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## Project: AIPOC – AI Agent-Based Process Automation Proof-of-Concept for Product Development

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### S - Situation

Client: A client in the AI Consulting sector

Employer: EPAM

Industry: Food and Beverages

The client faced significant challenges in their **Product Development Process (PDP)** – specifically, the process for launching new confectionery products for the European market, as well as modernising, modifying, or retiring existing ones. This process was **extremely lengthy and unpredictable** due to its complex, iterative nature and numerous interactions across various enterprise functions. This led to delays in market entry for new products and difficulties in managing the product lifecycle.

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### T - Task

In my role as **Enterprise Architect**, my task was to demonstrate to the client the **value of automating** their critical Product Development Process using **AI agents**. The goal was to showcase the **potential for significant process time reduction**, increased predictability, and enhanced transparency through analytics. The ultimate deliverable was a working **Proof-of-Concept (POC)** that would validate the viability and effectiveness of this approach.

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### A - Action

To accomplish this task, which spanned **six months**, I undertook the following actions:

- **Detailed Target Process Modelling:** I **meticulously modelled** and gained client agreement on the target state of the Product Development Process. This involved mapping out the complex workflows, iterations, and cross-functional interactions.
- **Identification of AI Agent Automation Segments:** Based on the modelled process, I identified specific fragments and activities that could be effectively automated using intelligent agents.

- **AI Agent Technical Specification Development:** I prepared a detailed technical specification outlining the operational logic of each AI agent, their functions, interactions, and behavioural requirements.
- **Selection and Application of Advanced Technologies:** For the POC development, I utilised leading multi-agent frameworks: **Crew AI** and **MS Autogen**.
- **Development of a RAG (Retrieval-Augmented Generation) System:** In the second phase of the project, I developed a functional RAG system for storing and retrieving organisational knowledge about the process.
  - **RAG Functionality:**
    - **Embeddings:** Converts user queries into vector representations using OpenAI embeddings.
    - **Similarity Search:** Searches a PostgreSQL database for documents with similar embeddings using cosine similarity.
    - **Context Construction:** Gathers top-matching documents and builds a context for the Large Language Model (LLM).
    - **Prompting:** Sends the context and user question to an LLM (via LangChain/OpenAI) to generate a relevant answer.
    - **Response:** Returns the answer and metadata to the client.
  - **Key Technologies Used for RAG:** FastAPI (API framework), LangChain & OpenAI (LLM and embedding), psycopg2 (PostgreSQL access), numpy (Vector math), python-dotenv (Environment variables), uv (Dependency management).
- **POC Demonstration:** Ultimately, I organised and conducted a demonstration of the working Proof-of-Concept, showcasing the automated process segments and the capabilities of the RAG system.

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## R - Result

As a result of our work, the client received:

- **A Working Proof-of-Concept (POC) with Agent-Based Architecture:** The practical applicability and value of automating the Product Development Process using AI agents were successfully demonstrated.

- **Confirmed Potential for Process Acceleration:** The POC showed the potential to **reduce product development time by up to 5 times**, which is critically important for the client's market competitiveness.
  - **Foundation for Process Analytics:** The project demonstrated the feasibility of creating an analytical system that can track each product at every development stage, enhancing process transparency and manageability.
  - **Client Engagement and Buy-in:** The client was highly impressed by the demonstrated capabilities, leading to **ongoing negotiations for full-scale implementation** of the developed approach.
  - **Technical Foundation for Scalability:** The designed architectural solutions and the RAG system established a robust technical foundation for further development and scaling of the system within the organisation.
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