Desk Utilization + Productivity Optimizer (Hybrid Work)

Technical Specification & Implementation Guide (Developer Edition)

Purpose: This document provides end-to-end implementation details for developers to build and deploy the Desk Utilization + Productivity Optimizer using Microsoft Power Platform and SharePoint.

1. Solution Architecture Overview

Components:

- Power Apps (Canvas App): Desk booking, floor plan visualization, personal productivity input, insights.
- SharePoint Online: Persistent storage (Desks, Bookings, Productivity, Recommendations).
- Power Automate (Cloud Flows): Calendar ingestion, reminders, check-in/out automation, AI recommendations, weekly reporting.
- Power BI: Utilization & productivity analytics dashboards.
- (Optional) Azure OpenAI / AI HTTP endpoint: Generate seat/work-pattern recommendations.

High-Level Data Flow:

Power Apps ■ SharePoint (CRUD). Power Automate pulls Outlook calendar into SharePoint, triggers reminders and AI. Power BI reads SharePoint lists for analytics.

2. SharePoint Data Schema

2.1 DesksList

Column	Type	Required	Description
Title (DeskID)	Single line of text	Yes	Unique desk identifier e.g., D-014
Location	Single line of text	Yes	Campus/Building e.g., BLR-EC-1
Floor	Single line of text	Yes	Floor number e.g., 3
NearTeamArea	Yes/No	No	Close to specific team area
Category	Choice	Yes	Quiet | Collaboration | Window | Standard
IsAvailable	Yes/No	Yes	Derived flag; updated by flows
Notes	Multiple lines of text	No	Optional notes about desk

2.2 DeskBookings

Column	Type	Required	Description
Title (BookingID)	Single line of text	Yes	Unique booking id (GUID)
User	Person/Group	Yes	Requester
DeskID	Lookup → DesksList	Yes	Booked desk
Date	Date	Yes	Booking date
StartTime	Date/Time	Yes	Start
EndTime	Date/Time	Yes	End
Purpose	Choice	No	Focus | Meeting | Collaboration
CheckInTime	Date/Time	No	Set on check-in
CheckOutTime	Date/Time	No	Set on check-out

Status	Choice	Yes	Booked | Checked-In | No-Show | Cancelled

2.3 ProductivityLog

Column	Type	Required	Description
Title	Single line of text	No	Optional label
User	Person/Group	Yes	Employee
Date	Date	Yes	Log date
FocusHours	Number (1 dec)	No	Self-reported
MeetingsHours	Number (1 dec)	No	From calendar flow
TasksCompleted	Number	No	Manual entry or integrated
EnergyLevel	Number (1–5)	No	Self-reported
Notes	Multiple lines of text	No	Optional

2.4 Recommendations

Column	Type	Required	Description
Title	Single line of text	No	e.g., Rec-<date>
User	Person/Group	Yes	Target user
Date	Date	Yes	Recommendation date
SuggestedDesks	Multiple lines of text	No	Comma-separated desk IDs
RecommendedFocusTime	Single line of text	No	e.g., 10:00–12:00
CollaborationSuggestions	Multiple lines of text	No	Narrative
Summary	Multiple lines of text	No	Short plan

3. Power Apps (Canvas App) Design

3.1 Screens

- Home: Quick stats and navigation.
- Book Desk: Filter by date/floor/category, gallery of available desks, Book button.
- Seating Map: Floor plan image with overlay icons indicating availability.
- My Day: Focus/meetings/tasks quick input (writes to ProductivityLog).
- Insights: Personal trends & AI recommendations (reads Recommendations).

3.2 Key Formulas (samples)

- AvailableDesks = Filter(DesksList, IsAvailable = true)
- Create Booking: Patch(DeskBookings, Defaults(DeskBookings), {Title: GUID(), User: User().Email, DeskID: DeskGallery.Selected.ID, Date: DatePicker1.SelectedDate, StartTime: StartTimeSel.SelectedTime, EndTime: EndTimeSel.SelectedTime, Status: 'Booked'})
- Seating Map Icon Visible: If(CountIf(DeskBookings, DeskID=ThisItem.ID && Date=DatePicker1.SelectedDate && Status <> 'Cancelled')>0, false, true)

3.3 Permissions

- Use SharePoint item-level permissions or app role checks for editing rights.
- Prevent overbooking via Power Automate conflict check before final commit.

4. Power Automate – Flow Specifications

Flow A: Calendar → MeetingsHours Sync (Daily)

- Trigger: Recurrence (every weekday 18:00).
- Actions: 'Get calendar view of events' (Outlook) for next day or current day.
- Aggregate busy meeting durations (exclude all-day/cancelled).
- Update or upsert item in ProductivityLog for each user (or just for the solo user).

Flow B: Booking Confirmation & Check-in Reminder

- Trigger: When an item is created in DeskBookings.
- Send Teams adaptive card with booking details + 'Check-in' button.
- Start a 'Delay until' action (StartTime + 1h).
- If no CheckInTime recorded → set Status = 'No-Show' and flip DesksList.IsAvailable = true.

Flow C: Conflict & Double-Booking Guard

- Trigger: When an item is created/modified (DeskBookings).
- Query overlapping bookings for same DeskID and Date/Time.
- If conflict → cancel latest booking and notify user.

Flow D: AI Recommendation Generator (Optional)

- Trigger: Manual from Power Apps or daily 19:00.
- Compose prompt: user preferences, historical focus hours, meeting hours, desk category usage.
- HTTP action: POST to AI endpoint; parse JSON; write to Recommendations list.

Flow E: Weekly Utilization Report

- Trigger: Friday 17:00.
- Query DeskBookings of the week → compute: bookings, no-shows, peak hours, seat-type demand.
- Send email/Teams message with KPIs and link to Power BI dashboard.

5. Power BI – Dashboard Specification

Datasets: DesksList, DeskBookings, ProductivityLog, Recommendations (SharePoint connectors).

- Utilization Heatmap: Matrix (DeskID × Date) colored by hours used.
- Peak Hours: Column chart of bookings by hour.
- Seat Type Demand: Stacked column by Category.
- No-Show Rate: KPI card and trend line.
- Focus vs Meetings: Scatter plot per day (x: MeetingsHours, y: FocusHours).
- Personal Productivity Score: Composite measure (e.g., FocusHours*0.6 + TasksCompleted*0.3 - MeetingsHours*0.1).

Sample DAX Measures:

Utilization Hours := SUMX(DeskBookings, DATEDIFF(DeskBookings[StartTime], DeskBookings[EndTime], MINUTE)/60.0) NoShow Rate % := DIVIDE(CALCULATE(COUNTROWS(DeskBookings), DeskBookings[Status] = "No-Show"), COUNTROWS(DeskBookings)) Productivity Score := AVERAGEX(ProductivityLog, ProductivityLog[FocusHours]*0.6 + ProductivityLog[TasksCompleted]*0.3 - ProductivityLog[MeetingsHours]*0.1)

6. Security, Roles & Governance

- Authentication: Azure AD (M365).
- Authorization: SharePoint list item-level permissions for Bookings. Read-only access to DesksList for all users; write restricted to admins.
- Data Loss Prevention (DLP): Keep AI/HTTP connectors in the same business data group; if external AI used, ensure data minimization.
- PII: Only store necessary fields (email, name). Avoid sensitive data (salary, medical).
- Audit: Enable SharePoint versioning; Power Automate flow run history as audit trail.
- Compliance: Retention policy for bookings (e.g., 12 months).

7. Non-Functional Requirements (NFRs)

- Performance: App loads < 3s on broadband; Gallery queries delegated with indexed columns.
- Scalability: Start with SharePoint (≤ 100k items per list); plan Dataverse/SQL if growth exceeds limits.
- Reliability: Flows include retry policies; conflict guard prevents duplicates.
- Usability: Mobile-friendly Canvas app; color-blind safe palette.
- Observability: Power BI monitoring page for flow failures, latency, and booking spikes.

8. Delivery Plan (Solo Build)

Phase	Scope	Duration
P0 – Setup	Create SharePoint lists, site, permissions; solution repo.	0.5 day
P1 – Power Apps	Screens: Home, Book Desk, Seating Map, My Day, Insights.	1.5 days
P2 – Flows (A–C)	Calendar sync, confirmation & reminder, conflict guard.	1 day
P3 – Power BI	Utilization + Productivity dashboards; measures.	1 day
P4 – AI (Optional)	Recommendation flow + prompt + storage.	0.5 day
P5 – Hardening	NFR checks, error handling, accessibility, docs.	0.5 day

9. Acceptance Criteria

- User can book, check-in, and check-out a desk without errors.
- Conflict guard prevents overlapping bookings for the same desk/time.
- Meetings hours auto-populate in ProductivityLog daily.
- Weekly report flow sends KPIs with correct counts.
- Power BI shows utilization heatmap and productivity score without manual refresh.
- (If AI enabled) Recommendations list gets populated with sensible suggestions.

10. Sample Payloads & Prompts

10.1 AI Prompt (for HTTP action)

SYSTEM: You are a workplace optimization assistant. You generate desk and schedule suggestions. INPUT: - User: jane.doe@contoso.com - Tomorrow MeetingsHours: 1.5 - Historical FocusHours (avg): 3.8 - Preferred Categories: Quiet, Window - Available Desks: D-012(Quiet), D-014(Window), D-021(Collab) - Constraints: 09:00–17:00 shift OUTPUT (JSON): { "suggested_desks": ["D-012", "D-014"], "focus_block": "10:00-12:00", "notes": "Avoid collaboration zone in the morning; energy typically peaks late morning." }

10.2 Example Adaptive Card Action (Teams)

{ "type": "AdaptiveCard", "$schema": "http://adaptivecards.io/schemas/adaptive-card.json", "version": "1.4", "body": [{"type": "TextBlock", "text": "Desk Booking Confirmed", "weight": "Bolder", "size": "Medium"}, {"type": "TextBlock", "text": "Desk D-014 | 10:00–16:00 | Floor 3"}, {"type": "ActionSet", "actions": [{"type": "Action.Submit", "title": "Check-in", "data": {"action": "checkin", "bookingId": "<>"}}, {"type": "Action.Submit", "title": "Cancel", "style": "destructive", "data": {"action": "cancel", "bookingId": "<>"}}]}] }

11. Risks & Mitigations

- Overbooking due to race conditions → Use flow-level concurrency control and a unique constraint pattern (check before create).
- SharePoint list throttling → Index Date, DeskID; use filtered views; consider Dataverse if >100k rows.
- Privacy concerns with productivity data → Keep dataset personal or anonymize in BI; obtain consent.
- AI hallucinations → Treat as suggestions, not mandates; keep prompt grounded with structured inputs.

Appendix A: Environment Prerequisites

- M365 tenant with SharePoint Online, Power Apps, Power Automate, Power BI Pro (for publishing).
- Permissions: SharePoint Site Owner for setup; Power Platform environment maker role.
- Connectors: Office 365 Users, Outlook, Teams, SharePoint, (HTTP for AI optional).
- Licensing: Evaluate per-user or per-app licenses depending on rollout scope.