- Project Name: **Smart Printing System(SPS)**
- Team Name: AITP

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SPS

كلية تكنولوجيا الصناعة والطاقة

جامعة برج العرب التكنولوجية
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Introduction

Traditional printing services face several challenges, including long wait times, reliance on manual operations, and lack of digital payment solutions. Smart Printing System solves these issues by implementing a fully automated, self-service printing system.

Executive Summary

SPS is a smart printing system designed to automate printing processes in educational institutions and businesses. The system allows users to upload their documents via an online platform, make payments electronically, and print automatically by scanning a QR Code at the printer.

Project advantages:

1-Saving time and effort for students.

2-Reducing crowding in front of traditional printers, especially during exams.

3-Supporting digital transformation within the university through electronic payment and smart printing management.

4-Completely self-operating, which reduces the need for employees to manage printing. (If the payment and confirmation processes are completed or provided in full by paying with Vodafone Cash wallet or any wallet)

Problem Analysis and Proposed Solution

1-Current Issues:

- Need for a staff member to manually manage printing.
- Long waiting times during peak periods.
- Lack of an electronic payment system, forcing students to use cash.
- Absence of a system for monitoring and managing printing and costs.

2-Smart Solution:

- 24-hour self-service printing station.
- A prepaid electronic payment system, allowing students to top up their printing balance via the website.
- Fully automated printing without human intervention.
- A touch screen to display QR code on it.
- Remote monitoring and maintenance (software)of the printer.

System Operation Mechanism

1-Uploading Files via the Website:

- The student logs into the smart printer's website.
- Uploads the file and selects the number of copies, paper type, and size.

2-Electronic Payment:

- The student can top up the printing balance electronically.
- Printing costs are automatically calculated and deducted from the balance.

3-Sending the Print Request:

- The student receives a unique printing code.
- The request is sent to Raspberry Pi, which converts the file into a printable format.

4-Printing Execution:

- Upon arrival, the student enters the code or scans the QR Code.
- The printer starts printing automatically, and the printing status is updated.

5-Student Notifications:

- A notification is sent to the student upon print completion.
- Alerts are sent if an issue occurs (e.g., paper or ink runs out).

Hardware and Equipment

1-Printer with Wi-Fi or Ethernet support.

2-Raspberry Pi 4 for managing the connection between the printer and the website.

3-Small touchscreen for the printer interface.

5-USB storage unit for temporary file storage.

6-Internt to ensure a stable connection.

Software Components and Technologies Used

Front-End (User Interface):

- HTML, CSS, JavaScript.
- Bootstrap or (Tailwind CSS) for improved design.

Website-to-Printer Communication:

- RESTful API for sending print commands.
- Web Socket for real-time printing status updates.

Back-End (Server & Database):

- Python (Django or Flask) for website and server management.
- CUPS (Common UNIX Printing System) for managing printing via Raspberry Pi.
- MySQL to store user and request data.

Electronic Payment System:

- Internal wallet that can be topped up manually or via electronic payment.
- Stripe API or PayPal API for secure online transactions.

Project Implementation Steps

1-Phase One: Analysis & Planning.

- Define requirements and possible scenarios.
- Design the website interface and printing system.

2-Phase Two: Setting Up the Environment & Connecting the Printer:

- Install Raspberry Pi OS.
- Connect the printer to Raspberry Pi via USB or Wi-Fi.
- Install and configure CUPS to control printing.

3-Phase Three: Website Development:

- Create a database to store user data.
- Develop login and balance top-up systems.
- Build file upload and print settings pages.

4-Phase Four: Payment System & Balance Management:

- Implement a system for electronic and manual balance top-ups.
- Develop an automatic balance deduction system upon printing.

➡ Create a special currency for the site to use in paying for printing operations within the site, such as game currencies. The student transfers money with a maximum of (10 pounds) to the wallet number found in the payment methods on the site, then this money is added as currency on the site to the student's account so that he can use it to pay for his printing operations.

5-Phase Five: Testing & Modifications:

- Test printing with different file sizes.
- Optimize performance and fix software bugs.

6-Phase Six: Deployment & Real-World Testing:

- Install the printer in its final location.
- Conduct trial runs with a limited number of students.
- Monitor performance and apply necessary improvements.

Feasibility study

Main components of the project:

components	Description	price
Raspberry Pi 5 (8GB RAM)	**Central control unit for system management.**	**6000**
Printer Xerox C 405	**Laser printer connected to Wi-Fi network to print paper**	**13750**
Power supply to Rpi	**The source that supplies power to the Raspberry Pi**	**1500**
Rpi cooler	**To cool the Raspberry Pi**	**500**
Cables and connectors (USB, HDMI,Adapter, Ethernet cable)	**Cables for connecting devices.**	**600**
SD Card (32GB)	**To store operating system and data.**	**160**
Protection box	**To protect the printer**	**7000**