PR2 Trainer's Guide

Modules Presentation

Co-funded by
the European Union

TrainChain
Blockchain Training for Start Ups

Project ID

Grant agreement	2021-1-IE01-KA220-VET-000032943
Programme	Erasmus+
Key action	Cooperation partnerships in vocational education and training
Field	Vocational Education and Training
Project acronym	TrainChain
Project title	TrainChain - Blockchain Training for Start Ups
Project starting date	28/02/2022
Project duration	24 months
Project end date	27/02/2024

Co-funded by the European Union

Introduction

In the following slides we present an overview of the TrainChain Modules and their respective Units as they are organized on the TrainChain Platform.
The presentation acts as a point of reference for the trainers who wish to demonstrate the platform and educate their audience on the covered Blockchain topics.

U1. Blockchain Technology Overview

- **Evolution of Blockchain**
Originally a computer science term, blockchain has evolved into the fifth computing revolution, offering a decentralized alternative to traditional databases.
- **Blockchain vs. Traditional Databases**
Contrasting centralized traditional databases with decentralized blockchains, the latter's security and lack of a single point of failure stand out.
- **Types of Blockchains**
Blockchains come in various types – public, private, consortium, hybrid, sidechains, and federated/permissioned – each tailored to specific use cases and organizational needs.
- **Common Characteristics of Blockchains**
Regardless of type, all blockchains share characteristics like decentralization, immutable ledger, cryptography, consensus mechanisms, smart contracts, transparency, interoperability, and resilience.

Module 0 - Introduction to Blockchain Technology

U2. How Blockchains Operate and Why They Matter

- **Decentralized Nature of Blockchains**
Blockchains operate without a central authority, utilizing a network of independent users (full nodes) distributed across various locations to maintain data integrity.
- **Cryptocurrency Incentives in Blockchain Networks**
Blockchains use cryptocurrencies as incentives for participants, rewarding those who operate the network's infrastructure (full nodes) in securing the data.
- **Trust Establishment through Innovative Methods**
Blockchains revolutionize trust on the internet by employing methods like requiring miners' accurate transaction history, staking cryptocurrency in Proof-of-Stake, and distributing data in private blockchains
- **Revolutionizing Industries with Secure Digital Records**
Blockchains have the potential to transform industries like finance, supply chain management, and property rights by providing faster, more secure transactions and creating permanent and reliable digital records.

Module 0 - Introduction to Blockchain Technology

U3. The Blockchain Structure

- **Bitcoin Model as a Blueprint for Blockchains**
Bitcoin serves as a widely-used model for understanding blockchain structures, with each node containing a copy of the entire network data to ensure security and persistence.
- **Core Elements of Blockchain Coordination**
The coordination of data organization in Bitcoin involves three key elements: Block, Chain, and Network
- **Block as Transaction Organizer**
Blocks in blockchains are collections of transactions recorded over specific time periods, emphasizing the importance of efficient data organization for secure movement and interpretation
- **Hashing and Chain Integrity**
Blockchain chains are sequences of blocks connected through hashing, creating a tamper-proof record of transactions that ensures data integrity and order.
- **Network of Full Nodes:**
The blockchain network comprises full nodes, globally dispersed computers running algorithms to secure the network.

Module 0 - Introduction to Blockchain Technology

U4. Main Blockchain Applications and Evolution

- **Blockchain as Immutable Code**

Blockchain operates on the principle of code as law, utilizing a rigid and impartial network where computer code dictates rules without inherent biases or interpretations, particularly showcased in insurance contract arbitration.

- **Advantages of Blockchain Record Keeping**

Blockchain's ability to maintain accurate and transparent records presents an advantage, alleviating the significant resources currently invested in establishing clear histories of actions and actors in various industries and regulatory bodies.

- **Evolution and Milestones in Blockchain**

Starting with Bitcoin, blockchain technology has evolved through milestones like Ethereum, demonstrating its potential beyond cryptocurrency trading.

- **Consensus Mechanism in Blockchains:**

The consensus algorithm, a key component of blockchains, facilitates agreement among participants represented by full nodes.

Module 0 - Introduction to Blockchain Technology

U5. Other Blockchains in use

- **Blockchain Beyond Cryptocurrency**

Blockchains are expanding beyond cryptocurrency trading, finding applications in various industries, adding a new layer of trust and security to online interactions.

- **Current Uses of Blockchain**

Presently, blockchain applications focus on fast and affordable value transfers, trading public stocks, international payments, currency exchange, and enhancing software system security.

- **Initial Coin Offerings (ICOs)**

ICOs, a novel innovation, leverage smart contracts to offer tokens in exchange for investment funds.

- **Future Applications of Blockchain**

Governments worldwide are actively exploring blockchain for applications like government-backed land record systems, identity management, and international travel security.

Module 0 - Introduction to Blockchain Technology

U1. General overview of Cryptocurrencies

- **Definition of Cryptocurrencies**
A cryptocurrency is a digital asset used for economic transactions, utilizing cryptographic methods, decentralized and secure for financial transactions.

- **Functioning of Cryptocurrencies**
They are operated and controlled through a decentralized database: blockchain, ensuring secure data transfer via encoded blocks in a peer-to-peer network.

- **Advantages**
Some advantages like Open code for mining crypto currency, no inflation and Peer-to-peer cryptocurrency network

- **Disadvantages**
Some disadvantages like: Strong volatility and large risks of medium and long term investing.

Module 1 - Cryptocurrencies and Payment Gateways

U2. History of Cryptocurrencies

• **Early Concepts: eCash and DigiCash**
US cryptographer David Chaum introduced eCash and DigiCash, using cryptography for anonymous money transactions.

• **B-Money and Blockchain**
Wei Dai proposed the concept of b-money in 1998, marking the early steps toward the development of blockchain.

• **Birth of Bitcoin**
In 2008, an anonymous figure known as Nakamoto introduced Bitcoin, describing its P2P functionality and proof-of-work consensus algorithm.

• **Genesis Block and Mining:**
The creation of the first decentralized and P2P Bitcoin block, "Genesis," allowed widespread participation in the mining process

• **Rising Interest and Regulatory Concerns:**
Interest in Bitcoin surged lead to global concerns about regulatory measures

• **Impact of Regulation on Cryptocurrency Dynamics**
Authors express concerns that increased market capitalization may attract more speculators.

• **Cryptocurrency's Potential and Growing Industry**
Cryptocurrencies hold significant potential to reshape the economy.

Module 1 - Cryptocurrencies and Payment Gateways

U3. Types of cryptocurrencies

- **Bitcoin (BTC)**
Bitcoin, the pioneer in cryptocurrencies, is a decentralized digital currency operating on a blockchain, designed to facilitate peer-to-peer transactions without the need for intermediaries.

- **Ethereum (ETH)**
Ethereum is a decentralized platform enabling the creation of smart contracts and decentralized applications (DApps) through its native cryptocurrency, Ether (ETH), contributing to the evolution of blockchain technology beyond simple transactions.

- **Litecoin (LTC):**
Created as the "silver to Bitcoin's gold," Litecoin is a peer-to-peer cryptocurrency known for faster transaction confirmation times and a different hashing algorithm, offering a complementary approach to digital currency.

- **Cardano (ADA):**
Cardano is a blockchain platform that aims to provide a more secure and scalable infrastructure for the development of smart contracts and decentralized applications, prioritizing academic research, and a layered architecture for sustainability.

Module 1 - Cryptocurrencies and Payment Gateways

U4. Investing in cryptocurrencies

- **Cryptocurrency Investment Basics**
Cryptocurrencies operate without government regulation, and their supply is market-controlled, making them resistant to external interference.

- **Steps to Invest Safely**
The investment process involves choosing a broker, establishing a budget, selecting cryptocurrencies, making purchases through a platform, and storing tokens in a secure wallet.

- **Investment Tips**
Practical advice includes being realistic with budgeting, avoiding investments with unconvincing programming terms, using reliable applications, utilizing free demos for learning, and considering the moves of experienced investors.

- **Bitcoin's Evolution**
Bitcoin, initially an investment asset, has evolved into a secure payment alternative widely accepted by companies worldwide.

- **Cryptocurrency Integration Beyond Large Corporations**
Beyond major companies, small and medium-sized enterprises and even government agencies are embracing cryptocurrencies and blockchain.

Module 1 - Cryptocurrencies and Payment Gateways

U5. Digital Wallets

- **Digital Wallet Overview**

A digital wallet, or e-wallet, is a versatile tool that allows electronic transactions, storing payment data, gift coupons, and licenses.

- **Benefits and Use Cases of Digital Wallets**

Digital wallets streamline payments, offer marketing insights for companies, enhance global financial participation, enable cross-border fund transfers, between others.

- **Types of e-Wallets: Hot vs. Cold**

Hot wallets are internet-connected, easy to use, and free but carry security risks. Cold wallets, not connected to the internet, offer enhanced security but may incur costs and are less convenient.

- **Examples and Steps for Opening Cryptocurrency Wallet**

Notable digital wallets like PayPal One Touch™, Apple Pay, and Google Pay offer varied services.

Module 1 - Cryptocurrencies and Payment Gateways

U6. Payment Gateways

- **Cryptocurrency Payment Gateway Overview**

  A cryptocurrency payment gateway is a digital currency payment processor that enables merchants to accept crypto payments and receive fiat money

- **Payment Gateway Functionality**

  Payment gateways simplify the process of receiving cryptocurrency payments by handling the exchange and wallet management

- **Payment Flow Process**

  The payment flow involves the customer choosing cryptocurrency payment, the merchant receiving an amount equivalent to the digital currency's fair market value and the funds being deposited.

- **Advantages and Disadvantages of Payment Gateways**

  Some advantages include removal of customer anonymity and global payment acceptance. Some disadvantages encompass reliance on third-party services and potential service interruptions.

- **Examples of Cryptocurrency Payment Gateways**

  PayRetailers, CoinGate, Bitpay, and GoCoin

Module 1 - Cryptocurrencies and Payment Gateways

U7. Buying, creating and investing in cryptocurrencies

- **Cryptocurrency Creation and Accessibility**

The creation of digital currency has become accessible to anyone with internet access.

- **Steps for Creating a Cryptocurrency**

Successful creation involves a clear vision, a supportive team, and choosing from three options: creating a blockchain, developing a token, or crafting a coin from scratch

- **Distribution of Created Coins**

Distribution involves listing the cryptocurrency on exchange apps dedicated to buying and selling..

- **Burger King's Whoppercoin**

Burger King introduced its own token, Whoppercoin, on the Waves blockchain, intending to reward customers.

- **Mining and Consensus Algorithms**

Cryptocurrency mining validates transactions, adds them to the blockchain, and generates new currencies, providing network security.

- **Buying vs. Investing in Cryptocurrencies:****

The distinction between buying and investing involves ownership intent.

Module 1 - Cryptocurrencies and Payment Gateways

U8. Advantages & threats using cryptocurrencies in business

- **Advantages of Cryptocurrency in Business**
1. Enhanced Security through Blockchain
2. Facilitates Foreign Payments and Lowers Commissions
3. Brand Awareness and Innovation

- **Threats and Disadvantages of Cryptocurrency in Business**
1. Volatility and Currency Value Collapse
2. Scams and Fraud Risks
3. Market Manipulation and Anti-Sale Mechanisms
4. Security Breaches and Hacks
5. Legal and Regulatory Uncertainties

Module 1 - Cryptocurrencies and Payment Gateways

U1. General overview of NFTs

- **Definition of NFTs:**
NFTs, or non-fungible tokens, are unique digital assets representing real-world objects, bought and sold online, often using cryptocurrency. They stand out for their non-fungibility, meaning each is distinct and not interchangeable.

- **Diverse Digital Objects:**
NFTs cover a wide array of digital items, including art, GIF s, video game skins, collectibles, music, and even tweets.

- **Popularity of NFTs:**
NFTs' rise in popularity stems from their evolution from cryptocurrencies, providing a digital representation of physical assets through blockchain technology, offering unique identification and tamper resistance.

- **Benefits of NFTs:**
NFTs streamline markets by eliminating intermediaries, allowing artists direct connections with audiences. They also enhance business processes, such as supply chain tracking for products like wine bottles.

- **Components of NFTs:**
NFTs rely on components like blockchain (commonly Ethereum), smart contracts, blockchain addresses, and cryptocurrency wallets for secure storage and exchange.

- **NFT Market Growth:**
Despite existing since 2014, NFTs gained substantial attention in 2021, with the market reaching $41 billion. Their uniqueness and limited supply create digital scarcity, potentially increasing the value of in-demand assets.

Module 2 –
The world of NFTs

U2. State of the Art

- **NFT Market Status:**

After a surge in 2021, many NFT collections are now in their first bear market, prompting discussions on the sustainability of the NFT trend.

- **2022 Trends:**

Despite the bear market, the NFT industry remains strong, with sales hitting half a billion dollars in June and July, led by iconic collections like Bored Ape Yacht Club.

- **NFT's Impact Debate:**

Enthusiasts believe NFTs are integral to the future of the internet, while critics draw parallels with the Initial Coin Offerings era, highlighting both technological potential and market overheating.

- **Challenges and Opportunities:**

NFTs present environmental challenges, gaming prospects, and the need for curation. Challenges include ownership uncertainties, centralization risks, security issues, scams, copyright problems, and contributions to the global silicon chip shortage.

- **Ownership and Security Concerns:**

Despite NFTs proving ownership, concerns arise regarding true asset possession, vulnerabilities, centralized storage risks, security, and potential blockchain network attacks.

- **Scams and Tech Impact:**

Scams and copyright issues persist, impacting buyers and artists. Additionally, NFTs contribute to a global silicon chip shortage, raising doubts about their value in the human experience.

Module 2 –
The world of NFTs

U3. Benefits & considerations entering the world of NFTs

- **Blockchain's Role:**

Blockchain, initially introducing fungibility through cryptocurrencies, now brings non-fungibility with NFTs. Its immutability and decentralization foster secure and irreversible digital asset transactions.

- **Blockchain Distinctiveness:**

Unlike traditional databases, blockchain's immutability ensures reliability in peer-to-peer digital asset transactions, setting it apart in the digital space.

- **NFTs' Unique Value:**

NFTs, representing unique and singular items, find applications beyond collectibles, including certificates, deeds, and IoT object identification. Each NFT carries distinct value in the digital realm.

Module 2 –
The world of NFTs

U4. NFTs in practice

- **Considerations Before Creating NFTs:**

-Assess your commitment to selling NFTs, considering transaction fees, especially the "gas" fees on the Ethereum blockchain.

-Acknowledge the environmental impact, as popular NFT marketplaces often rely on the energy-intensive Ethereum blockchain.

- **Choosing a Platform:**

Numerous platforms exist for selling NFTs, such as OpenSea, Rarible, AtomicHub, and Solsea, each with its unique features and blockchain compatibility.

- **Creating a Wallet and Connecting to a Platform:**

Set up a cryptocurrency wallet, like MetaMask, which supports Ethereum-based applications. Connect the wallet to the chosen NFT marketplace, ensuring security measures to avoid potential scams.

- **NFT Creation:**

Navigate to the NFT creation page on the platform, considering the option to organize NFTs into collections for a series.

- **Selling Your NFT:**

Choose a sales approach, such as "Fixed price," "Open for bids," or "Timed auction," and list your NFT for sale. Rise above the competitive NFT environment through effective marketing and exceptional art.

- **Buying an NFT:**

-Create a cryptocurrency wallet, fund it with Ether (ETH), and explore NFTs on platforms like Zerion.

-Browse NFTs on marketplaces like SuperRare, Nifty Gateway, or NBA Top Shot.

-Purchase desired NFTs using Ether tokens, engaging in the growing culture of supporting artists and expressing identity through unique digital assets.

Module 2 –
The world of NFTs

U5. NFT Use cases

- **Art:**
NFTs in art for both individual artists and businesses; diverse applications, from architecture firms to charity events.
- **Healthcare:**
NFTs enhance PHI protection; applications include tokenized blood for inventory and EY Canada collaboration.
- **Gaming:**
NFTs integrated; common use cases—trading in-game items and purchasing virtual real estate. Notable success in Axie Infinity.
- **Sports:**
NFTs in sports for memorabilia and collectibles; engaging fans with unique digital content and motivating sports activities.
- **Automotive:**
Manufacturers use NFTs as digital tokens for resale; notable example, McLaren Racing Collective's 3D car parts NFTs.

Module 2 –
The world of NFTs

U1. Blockchain & Smart Contracts

- **Current situation and existing Problems**

Blockchain technology effectively addresses issues related to data verification slowdowns caused by limited transparency. Blockchain incorporates "smart contracts," that automate processes according to predefined conditions, facilitating immediate, intermediary-free conclusions and ensuring secure and reliable transactions.

- **Which of the problems will be addressed?**

Smart contracts on blockchain offer immense benefits due to their immutable and automated nature, ensuring swift and precise executions. They eliminate manual errors and the need for third-party intermediaries, thereby maintaining transaction integrity and reducing time and costs. Overall, smart contracts enhance security and efficiency in digital transactions, making them robust against alterations and breaches.

Module 3 – Smart Contracts

U2. How Smart Contracts Work

- **How Smart Contracts Work**

Smart contracts are automated, self-executing code on a blockchain that activate when predefined conditions are met. Utilizing programming languages like Solidity, these contracts implement terms automatically, such as transferring funds or registering a vehicle, once triggered. They ensure transactions cannot be altered post-execution, enhancing transparency and trust among parties. They reduce the need for intermediaries and legal oversight, thereby lowering execution and enforcement costs.

- **Smart contracts in untrusted and semi trusted environments:**

Smart contracts are executed identically on all nodes, potentially slowing down the network. Cryptlets offer a solution by separating the contract's logic from its data and ledger components, allowing the logic to run in an optimized, secure computing environment, potentially off-chain.

Module 3 –
Smart Contracts

U3. Real life implementations

- **Smart Contacts forms**

Legal Contracts
Decentralized Autonomous Organizations (DAOs)
Application Logic Contracts (ALCs)

Real life implementations:
Digital Identity
Cross Border Payments
Loans and Mortgages
Real Estate
Healthcare
Supply chain
NFT

Module 3 –
Smart Contracts

Unit 1. Supply Chain and Logistics

Description: An introduction to Supply Chains and Logistics

Objective: To provide basic definitions and processes

In this unit we;

- **define what we mean by Supply chain and Logistics**
- **introduce the Supply Chain Operations Reference (SCOR) model.**

Module 4 - Blockchain in Supply Chain & Logistics

Unit 2. Blockchain as an enabling technology

Description: A short introduction to blockchain technology

Objective: To inform for the basic characteristics of the technology

In this unit we;

- **examine the characteristics of blockchain that make it useful in Supply Chain and Logistic use cases.**
- **explore how those characteristics enable functionality that is useful to supply chain and logistics processes.**

-

Module 4 - Blockchain in Supply Chain & Logistics

Unit 3. Opportunities in Supply Chain and Logistics by Blockchain

Description: The benefits and the supporting technologies

Objective: To understand the opportunities blockchain gives

Module 4 - Blockchain in Supply Chain & Logistics

In this unit we;

- **present the benefits of exploiting blockchain**
- **show how it can be combined with other technologies to bring value to existing supply chain and logistics processes**
- **discuss opportunities for potential improvements to existing blockchain technology**

Unit 4. Barriers to the Deployment of Blockchains

Description: Issues slowing down the adoption of blockchain

Objective: To describe general concerns and how to address them

Module 4 - Blockchain in Supply Chain & Logistics

In this unit we;

- **Highlight the current issues slowing down the adoption of blockchain for use in supply chains**
- **Identify opportunities for reducing carbon footprint of blockchain technology**

Unit 5. Real life implementations

Description: Examples of successful implementations

Objective: To motivate learner to engage with blockchains

In this part we provide some real-life cases where blockchain technology has been successfully implemented.

Module 4 - Blockchain in Supply Chain & Logistics

U1. Basic Knowledge and Terms

The 'Ingredients'

- Solidity and REMIX IDE

- Fees

- Testnet

- Crypto Faucet

- Metamask

Module 5 –
Smart Contracts
Cookbook

Hands-on programming tutorial

U2. Building a Smart Contract

<u>The 'Recipe'</u>

- Environment setup REMIX IDE

- Our first Smart Contract

U3. Metmask Configuration

U4. Connect to Remix and Compile

- Connect Remix to the RSK TESTNET

- Compile Smart Contract
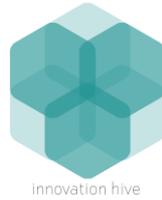
U5. Deploy Smart Contract on the RSK TESTNET

Module 5 –
Smart Contracts
Cookbook

Hands-on programming tutorial

U4. Connect to Remix and Compile

- Connect Remix to the RSK TESTNET

- Compile Smart Contract

Module 5 –
Smart Contracts
Cookbook

Partnership