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| Physical Therapy Advisor |
| Documentation |

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# Background

The field of physical therapy is facing an increasing demand for services, leading to heavier workloads and a growing administrative burden on therapists. This leaves less time for physical therapists to focus on direct patient care, which is essential for delivering effective treatment. Tasks such as managing patient records, tracking progress, and formulating treatment plans can be time-consuming and reduce the time available for individualized patient attention. The rise of AI and technological advancements presents an opportunity to alleviate some of these challenges by introducing AI-powered tools. These tools can automate administrative tasks, suggest treatment options based on patient data, answer frequently asked questions about therapy techniques, and help track patient progress, all of which would allow therapists to focus more on patient care.

This project is dedicated to my friend, a physical therapist, and to others in the field. It is my hope that AI can improve the efficiency and productivity of physical therapists, ultimately enhancing the quality of care they provide. By integrating AI into the physical therapy workflow, therapists can improve their ability to offer personalized treatments while also achieving a healthier work-life balance. As the demands on healthcare professionals continue to grow, AI has the potential to create a more sustainable and effective way for physical therapists to manage their work while prioritizing patient outcomes.

# Purpose

**Physical Therapy Advisor** is designed to support physical therapists with the following key tasks:

•    Quick Lookup for Existing Patient Records and Treatment plans:

Easily access up-to-date patient information to ensure timely and accurate treatment.

•    Personalized Treatment Suggestions:

Leverage AI-driven recommendations to create customized treatment plans based on individual patient data and the latest clinical research. This enables therapists to quickly review and adjust plans to meet specific patient needs.

•    Clinical Insights and Concepts Based on Medical Research:

Provide data-driven insights and evidence-based recommendations that assist physical therapists in making informed decisions about treatment approaches, techniques, and best practices. This allows for quick access to relevant information that supports high-quality care.

•    Enhancing Productivity and Quality of Care:

Streamline administrative tasks, giving therapists more time to engage with patients while improving the accuracy of treatments. This leads to better patient outcomes and overall care quality.

# Solution

The solution is composed of multiple components within the Power Platform and Azure services. The “Physical Therapy Advisor” is developed using the following technologies:

1. Power Platform components

* Dataverse, Power Apps (Canvas App, Model Driven App), and Power Automate
* Copilot Studio Agent
* AI Builder (Document Processing), AI Prompt

1. Azure Services (Azure Blob Storage, Azure Search)

This solution optimizes both development and delivery by leveraging low code/no code resources while extending Azure Services, resulting in enhanced productivity and high accuracy, and reduced maintenance effort.

## Architecture

Below is the architecture of the Power Platform Components and Azure Services.

A diagram of a software development

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## Data Model

The data model contains the custom table for this solution. Default tables did not meet the needs of the architecture. The data model diagram calls out the table and fields that are used within the solution.

A screenshot of a diagram

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### Table Description

|  |  |
| --- | --- |
| **Table Name** | **Description** |
| Patient Info | Store patient’s information (Name, Date of Birth) |
| Pain Category | Store pain categories, detailed description, examples, and symptoms for each category |
| Patient Initial Diagnose | Store patient’s diagnosis and comments about their situation |
| Treatment Plan | Store patient’s treatment plan and goals (data is uploaded using Document Processing for each PDF treatment in Canvas App) |

## Technology

The solution leverages several features of Power Platform and Azure.

### Power Platform

### Copilot Studio Agent

Copilot Studio serves as a platform for the Physical Therapy Advisor, utilizing generative AI triggers to explore a wide range of topics. It integrates diverse sources of knowledge, including public medical websites, Dataverse, and Azure Search, to provide evidence-based recommendations for physical therapy. The system is designed to capture input from physical therapists effectively through adaptive cards and AI-generated prompts, which create a structured and intuitive input process. Azure Search then uses these inputs to deliver relevant, accurate results, ensuring that user queries are answered in the most natural and efficient manner possible.

### AI Builder

### AI Prompt

AI Prompt is leveraged to process inputs and generate structured outputs with predictable patterns, allowing for better control over the agent’s behavior. This results in an improved user experience, particularly when interacting with the chatbot, by delivering more accurate and consistent responses.

### Document Processing

The Document Processing Custom Model is trained to extract information from both existing and future patient treatment plans, enabling the automatic updating or creation of patient records in Dataverse. This Document Processing capability is seamlessly embedded within the Canvas App, allowing physical therapists to easily access and upload PDF treatment plans for data extraction and processing.

### Dataverse

Dataverse serves as the data source for AI Prompt, enhancing the accuracy of the agent’s responses. It acts as the knowledge base for the prompt’s instructions, allowing it to transform user inputs into relevant outputs for chatbot topics, actions, and flows. This integration ensures that the agent delivers contextually accurate and appropriate responses based on the information stored in Dataverse.

### Power Apps

### Model Driven App

The Model-Driven App acts as a user-friendly front-end interface designed specifically for administrators. It allows them to easily query, view, and update data stored in Microsoft Dataverse. Through this app, admins can seamlessly interact with various data entities, manage records, and perform CRUD (Create, Read, Update, Delete) operations, all within a visually structured and responsive environment tailored to their needs.

### Canvas App

The canvas App currently serves as the front-end application, embedding the Document Processing AI Model to extract patient treatment plan PDFs and upload the extracted data into Dataverse for storing treatment plan information. In the future, the Canvas App will evolve into a more comprehensive interface, designed to collect additional data from users on various topics and requests. This expansion will help the chatbot filter data more effectively, reducing token limits and improving response generation efficiency.

### Azure Services

### Azure Blob Storage

Azure Blob Storage is utilized to store various types of data related to physical therapy medical research, including pain descriptions, symptoms, exercises, and treatment methods. This data is securely stored in Azure Blob Storage, which offers scalable and cost-effective storage solutions. Additionally, Azure Blob Storage integrates with Azure Cognitive Search to enable advanced semantic search capabilities. Through Azure Cognitive Search, documents stored in Blob Storage are vectorized, allowing for more accurate and meaningful search results based on the content and context of the research data.

### Azure Search

Azure Search vectorizes documents stored in Blob Storage and divides them into manageable chunks, enabling users to perform semantic searches on medical data. This powerful capability enhances the chatbot’s functionality by integrating Azure Search into its actions and knowledge base. By leveraging Azure Search, the chatbot can offer more accurate, up-to-date, and contextually relevant responses. This includes providing users with pertinent suggestions, evidence, and examples based on their specific queries, improving the overall quality and precision of the chatbot’s outputs.

# Power Platform Usage

## Personas, Users Requirements and Licenses

### Physical Therapists Users

Physical Therapists who work with patients at a clinical.

Their role is intended for:

* Viewing/modifying custom Dataverse table data (listed in section 3.2.)

User requirements as follow:

* Power Apps Premium license
* Assigned to an Entra Security group that has access to the Power Platform environment
* Required minimum access security roles (App Opener and Physical Therapy User)
* Share canvas app with users through their security group

### Physical Therapists Admin

Admins works with Physical Therapists to train chatbot and manage backend data

* Viewing/modifying/maintaining custom Dataverse tables
* Train Physical Therapy Advisor Chatbot, Prompt, Document Processing model

User requirements as follows:

* Power App Premium license
* Copilot Studio per user (and Copilot Studio – tenant license) to manage/ create copilot agents
* Assigned to an Entra Security group (admin group) that has access to the Power Platform environment
* Required minimum access security roles (App Opener and Physical Therapy Admin)

## Tenant/Org Requirements and Licenses

* M365 licensing plan for users for organization
* Pay-as-you-go subscription for tenants

## Power Platform Security

### Azure Active Directory Security Group

Security groups should be implemented to manage user access to applications and resources in a way that minimizes maintenance efforts. These groups should be configured to provide the necessary permissions based on user roles, ensuring that only authorized users can access specific resources while reducing the need for frequent manual updates or modifications.

|  |  |
| --- | --- |
| **Name** | **Description** |
| physical-therapist-users | This Active Directory (AD) group is designed for admin users and physical therapists who use copilots and Power Apps within the Physical Therapy Advisor solution. It grants access to the application and agent necessary for their clinical work. |
| physical-therapist-uats | This AD group is intended for test users, including physical therapist testers and stakeholders, who will evaluate and validate copilots and Power Apps within the Physical Therapy Advisor solution during the user acceptance testing (UAT) phase. |
| physical-therapist-devs | This AD group is designated for developers who are responsible for maintaining and managing copilots, Power Apps, and associated workflows within the Physical Therapy Advisor solution. They have the necessary privileges to perform development and administrative tasks. |

### Power Platform Environment

Since Protected Health Information (PHI) is highly regulated, it is essential to establish separate environments for appropriate users to access health-related data solutions. This approach ensures compliance with privacy regulations and significantly reduces the risk of unauthorized access to sensitive data. The recommended environments for these users include:

|  |  |  |
| --- | --- | --- |
| **Environment Name** | **Security Group** | **Description** |
| Physical Therapy Dev | physical-therapist-devs | This environment is specifically designed for developers to create, configure, and manage Power Platform solutions. It is a restricted space where no user access is authorized, ensuring that only developers can build, test, and deploy solutions without interference from non-developer users. |
| Physical Therapy UAT | physical-therapist-uats | This environment is used by stakeholders and testers to validate that applications and data suggestions function as expected. It serves as a staging ground where they can thoroughly test features, workflows, and ensure that the system meets the necessary requirements before going live. |
| Physical Therapy PROD | physical-therapist-users | This environment is dedicated to real users, such as physical therapists, and supports their day-to-day work with patients. It provides the tools and data necessary for these professionals to manage patient information, track progress, and deliver effective therapy services in a secure and efficient manner. |

### Security Roles

A security role is used to manage and control a user's access to data within customized tables (as listed in section 3.2.1). By assigning specific security roles, administrators can define permissions and ensure that users only have access to the data and resources they are authorized to view or modify. This helps maintain data integrity and privacy by enforcing role-based access control across the application.

### Physical Therapy User

This security role is created for physical therapists, granting them access to specific customized Dataverse tables. It enables basic data customization and the ability to create new records, empowering physical therapists to efficiently interact with and personalize the system to support their workflow and patient care needs.

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### Physical Therapy Admin

This security role is specifically designed for physical therapist user admins, granting them access to customized Dataverse tables. It provides full control over data customization, enabling admins to overwrite existing data and make precise adjustments as necessary. This ensures that physical therapist admins can efficiently manage and interact with the data, while also maintaining the integrity, security, and flexibility of the system.

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### Security Role Assignment

|  |  |  |
| --- | --- | --- |
| **Environment Name** | **Target User** | **Security Roles** |
| Physical Therapy Dev | App Developers | System Customizer |
| Physical Therapy UAT | Stakeholders/ App Testers | App Opener, Physical Therapy User/ Physical Therapy Admin |
| Physical Therapy PROD | Physical Therapists | App Opener, Physical Therapy User |
|  | Physical Therapists admin (managers, directors) | App Opener, Physical Therapy Admin |

## Application Access

Users will access the applications through the following channels:

* Teams channel for chatbot interactions and questions
* PT Treatment App (Canvas App) to upload treatment plan documents
* Physical Assistance Admin (Model Driven App) to query and access all Dataverse Data

## Power Platform Application

### PT Treatment App

### Application Overview

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### Document Upload Process

A diagram of a patient treatment

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### Physical Therapy Admin

### Application Overview

*A screenshot of a computer

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### Treatment Plan Processing

### Model Overview

The AI model is trained to extract 28 fields as follows:

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### AI Prompts

The following prompts are utilized by the Copilot Studio agent to gather information and structure the output for various topics and actions:

|  |  |  |
| --- | --- | --- |
| **Prompt Name** | **Description** | **Topic Usage in Copilot** |
| Categorize Patient’s Pain | The agent extracts key pain information from the user's comments, evaluates it against predefined pain categories, and categorizes the pain, then returns a JSON summary with the diagnosis, pain category, affected body part, and original comments. | Treatment Plan Creation and Generation;  Physical Therapy Methods and Modalities Guidelines;  Pain Exercise Guidelines;  Pain Definitions, Description, Symptoms, Cause and Preventive Care Information |
| Summarize Physical Therapy Search Results | The agent gets result from Azure Search and generates a detailed 3000-word summary, including 1000 words each on exercises, treatments, and pain description for the patient's condition, strictly following the provided resources with key terms, explanations, benefits, and URLs extracted for reference. | Treatment Plan Creation and Generation |
| Treatment plan generation | The agent generates a detailed treatment plan in JSON format by analyzing the patient's comments, diagnosis, goals, and potential, using resources like Physical Therapy Exercises, Treatment, and Pain Information to suggest appropriate approaches, frequency, duration, intensity, goals, and certified period. | Treatment Plan Creation and Generation |
| Content Not Supported | The agent evaluates the user's request and responds in a friendly, professional tone, either providing information about chatbot functionalities or politely informing the user that the requested topic is unsupported, while maintaining the core meaning of the provided examples. | Unrelated Physical Therapy or Chatbot Offered Functionalities |
| Extract Full Name and Patient’s Date of Birth | The agent processes the user's message by extracting the patient's full name and date of birth, returning a JSON response with the format {fullName: string, dob:date} | Patient Historical Data and Treatment Plan |
| Patient Historical Data | The agent verifies patient details, responds with a treatment plan summary if the information matches, and provides a polite, professional tone while assisting with missing or duplicate patient data. | Patient Historical Data and Treatment Plan |

### Copilot Studio

### Customized Topics

|  |  |  |
| --- | --- | --- |
| **Topic Name** | **Description** | **Actions/Connectors used** |
| Unrelated Physical Therapy or Chatbot Offered Functionalities | This topic triggers when users ask about non-physical therapy subjects, prompting the agent to provide relevant responses. | AI Prompt (Content Not Supported) |
| Pain Definitions, Description, Symptoms, Cause and Preventive Care Information | The agent triggers this topic only when users ask about body pain descriptions, symptoms, causes, or preventative care, and not when discussing treatment plan creation or during other ongoing topics. | Plugin action (Azure Search – Vectorized search vector - Physical Therapy Pain, Description, Symptoms, Cause and Care);  AI Prompt (Categorize Patient’s Pain) |
| Pain Exercise Guidelines | The agent triggers this action when users request tailored exercises for conditions like Achilles tendinosis, back pain, ankle sprains, and more, focusing on mobility, pain relief, and recovery. | Plugin action (Azure Search – Vectorized search vector - Physical Therapy Exercise Guidelines Search);  AI Prompt (Categorize Patient’s Pain) |
| Physical Therapy Methods and Modalities Guidelines | The agent triggers this action when users ask for details about physical treatments and methods, explaining their benefits and suitability for different conditions. | Plugin action (Azure Search – Vectorized search vector - Physical Therapy Treatment Method and Modalities Search);  AI Prompt (Categorize Patient’s Pain) |
| Patient Historical Data and Treatment Plan | This topic triggers when users request information about an existing patient’s records, including personal details, diagnosis, treatment plan, progress, goals, therapies, or recovery timeline, ensuring accurate and relevant responses for individualized care. | AI Prompt (Extract Patient’s Full Name and Date of Birth, Patient Historical Data) |
| Treatment Plan Creation and Generation | This topic triggers when users want to create a treatment plan for a future patient based on their condition. | Connector (Azure Search – Vectorized search vector)  AI Prompt(Categorize Patient’s Pain, Summarize Physical Therapy Search Results, Treatment plan generation) |

# Azure Service Usage

## Azure Blob Storage

Azure Blob Storage is utilized to store various categories of data across different blob storage containers, including:

* treatment-cause
* treatment-exercises
* treatment-plans

These containers organize and store specific datasets related to physical therapy. Azure Blob Storage will also serve as a data source for Azure Search, which will vectorize the content for semantic search capabilities. This enables more intelligent and context-aware searches across the stored data, improving accessibility and relevance for users querying the system.

## Azure Search

Azure Search is utilized to vectorize the contents of various Blob Storage containers into indexed categories based on matching names. This process enables semantic search, allowing users to quickly query and retrieve relevant data based on their search inputs.

Azure Search serves as a key knowledge source, combining data from Copilot Studio, public web resources, and Dataverse to deliver the most accurate and relevant information to users. By vectorizing documents, Azure Search ensures that the amount of data retrieved is more efficient and stays highly relevant to the user's query, optimizing both speed and accuracy. This advanced indexing method enhances the overall search experience, ensuring that results are contextually aligned with the user's needs.

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# Project Scalability

As the project grows and expands, we can consider the following scalability options:

## Azure Document Intelligence Training

Efficiently train the Azure Document Intelligence Service to support and parse various types of treatment plan forms and written styles, handling large volumes of data. This will improve the accuracy and efficiency of document processing, ensuring better handling of diverse data inputs.

## App Insight for Data Logging

Leverage Azure Application Insights to track and analyze chatbot performance and user interactions. By integrating Power BI, we can generate comprehensive reports that provide insights into accurate answer rates, allowing us to continuously improve user experience and system performance.

## Implement Semantic Chunking

Use Azure Document Intelligence Layout model to process large amounts of text data. The model can break down documents into smaller, meaningful chunks based on their content, ensuring accurate parsing without losing important information. This allows the system to handle an increasing volume of documents while maintaining high performance. By combining this with Retrieval-Augmented Generation (RAG), the system can continue to provide relevant and accurate search results as the number of user queries grows. The integration with Azure Search allows the solution to scale smoothly, processing more data and delivering faster, precise results without losing efficiency. This scalable approach ensures that the solution remains responsive as both data and user interactions expand.

## Leverage Power Automate to run parallel actions for Copilot

Leverage Power Automate to execute parallel actions, such as Azure Search and Dataverse queries, simultaneously. This will enable the system to return structured outputs more quickly, significantly reducing response times. By processing multiple tasks concurrently, the solution will enhance overall efficiency, ensuring faster and more responsive user interactions.

## Fine tune and create AI Prompt

Enhance AI prompts to more strictly filter data based on user inputs, optimizing the Dataverse query process. This will allow the Copilot to generate more accurate, tailored responses, reducing chatbot timeouts and minimizing token limitations. By refining the AI prompts, the system can quickly focus on the most relevant data, ensuring users receive the most pertinent information with improved efficiency and faster response times with high accuracy.

## Use Azure Functions PDF uploads through Copilot

Enable PDF uploads through Copilot using Azure Functions, allowing users to extract treatment plan information directly through the chatbot. Users will also query and interact with the contents of the uploaded PDF documents, enhancing the system’s flexibility and user experience.

## Create Deployment Pipeline

Set up deployment pipeline for solution deployment across Dev, UAT, and PROD environment for easy maintenance.

# Documentation Reference

### Document Version

|  |  |  |
| --- | --- | --- |
| Author | Document Version | Updated Date |
| Vy Duong | v1.1 | 2/28/2025 |