ASSIGNMENT 04

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REPORT ON EFFORT ESTIMATION FOR HEALTHCARE MANAGEMENT SYSTEM DEVELOPMENT

A healthcare organization has requested the development of a Healthcare Management System (HMS) to manage patient records, appointments, billing, and provide data analytics for hospital administrators. To estimate the development effort, the Advanced COCOMO model has been used, with a focus on identifying key cost drivers that impact both effort and project schedule.

The report encompasses:

PART 1 : Effort Estimation Using Advanced COCOMO
PART 2: Schedule Estimation
PART 3: Analysis and Recommendations
PART 4 : Risks and Alignments

PART 1 : Effort Estimation Using Advanced COCOMO:

1. Use the Advanced COCOMO model to estimate the development effort in person-months.

Data:
A=3.0
B=1.12
KLOC = 300

Solution:

Cost Driver	Rating	Multiplier
RELY	Very High	1.40
CPLX	HIgh	1.15
TIME	Moderate	1.0
ACAP	Low	1.19
PCAP	Low	0.86
TOOL	High	0.91
DATA	High	1.08

EAF=RELY x CPLX x TIME x ACAP x PCAP x DATA x TOOL
EAF = 1.40 x 1.15 x 1.11 x 1.19 x 0.86 x 1.08 x 0.91
EAF = 1.6643

2. Identify relevant cost drivers from the given scenario and provide justifications
for their ratings (e.g., RELY, CPLX, TIME, ACAP, PCAP, etc.).

Cost Driver	Rating	Justification
RELY	Very High	High reliability is needed due to the sensitive nature of healthcare data.
CPLX	High	The system has several complex modules
TIME	Moderate	The project must be delivered in 12 months, but no critical time constraints.
ACAP	Low	The team is low-level with 3-5 years of experience.
PCAP	Low	Similar to ACAP, the team has little experience in software development.
TOOL	High	Modern tools (Django, React, PostgreSQL) support efficiency.
DATA	High	The schedule is fixed at 12 months, a standard time frame.

3. Calculate the nominal effort using the **Effort Adjustment Factor (EAF)** and
COCOMO equations.

Data:
A=3.0
B=1.12 (For Semi-detached Projects)
KLOC = 300

Formula:
Nominal effort is given by:

$$\text{Nominal Effort (PM)} = A \times (KLOC)^B \times EAF$$

Solution:
Since EAF = 1.6643

$$\text{Nominal Effort (PM)} = A \times (KLOC)^B \times EAF$$
$$\text{Nominal Effort (PM)} = 3.0 \times (300)^{1.12} \times 1.6643$$
$$\text{Nominal Effort (PM)} = 3.0 \times 400.67 \times 1.6643$$
$$\text{Nominal Effort} \approx 2969.810 \text{ person-months}$$

PART 2: Schedule Estimation:

Data:
C=2.5
D=0.35(For Semi-detached Projects)
KLOC = 300
Effort = 2969.810 Persons-month

Formula:

$$\text{Schedule (TDEV)} = C \times (\text{Effort (PM)})^D$$

Solution:

$$TDEV = 2.5 \times (2969.810)^{0.35}$$
$$TDEV \approx 41.0577 \text{ months}$$

PART 3: Analysis and Recommendations:

Analysis

Cost Driver	Rating	Impact On Effort	Impact On Schedule
RELY	Very High	Increases effort due to high reliability requirements.	Increases time for thorough testing and debugging.
CPLX	HIgh	Significant impact.	Moderate complexity, no significant effect on time.
TIME	Moderate	No significant impact, reasonable 12-month deadline.	Keeps pace steady, no need for aggressive optimizations.
ACAP	Low	No impact; analysts are low-level.	No delays; analysts can meet deadlines.
PCAP	Low	No impact; programmers are low-level.	No major effect on the timeline.
TOOL	High	Reduces effort due to efficient modern tools.	Slight acceleration in development tasks.
DATA	High	No adjustment needed; standard 12-month timeline.	Schedule is realistic and well-paced.

Recommendations

S NO	Recommendation
1	Increase team size or outsource to reduce workload and meet the 12-month deadline.
2	Use Agile methodology to prioritize core features and deliver them incrementally.
3	Reduce scope by focusing on essential features and delaying non-critical modules.
4	Automate testing to save time and reduce manual effort.
5	Engage external consultants early to avoid delays related to compliance changes.
6	Increase team size or outsource to reduce workload and meet the 12-month deadline.
7	Use Agile methodology to prioritize core features and deliver them incrementally.

PART 4 : Risks and Mitigation Strategies

- **Frequent changes in requirements**
  Risk: Estimated effort exceeds available person-months.
  Mitigation: Plan for scope management and prioritize essential features.

- **System integration complexity**
  Risk: Difficulty in integrating multiple system modules.
  Mitigation: Focus on delivering a minimum viable product (MVP).

- **External dependencies on consultants**
  Risk: Delays due to waiting for expert advice.
  Mitigation: Add specialized resources or consult regularly to stay on track.

- **Time pressure and potential skill mismatches**
  Risk: Team may struggle to meet deadlines or handle complex tasks.
  Mitigation: Monitor progress closely and allocate tasks based on team members' strengths.

- **Increased effort due to scope creep and delays**
  Risk: Project may expand beyond initial estimates or face delays.
  Mitigation: Break the project into smaller modules, maintain clear communication, and provide targeted training.

In conclusion, the Advanced COCOMO analysis reveals that developing the Healthcare Management System within the 12-month target is challenging due to high complexity and reliability requirements. Strategic adjustments, including scope prioritization and resource optimization, are essential to ensure timely and successful project delivery.