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CIS 5610

January 2024

Microsoft Power Apps: Low-Code Web Application Development Platform

In the realm of software development, organizations have always been looking for transformative solutions in their traditional code-centric application development methods. In response to this thrive for a new approach, the adoption of a low code web application development platforms has gained the popularity to meet the evolving needs of modern businesses. Low-code platforms provide major change in application development by enabling users to create robust and feature-rich web applications with minimal manual coding. This approach is particularly beneficial for businesses where agility, speed and adaptability are crucial for success. The demand for rapid application development with less development cost plays major role in popularity of low code solutions.

Traditional web application development techniques generally need large amount of resources, highly skilled developers and extended development cycles while low code platforms reduce this cost significantly by streamlining development process which helps organizations to achieve more with fewer resources. Now there are dozens of vendors selling their products under the name of ‘low code’. Most products are further developed and repositioned over the years. For examples, they have been offered as solutions for ‘rapid application development (RAD)’, ‘platform as a service (PaaS)’, ‘model driven application platform’ and ‘business process management (BPM)’. (Bock, Alexander & Frank, Ulrich, 2021)

Let us dive into the history of low code development. In 2014, the market analysis firm Forrester first used the term low-code where low-code development platforms (LCDPs) were defined as “platforms that enable rapid delivery of business applications with minimum of hand coding and minimal upfront investment in setup, training and deployment”. Microsoft was among the first to release its Power apps LCDP in November 2016. Appian started its public offering in May 2017 and the OutSystems did the same in July 2018. Siemens announced the acquisition of Mendix in August 2018. In January 2020, Google acquired the LCDP provider Appsheet and made its flagship low-code solution. In June 2020, Amazon also released Honeycode, a LCDP for web and mobile application development. In 2021, most large cloud providers offered LCDPs within their cloud-based solutions. (Davide Di Ruscio, 2022)

Microsoft Power Apps was recognized as Leader in 2023 Gartner's Magic Quadrant report for Enterprise low code application development platforms.

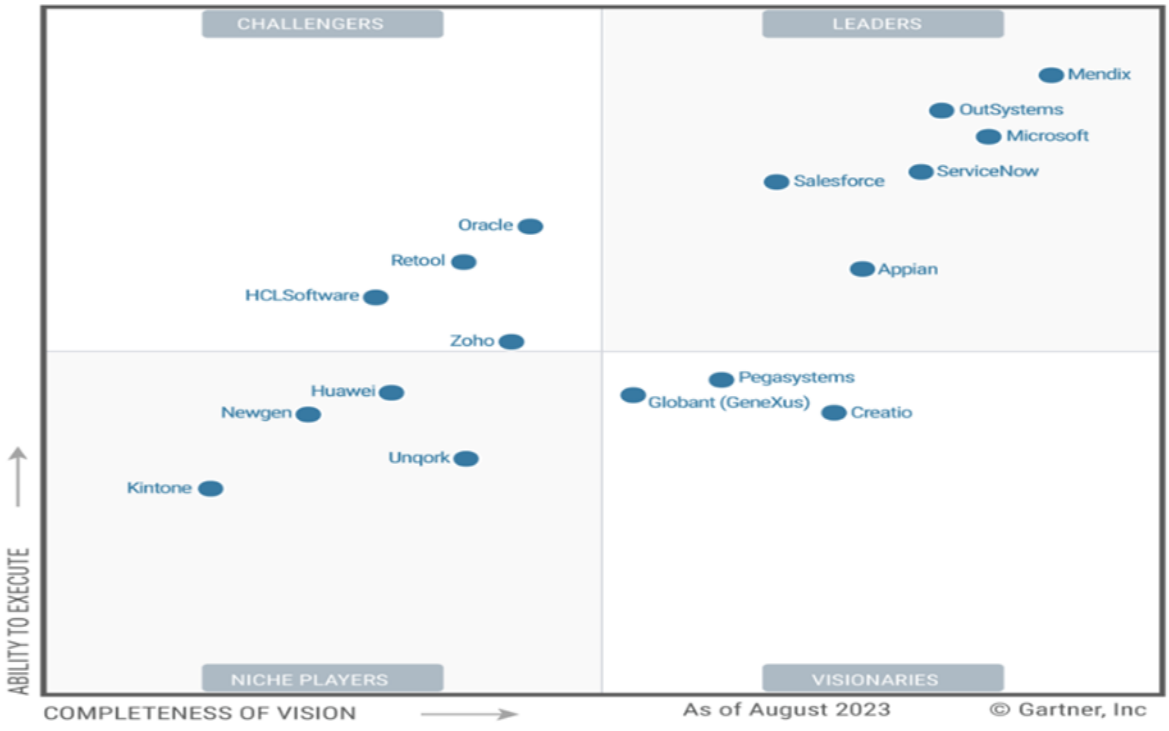

Fig. 1. Gartner Magic Quadrant for Enterprise Low-Code Application Platforms. 2023

Their continued leadership in the industry is emphasized by two unique areas of innovation. Firstly, they utilize smart tools like copilot and generative AI to expedite development, creating enhanced user experiences. Secondly, they make significant progress in ensuring large-scale security and governance, giving organizations control while empowering many developers.

Microsoft Power Platform Ecosystem:

Integration of Power platforms with other Azure services, creating a powerful and flexible environment for developing, deploying, and managing applications.

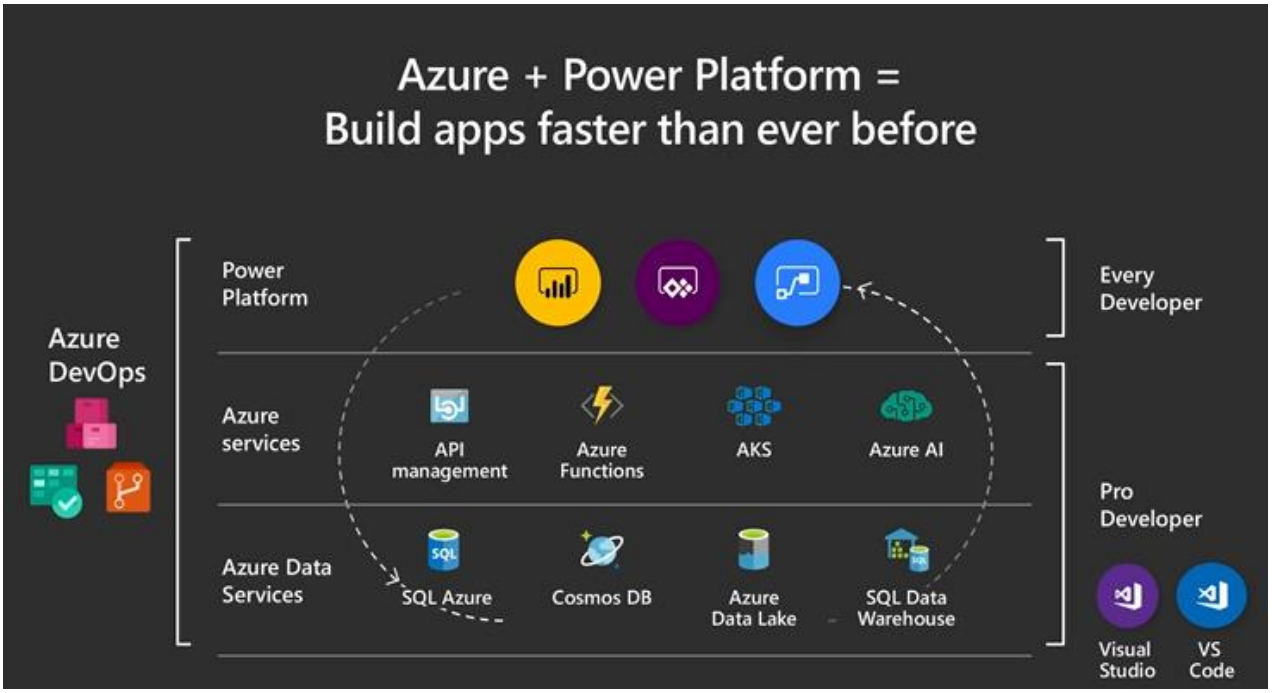

Fig. 2. Microsoft Power Platform Ecosystem. 2022

Power Platforms:

Comprises of Power Apps, Power BI, and Power Automate which facilitates the creation of applications, automation of workflows, and data visualization, without extensive coding. These platforms can be used by both Citizen developers as well as pro developers.

Azure Services:

Comprises API management, Azure functions, AKS, and Azure AI, and these platforms can only be used by Pro Developers.

- API Management: Integrates Power Apps with external services and APIs, ensuring smooth data exchange and functionality extension.
- Azure Functions: Custom functions developed using Azure Functions can be seamlessly integrated into Power Apps, extending its capabilities.
- AKS: Allows containerized Power Apps to run efficiently, providing a scalable and manageable environment.
- Azure AI: Infuses Power Apps with intelligent features, such as predictive analytics, sentiment analysis, or image recognition, enhancing overall application capabilities.

Azure Data Services:

- SQL Azure: Ideal for Power Apps requiring structured and relational data storage, such as user profiles, transaction records, or configuration settings.
- Cosmos DB: Suitable for Power Apps dealing with diverse data types, unstructured data, or scenarios requiring global data distribution.
- Azure Data Lake: Useful for Power Apps that need to store and analyze large volumes of data, especially in scenarios involving big data and analytics.
- SQL Data Warehouse: Appropriate for Power Apps that involve complex data queries, reporting, and business intelligence, where a scalable data warehouse is essential.

Azure DevOps:

Integrates with Power Platform Build Tools to automate the packaging and deployment of Power Apps solutions.

Overview of creating apps in Power Apps:

Power Apps is a platform designed for creating business apps with high productivity, and it has four key components:

- Canvas Apps: Design your app by easily dragging and dropping elements onto a canvas. These kinds of applications are built in Power App Studio.
- Model-Driven Apps: Ideal for data-dense and process-driven applications, offering a structured approach to app development. These kinds of applications are built in App Designer.
- Cards: Micro-apps containing enterprise data and workflows, providing interactive and lightweight UI elements for other applications to use.
- Microsoft Dataverse: The data backbone enables scalable and secure storage of data through a set of tables, allowing dynamic management of information.

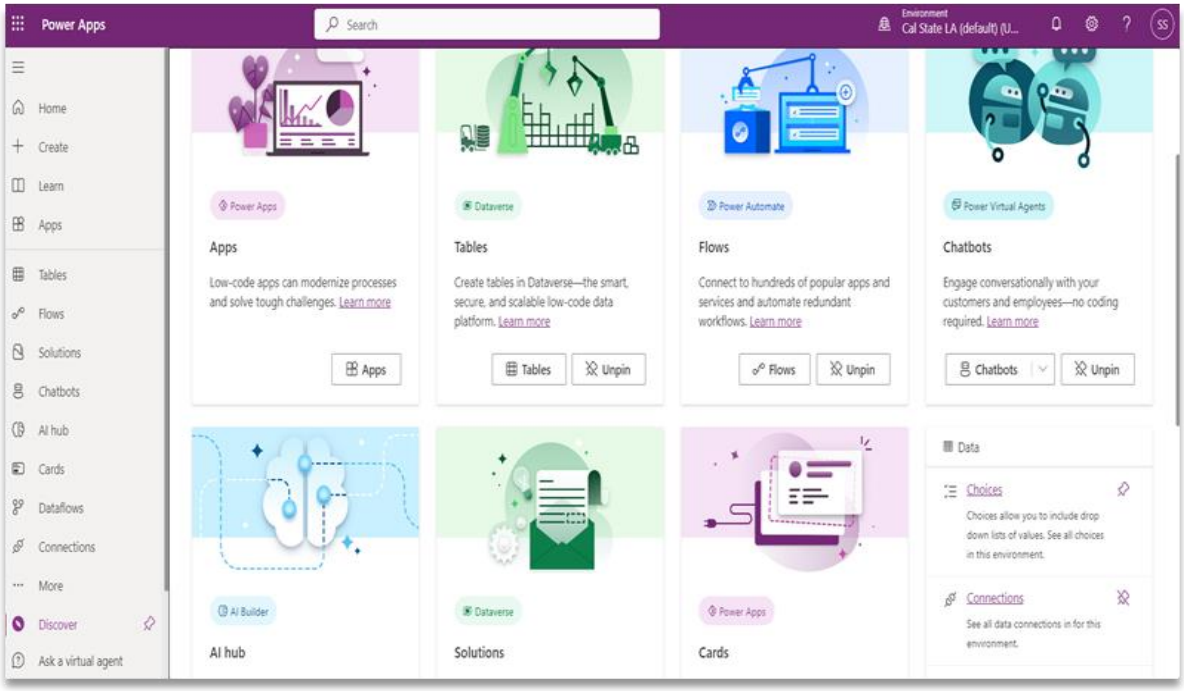

Fig. 3. Microsoft Power Apps User Homepage

Beyond the core components, Power Apps extends its functionality with Connectors for smooth integration and solutions for comprehensive application lifecycle management, allowing the transfer of apps and components between environments. It also incorporates features like Chatbots and the AI Hub, adding advanced capabilities to the platform.

Microsoft Power Apps Features:

Power Apps has a variety of features that make it a versatile and powerful tool for app development. Some key features include,

AI-Powered Development:

Easily code, design apps, and make changes with the help of smart AI suggestions and copilot. This feature helps in the generation of working apps and data by providing image files and Figma files to AI pilot.

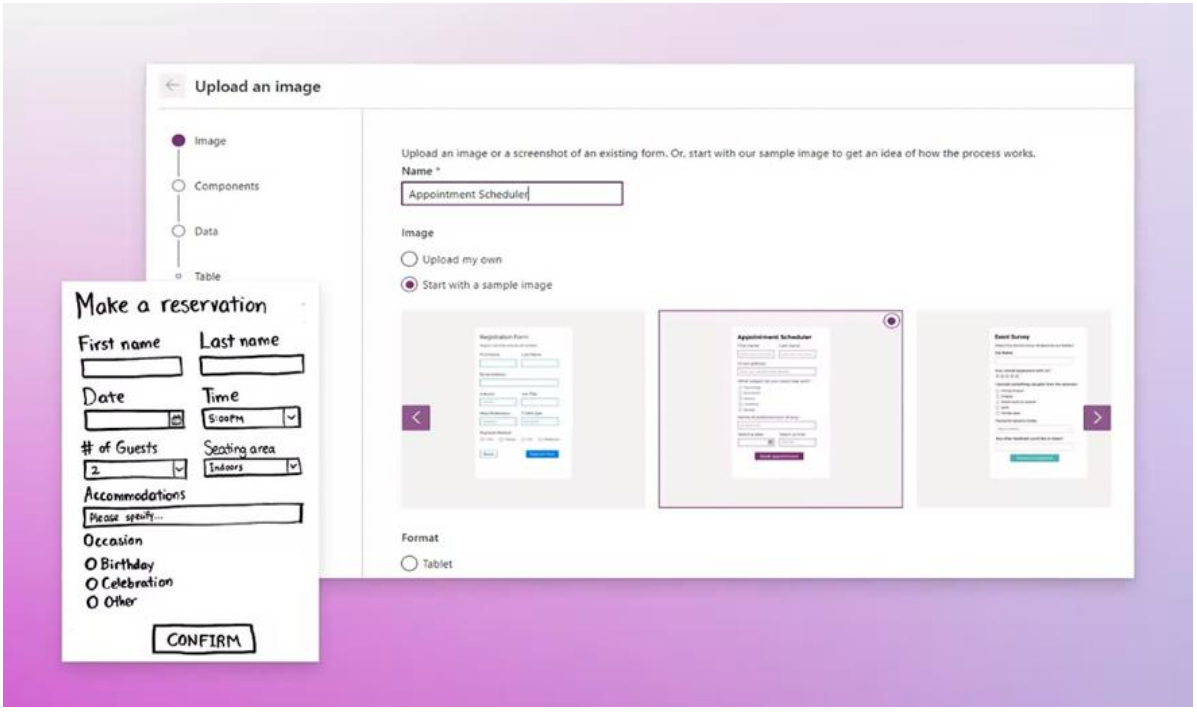

Fig. 4. Microsoft Power Apps AI Powered Development

Premium Governance:

Ensure secure development practices with premium governance features. This feature enables users to utilize the built-in deployment pipelines within the Power Platform. The available governance tools help in creating a risk-free IT environment for anyone to create apps.

Custom Code Development:

Utilize trusted tools like Microsoft Azure, Visual Studio, and GitHub for creating custom code. Build apps efficiently using the user-friendly language, Microsoft Power-fx, providing flexibility in development.

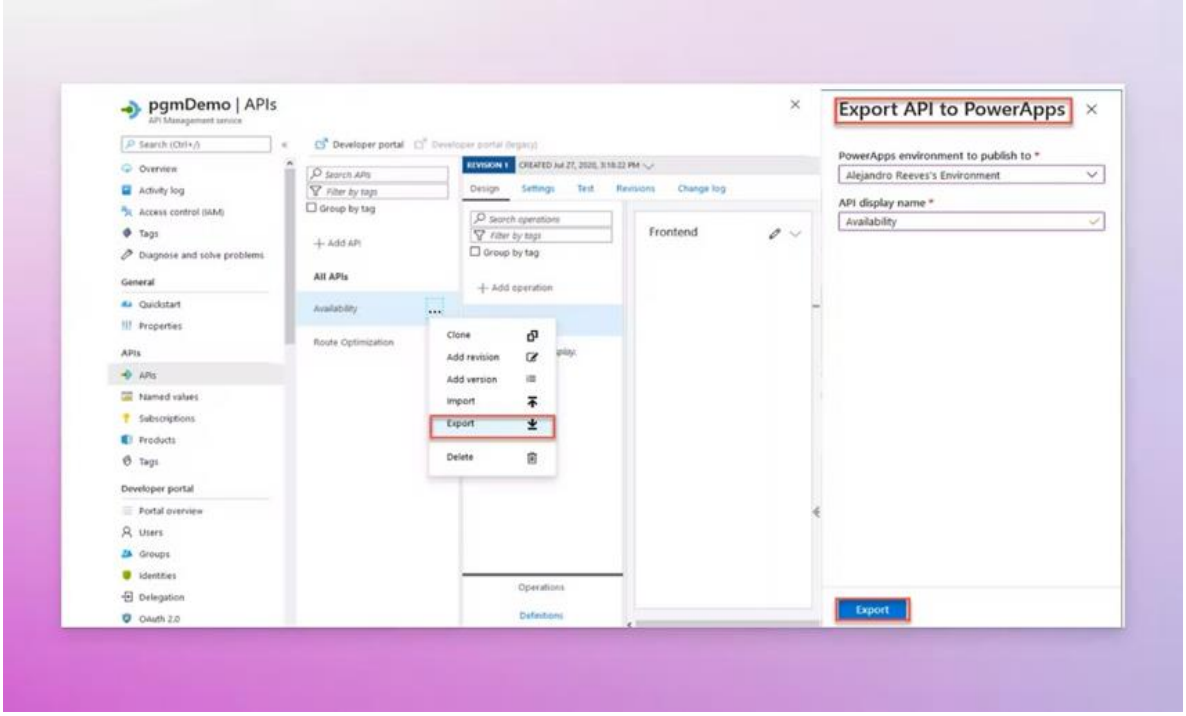

Fig. 5. Microsoft Power Apps Custom Code Development

Connected Secured Data:

Helps in seamlessly connecting to various data sources through a vast selection of 1000+ connectors. Leverage Microsoft Dataverse, an integrated data platform, to efficiently handle business logic, ensure security and compliance, and break down data silos.

Differences between power apps and traditional app development approaches:

Compared to traditional app development, Power Apps projects differ in two essential aspects:

1. Involvement of various developers:

In regular app-making setups, only professional developers can create apps. But with Power Apps, anyone can make the apps they want. It gives everyone the ability to build apps using its advanced features. Both Citizen developers and professional developers can participate in solution-making.

2. Development methodology:

In both the waterfall and agile methodology of app development a significant amount of time can pass before the first minimum viable product (MVP) is delivered to users. With Power apps time to market is very quick. People can try out the real working app early in the process of creating it. If there are new things we need to add, we can include them in the next version.

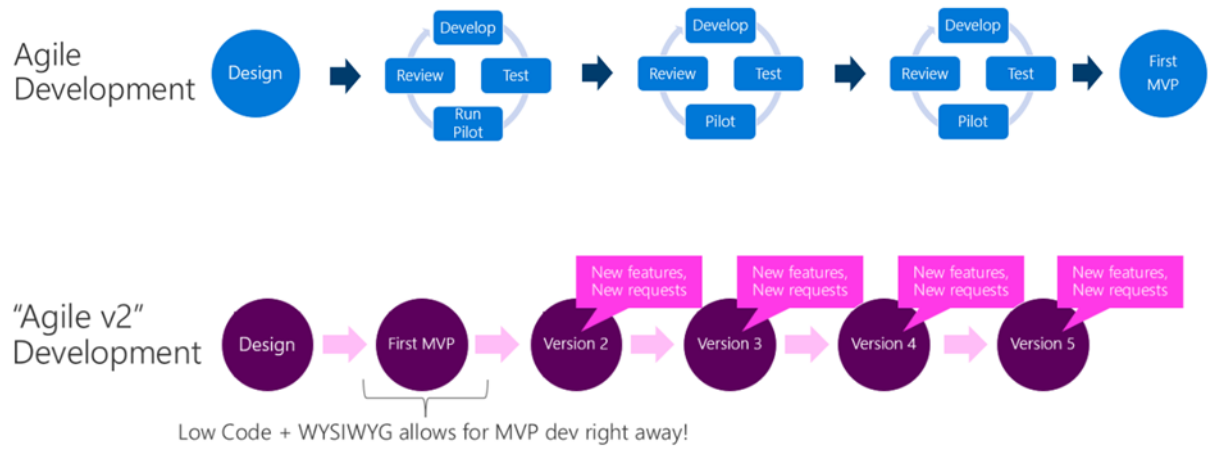

Fig. 6. Traditional vs Power Apps Application Development Methodology. 2022

Planning a Power App Project:

Planning- Planning phase is very important as it helps to convert all business process thoughts into fully working solutions by using Power Apps. This phase also helps to decide who is taking the responsibilities to create requirements and build apps who has complete knowledge of all business processes.

Design- Designing phase includes Conceptual/ Architectural design helps to turn all business processes into the screen and features of an app.

Make- Includes making an actual app by using Power App platform with the process like setting up tables, lists, add connectors, create and edit forms, create Power Automate flows.

Test- This phase can make other users to try the app with Unit test, End-to-end test, User Acceptance test which includes creating test cases and scenarios.

Deploy and Refine- This last phase helps to launch the app and delivers on the user's hand. It also incudes to add new features or fixes the app as per the feedback received from users. (Microsoft)

Use Cases:

1. Finance: Easily make budgets and reports that update in real-time using apps created from Excel.
2. Sales and Marketing: Connect different systems to get instant notifications and access sales tools on your phone.
3. Human Resources: Make apps that make it simple for employees to stay connected, track data, and share information.
4. Operations: Make auditing and managing inventory easier and save money on dispatch costs.

5. Frontline workers: Make in-store customer service better and improve customer experiences.

Customers using power apps:

1. Professional Services Industries: Accenture, EY, Arvato etc.
2. Banking and capital Market Industries: AY, HSBC, EUROBANK, USBank, and Swedbank, etc.
3. Insurance Industries: AXA, Zurich, Nationwide, PROSEGUR, etc.
4. Healthcare Industries: SAT Health, VITA's healthcare, Fraser health etc.
5. Consumer Goods Industries: MI, G &J Pepsi, Cocacola Africa, Wipro etc.
6. Automotive: Toyota, Jaguar Land Rover, POS Aviation etc.

Advantages of Power Apps:

1. Reduced IT Cost- Generally organizations appoint in-house or hire an external IT specialist to custom their business apps in traditional way. On other hand, Power Apps allows citizen developers with little or no experience to create high quality apps and it can be modified without further expense and Microsoft also provides consulting service for complicated apps.
2. Faster App Development- Creating and testing of apps can be done quickly with Microsoft Power Apps. This low-code platform cut 50 to 90% of development time.
3. Useful Integration: Power Apps is a part of Microsoft Power platform, so it automatically integrates with Power BI for business intelligence, Power Virtual Agents for agile

customer service, Power Pages to build external facing websites, Azure for cloud storage and Microsoft suite.

4. AI Capabilities: Power Apps includes AI Builder with its pre-built models of AI capabilities, and it can be possible to build and train new AI model which saves significant amount of time and money. (Incworks)

Limitations of Power Apps:

1. Limited amount of customization- Although Power Apps provides pre-built templates and connections, customization in this low-code solutions platform is restricted compared to the possibilities offered by traditional development platforms. For example, the user interface (UI) cannot be changed extensively, and some functionalities are required to be developed on a bespoke basis.
2. Restricted functionality- Applications that require complicated computations, complex data manipulations, or high-performance graphics may not be suitable for Power Apps use. similarly, Power Automate is less capable of automating all necessary business operations and Power BI might not be able to perform all reporting and analysis functions either.
3. Limited data storage capacity- Applications with large numbers of data are not suitable for Power Apps. Although integration with Microsoft Azure (Cloud storage) is possible that makes it more complex and expensive.
4. Low-code applications developed through power apps can’t be published on Google Play Store, Apple App Store, and Windows Store.

Pricing Plans:

Microsoft currently provides two types of plans, as outlined below. To subscribe to either of these plans, individuals are required to use their work or school accounts exclusively.

Power Apps Developer Plan: The Power Apps Developer Plan provides access to the full range of Power Apps features, including Dataverse and Power Automate. This plan is free of cost. However, it is specifically designed for development and testing purposes. To deploy or run solutions in a production environment for actual use, a paid plan is necessary.

Power Apps Premium Plan: Ideally suited for team projects. This plan is ideal for businesses seeking consistent user-based licensing, the plan, priced at $20 per user per month, offers users the flexibility to run an unlimited number of apps. With this plan, licensed users can develop, update, and deploy an unlimited number of applications. The package includes unlimited Power Apps and Power Pages for each assigned user, along with 500 AI Builder credits. Additionally, users benefit from Dataverse entitlements, providing a 250 MB database and 2 GB file storage. (Microsoft)

Future Scope:

As per Gartner, by 2026, low-code development platforms such as Microsoft Power Apps will account for 75 percent of new application development. In the future, organizations are strategically channeling their efforts toward boosting workplace productivity, cost-cutting, and fast-tracking professional development. In the future, organizations hold a vision of crafting applications infused with AI to modernize legacy systems, unlocking the full potential of data, fostering a more business-centric approach to automation, and expediting the overall digital transformation journey for organizations. Power Apps and Power Platforms are emerging as

pivotal players in this scenario. The infusion of AI capabilities into MS Power Apps marks a paradigm shift in the development and reimagining of how businesses and individuals engage in their work.

References:

1) Bock, Alexander & Frank, Ulrich. (2021). Low-Code Platform. Business & Information Systems Engineering. 63. 10.1007/s12599-021-00726-8.
2) Davide Di Ruscio (2022) https://doi.org/10.1007/s10270-022-01038-5
3) Incworx https://www.incworx.com/blog/benefits-of-using-microsoft-powerapps
4) R. Waszkowski, "Low-code platform for automating business processes in manufacturing", *IFAC-PapersOnLine*, vol. 52, no. 10, pp. 376-381, 2019.
5) Rattakorn Poonsuph, "Design and Implementation of a LCDP with Enhanced Functionality", 2023 IEEE 8th International Conference On Software Engineering and Computer Systems (ICSECS), pp.145-151, 2023.
6) Microsoft https://www.microsoft.com/en-us/power-platform/products/power-apps and https://learn.microsoft.com/en-us/power-apps/guidance/