

# Effort Estimation for HMS

Using Function Point Analysis

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## Abstract

This report delivers a comprehensive effort estimation for the Health Management System (HMS) using Function Point Analysis (FPA). The HMS oversees patient records, appointments, and prescriptions, with seamless integration to a laboratory system. We classify functions, evaluate complexity (Simple, Average, Complex), compute function points, and derive effort, time, and cost metrics.

## 1 Introduction

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Assigned as part of Software Engineering (Spring 2025) at FAST National University, Peshawar Campus, this analysis estimates the effort for developing the Health Management System (HMS). Featuring modules for Patient Records, Appointments, and Prescriptions, plus lab integration, we apply FPA with a team of 4 developers, a productivity rate of 5 FP/person-month, and a cost of 25,000 PKR/person-month.

## 2 Task 1: Identify and Count Function Types

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HMS functions are grouped into:

**External Inputs (EI):** User data entry/update.

**External Inquiries (EQ):** Data retrieval.

**Internal Logical Files (ILF):** Stored data.

**External Interface Files (EIF):** External data references.

**External Outputs (EO):** None identified.

**Counts:**

- EI: 6 (Add Patient, Update Patient, Schedule Appointment, Modify Appointment, Issue Prescription, Fulfill Prescription).
- EQ: 3 (View Patient History, View Appointments, View Prescription History).
- ILF: 3 (Patient Records, Appointments, Prescriptions).
- EIF: 1 (Laboratory System).
- EO: 0.

## 3 Task 2: Determine Complexity and Assign Function Points

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Complexity levels (Simple, Average, Complex) are assigned based on data elements and file interactions. See Table 1 for details.

## 4 Task 3: Apply Weighting Factor

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Weighted points:

- ◇ EI:  $6 \times 4 = 24$
- ◇ EQ:  $3 \times 4 = 12$
- ◇ ILF:  $3 \times 10 = 30$
- ◇ EIF:  $1 \times 5 = 5$
- ◇ EO:  $0 \times 0 = 0$

**Function Complexity Table**

Type	Function	Complexity	Points
EI	Add New Patient Record	Average	4
EI	Update Patient Record	Average	4
EI	Schedule Appointment	Average	4
EI	Modify Appointment	Average	4
EI	Issue Prescription	Average	4
EI	Fulfill Prescription	Average	4
EQ	View Patient History	Average	4
EQ	View Appointments	Average	4
EQ	View Prescription History	Average	4
ILF	Patient Records	Average	10
ILF	Appointments	Average	10
ILF	Prescriptions	Average	10
EIF	Laboratory System	Simple	5

Table 1: Function Types and Assigned Complexity

## 5 Task 4: Calculate Unadjusted Function Points (UFP)

$$\text{UFP} = \text{EI} + \text{EQ} + \text{ILF} + \text{EIF} + \text{EO} = 24 + 12 + 30 + 5 + 0 = \mathbf{71}$$

## 6 Task 5: Calculate Value Adjustment Factor (VAF)

$$\text{VAF} = 0.65 + (0.01 \times \text{Sum of GSC ratings})$$

GSC ratings:

1. Data Communications: 3
2. Distributed Data Processing: 2
3. Performance: 3
4. Heavily Used Configuration: 2
5. Transaction Rate: 3
6. Online Data Entry: 4
7. End-User Efficiency: 4

- 8. Online Update: 4
- 9. Complex Processing: 2
- 10. Reusability: 2
- 11. Installation Ease: 2
- 12. Operational Ease: 3
- 13. Multiple Sites: 2
- 14. Facilitate Change: 3

$$\text{Sum} = 3 + 2 + 3 + 2 + 3 + 4 + 4 + 4 + 2 + 2 + 2 + 3 + 2 + 3 = 39$$

$$\text{VAF} = 0.65 + (0.01 \times 39) = 0.65 + 0.39 = 1.04$$

## 7 Task 6: Calculate Adjusted Function Points (AFP)

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$$\text{AFP} = \text{UFP} \times \text{VAF} = 71 \times 1.04 = 73.84 \approx 74$$

## 8 Task 7: Calculate Effort, Time, and Cost

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Given:

- ★ Productivity: 5 FP/person-month
- ★ Cost: 25,000 PKR/person-month
- ★ Team: 4 developers

1. **Effort:**

$$\text{Effort} = \frac{\text{AFP}}{\text{Productivity}} = \frac{74}{5} = 14.8 \approx 15 \text{ person-months}$$

2. **Time:**

$$\text{Time} = \frac{\text{Effort}}{\text{Team Size}} = \frac{15}{4} = 3.75 \text{ months}$$

3. **Cost:**

$$\text{Cost} = \text{Effort} \times \text{Cost per person-month} = 15 \times 25,000 = 375,000 \text{ PKR}$$

## Final Results

The HMS development requires:

**UFP:** 71

**VAF:** 1.04

**AFP:** 74

**Effort:** 15 person-months

**Time:** 3.75 months

**Cost:** 375,000 PKR

Estimates assume average complexity and moderate system characteristics.