type="text" value="D67342C2"/>
Transaction Reference	<input type="text" value="2413"/>
	<input type="button" value="Query"/>
Response	
Description	
▲ Query giao dịch cổng quốc tế môi trường test	
Uri query	https://10.36.74.105/vpcpay/Vpcdps.op
Merchant ID	<input type="text" value="TESTONEPAY"/>
Access code	<input type="text" value="6BEB2546"/>
Transaction Reference	<input type="text" value="GDEAXIEM_41382.452331"/>
	<input type="button" value="Query"/>
Response	
Description	

Figure 3. Use the query function to check the status of a transaction via the payment gateway.

Steps to Upgrade v1.0 to 2.0—JSP

- **Step 1:** Open the real running website (integrated version 1.0). Get the MerchantID, Accesscode, Hashcode (SECURE_SECRET) parameters and send them back to OnePAY (to email: tech@onepay.vn) to receive the real account information of version 2.0.
- **Step 2:** In the real running module, find the payment form. Update the value of the vpc_Version argument from “1” to “2”.
- **Step 3:** Download the Domestic JSP v2.0 module here, the International JSP v2.0 module here
- **Step 4:** Open the do.jsp file on the real running website (integrated version 1.0). Update the functions similar to the do.jsp file of version 2.0. Specifically:
 - Update the used library as below:

```
< %@ page import="java.util.*,
java.util.ArrayList,
java.util.Collections,
java.util.Iterator,
java.util.Enumeration,
java.util.Map,
java.net.URLEncoder,
javax.crypto.*,
javax.crypto.spec.*,
java.util.HashMap,
java.io.ByteArrayOutputStream" %>
```

-Declare more variables:

```
String hashAllFields(Map fields) {
List fieldNames = new ArrayList(fields.keySet());
Collections.sort(fieldNames);
StringBuffer buf = new StringBuffer();
Iterator itr = fieldNames.iterator();
while (itr.hasNext()) {
String fieldName = (String) itr.next();
String fieldValue = (String) fields.get(fieldName);
if ((fieldValue != null) && (fieldValue.length() > 0) && fieldName.indexOf("vpc_") ==
0) {
buf.append(fieldName + "=" + fieldValue);
if (itr.hasNext()) {
buf.append('&');
}
}
}
byte[] mac = null;
try {
byte[] b = decodeHexa(SECURE_SECRET.getBytes());
SecretKey key = new SecretKeySpec(b, "HMACSHA256");
Mac m = Mac.getInstance("HMACSHA256");
m.init(key);
```

```

m.update(buf.toString().getBytes("UTF-8"));
mac = m.doFinal();
} catch (Exception e) {
e.printStackTrace();
}
String hashValue = hex(mac);
return hashValue;
}

-----
/** Old function
String hashAllFields(Map fields) {
// create a list and sort it
List fieldNames = new ArrayList(fields.keySet());
Collections.sort(fieldNames);
// create a buffer for the md5 input and add the secure secret first
StringBuffer buf = new StringBuffer();
buf.append(SECURE_SECRET);
// iterate through the list and add the remaining field values
Iterator itr = fieldNames.iterator();
while (itr.hasNext()) {
String fieldName = (String) itr.next();
String fieldValue = (String) fields.get(fieldName);
if ((fieldValue != null) && (fieldValue.length() > 0)) {
buf.append(fieldValue);
}
}
MessageDigest md5 = null;
byte[] ba = null;
// create the md5 hash and UTF-8 encode it
try {
md5 = MessageDigest.getInstance("MD5");
ba = md5.digest(buf.toString().getBytes("UTF-8"));
} catch (Exception e) {} // wont happen
//return buf.toString();
return hex(ba);
}
**/

```

-Add decodeHexa() function:

```

public static byte[] decodeHexa(byte[] data) throws Exception {
if (data == null) {
return null;
}
if (data.length % 2 != 0) {
throw new Exception("Invalid data length:" + data.length);
}
public static byte[] decodeHexa(byte[] data) throws Exception {
if (data == null) {

```

```
return null;
}
if (data.length % 2 != 0) {
throw new Exception("Invalid data length:" + data.length);
}
ByteArrayOutputStream out = new ByteArrayOutputStream();
byte b1, b2;
int i = 0;
while (i < data.length) {
b1 = decodeHexArray[data[i++]];
b2 = decodeHexArray[data[i++]];
out.write((b1 << 4) | b2);
}
out.flush();
out.close();
return out.toByteArray();
}
```

Step 5: Open the dr.jsp file on the real running website (integrated version 1.0). Update the functions similar to the dr.jsp file of version 2.0. Specifically:

- Update the used library as below:
- Update the hashAllFields() encryption function:
- Add the decodeHexa() function:

Step 6: Update the SECURE_SECRET parameter value sent by OnePAY to the do.jsp file and dr.jsp file.

Step 7: Deploy the website on the web server. Restart the web server (Tomcat/TCat) and test the payment process again.

INTEGRATED STANDARD CHECKOUT

<https://www.nganluong.vn/vn/home.html>

Integrated Documentation

(Download)

https://drive.google.com/open?id=1AfOFQSKSV-KkeaU_js0ZzSqf4XgalXPO

Sample Code

PHP (Download)

<https://drive.google.com/file/d/1n1IotMrzkVEC9W2HzCJoXgczB72e3z5F/view>

.Net (Download)

<https://drive.google.com/open?id=1tA-Q5iMgUkszcUFxEDIpOYl604ApexrA>

CMS Integration Documentation

Wordpress (Download)

https://drive.google.com/open?id=1nfLqD_qeNVgox5SD6UhIdL9lJE1wD5oj

Magento (Download)

https://drive.google.com/open?id=1z6frqGVqodi8xXV_KSLf_8dQX1qjOsyz

OpenCart (Download)

<https://drive.google.com/open?id=1DSX2p0asnM2S6lEhC6zX95hSFNFxvvh8>

Drupal (Download)

<https://drive.google.com/open?id=1BSbmawOiYGSJHxF7ZN1i5rLzT389-vt7>

CubeCart (Download)

https://drive.google.com/open?id=1XSYiThyNizxSV3ccLeWAEhYWdAXH2_4

Advanced Checkout Integration Documentation
(Download)

<https://drive.google.com/file/d/1NVTfQEaBs7cnFw-93glD0Gye5CcOKHt0/view?usp=sharing>

Sample Code

PHP (Download)

<https://drive.google.com/open?id=1tbOyFRiocOp2SyyzoMRWAqLWhGZY9Qcd>

.Net (Download)

<https://drive.google.com/open?id=1qdOuLtrAS95BuXldxSbsm-fOp47HMhJi>

Java (Download)

https://drive.google.com/open?id=1NTkS_AAAtJDXOgkxmhkAaLK0glOPYFiuI

SEAMLESS CHECKOUT INTEGRATION

Integration Documentation (Download)

https://drive.google.com/file/d/1axMmnFmDM-iXTqbET_Y_jsicfSh-FShI/view?usp=sharing

Sample Code

PHP (Download)

<https://drive.google.com/open?id=1rD5X-mpoEa9p3xbcMckP4GAjoB1VcDf>

INTEGRATION FOR MOBILE APPS

Integration Documentation

(Download)

https://drive.google.com/open?id=1w37gvNfamr_thDno2EzHI5tnx5bxIvc0

Sample Code

Android (Download)

[https://drive.google.com/open?id=1k7oq\\$clBKPoZaSUAZpO9Tx3Dhpnml2iV](https://drive.google.com/open?id=1k7oq$clBKPoZaSUAZpO9Tx3Dhpnml2iV)

iOS (Download)

https://drive.google.com/open?id=1J2zj_zOx61xpAmHzIGIC5KboZzYXaFMM

PAY FOR PUBLIC ADMINISTRATIVE PROCEDURES QUICKLY EASY

<https://www.nganluong.vn/vn/about/hanhchinhcong.html> [7]

Online payment without having to go to the place, Sitting at home still submit all procedures on time. Online payment only requires customers to have a smartphone, tablet, PC, you can pay and complete documents and procedures remotely without having to go to the Reception Unit/Administrative Unit. You can freely choose the following payment methods: ATM card, Visa, Master Card, JCB, QRCode, Instant transfer, e-wallet. No need to come to receive procedures and documents. The system will record your information and send documents and procedures to your place of residence. Pay financial obligations on land. Support online payment for households and individuals Pay voluntary social insurance

and health insurance according to the household. Online renewal of Health Insurance cards for households and voluntary social insurance. Paying traffic violation fines, Looking up and paying fines for administrative violation decisions in the field of road traffic. Payment of administrative procedure fees and charges Online payment of public service fees and charges for level 3 and 4 procedures Personal tax payment Registering, declaring and paying personal taxes Electricity bill payment, Support for online EVN payment anytime, anywhere. Payment of Cinema Department files Submitting and paying files in the field of Cinema, feature films, etc. Payment of Copyright Department files Online payment of administrative procedures of the Copyright Department (Copyright, ownership of works, etc.)

Instructions for registering and eKYC JetPay Ewallet

- Download the Company's e-wallet application—JetPay Ewallet, To download the JetPay Ewallet application on your smartphone, do the following: For Android operating system (On Samsung, HTC, Xiaomi, Realme, ...) Go to CH Play, search "JetPay Ewallet" on the toolbar [8]. Select the JetPay Ewallet application. Click Install to download the application. For iOS operating system (On iPhone)—currently not available Go to Appstore, search "JetPay Ewallet" on the toolbar. Select the JetPay Ewallet application and click Get to download the application.

- Register for a JetPay Ewallet e-wallet account. Open the JetPay Ewallet application you just downloaded, on the login screen click "Register" and enter the information required by the application. The application will send a verification code to the registered phone number. Enter the correct 6-digit OTP and click "Verify". After successful authentication, the application automatically returns to the login screen. Log in with the registered information and click "Login". For the first login, the application will ask for "Confirm the terms of use". Read the Agreement carefully and click "I have read and agree...", then click "Confirm".

- Customer authentication (eKYC—Electronic Know Your Customer) is a solution to verify the identity of online customers through electronic technology and artificial intelligence [9]. After logging into the wallet, if the account has not been authenticated, the system will request immediate authentication. You must authenticate to use. Take a photo of the front and back of the chip-attached CCCD Next step, read the NFC chip, place the back of the phone on the chip-attached CCCD. After successfully scanning NFC, take a photo of your face according to the instructions on the application. After completing the above steps, you check the information again. If it is correct, click "Complete" then click "Send verification information" to send the e-wallet registration file to the Company for approval of online payment integration. The Company will receive the file and process it after 1 working day. After the Company approves, you can use the JetPay Ewallet feature.

eKYC (Electronic Know Your Customer) is a project designed to verify customer identity electronically. This is an essential system to ensure authenticity and security in online transactions [9].

1. **Upload Document** (ID Card): Initially, users are required to upload an image of their ID card, essential for extracting facial information from the ID card photo.

2. **Face Verification**: Following the document upload, to verify whether the user matches the individual pictured on the ID card. Here's how we do it:

Step 1—Still Face Capture: Users are prompted to maintain a steady face in front of the camera.

Step 2—Face Matching (Face Verification): facial recognition technology to compare the live image of the user's face with the photo on the ID card.

3. **Liveness Detection**: To ensure the user's physical presence during the eKYC process and to prevent the use of static images or videos, we implement Liveness Detection.

This step involves the following challenges to validate the user's authenticity:

Step 3—Liveness Challenges: Users are required to perform specific actions or challenges, which may include blinking, smiling, or turning their head.

Step 4—Successful Liveness Verification: Successful completion of the liveness challenges indicates the user's authenticity, confirming a successful eKYC process.

These combined steps—ID card upload, Face Verification, and Liveness Detection—comprehensively verify the user's identity, enhancing security and reducing the risk of fraudulent attempts.

Installation, Clone the repository

```
pip install facenet-pytorch
```

```
git clone https://github.com/manhcuong02/eKYC
```

```
cd eKYC
```

Install the required dependencies

```
pip install -r requirements.txt
```

Recently, deep learning convolutional neural networks have surpassed classical methods and are achieving state-of-the-art results on standard face recognition datasets. One example of a state-of-the-art model is the VGGFace and VGGFace2 model developed by researchers at the Visual Geometry Group at Oxford [10].

Face Recognition:

- **VGGFace** and **VGGFace2** Models
- Install the keras-vggface Library
- Detect Faces for Face Recognition
- Perform Face Identification With VGGFace2
- Perform Face Verification With VGGFace2

Pretrained models

See: `models/inception_resnet_v1.py`

The following models have been ported to pytorch (with links to download pytorch state_dict's):

Model name	LFW accuracy (as listed here)	Training dataset
20180408-102900 (111MB)	0.9905	CASIA-Webface
20180402-114759 (107MB)	0.9965	VGGFace2

Performance comparison of face detection packages

This notebook demonstrates the use of three face detection packages:

Each package is tested for its speed in detecting the faces in a set of 300 images (all frames from one video), with GPU support enabled. Performance is based on Kaggle's P100 notebook kernel. Results are summarized below.

Package	FPS (1080x1920)	FPS (720x1280)	FPS (540x960)
facenet-pytorch	12.97	20.32	25.50
facenet-pytorch (non-batched)	9.75	14.81	19.68
dlib	3.80	8.39	14.53
mtcnn	3.04	5.70	8.23

Usage: Download weights of the pretrained VGGFace models from ggdrive, and then add them to the "verification_models/weights" directory. Download weights and landmarks of the pretrained liveness detection models from ggdrive, and then add them to the "liveness_detection/landmarks" directory. The source code has been rewritten and tested to be compatible with the VGGFace2 model (InceptionResnetV1), using Norm L2 for face matching [11]. VGGFace2 and CASIA-Webface are used to train the Inception Resnet (V1) models. PyTorch is a fully featured framework for building deep learning models, which is a type of machine learning. PyTorch is a machine learning library based on the Torch library, used for applications such as computer vision and natural language processing. MTCNN (MTCNN or Multi-Task Cascaded Convolutional Neural Networks is a neural network which detects faces and facial landmarks on images.) for face detection before inference. These models are also pre-trained, which is the fastest MTCNN implementation available (for example, <https://github.com/timesler/facenet-pytorch/blob/master/README.md>). What Is the L² Norm / Euclidean Norm? L² is the most commonly used norm and the one most encountered in real life. The L² norm measures the shortest distance from the origin. It is defined as the root of the sum of the squares of the components of the vector. The L_p-norm is a general equation where you can replace p with any number. The most commonly used L_p-norms are L1, L2, and L-infinity. The L1 norm is the sum of the absolute value of the entries in the vector. The L2 norm is the square root of the sum of the squares of entries of the vector.

Using the PyQt5 Interface:

```
python3 main.py
```

4. Conclusion

E-commerce platforms all integrate online payment gateways on the website to help customers pay more easily [12]. Solve the pain-point of buyers about online payment compared to COD payment without changing product and price policies. Security factors need to be put first, just a small mistake in security holes can

make you lose a lot of potential customers on your website. Help business owners and individuals doing online business about online payment features and solutions, current electronic payments. The eKYC (Electronic Know Your Customer) flow, which comprises three main components: Upload Document (ID Card), Face Recognition (Verification), and Liveness Detection.

Acknowledgements

I would like to sincerely thank the teachers of FPT School of Business & Technology và Teacher of scientific research and my colleagues in the class 24MSE43022— Master of Software Engineering for their enthusiastic support in completing this article. My colleagues at Tay Do University have helped me with time and facilities for the research on Scientific Articles in Payment integration code for other application programs.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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