

*“Holiday Out” Hotel project – Complexity analysis  
by AdamBondarowicz, s3855*

# **Complexity analysis**

“Holiday Out” Hotel project

**The complexity analysis in this project is realized by means of the Use Case Points method.**

This method consists of the following parts:

1. Technical Complexity Factor (TCF).
2. Environment Complexity Factor (ECF).
3. Unadjusted Use Case Points (UUCP).
4. Productivity Factor (PF).

Each variable is defined and computed separately, using perceived values and various constants. The complete equation is:

$$UCP = TCP * ECF * UUCP * PF$$

Steps needed to complete the analysis:

1. Determine and compute the Technical Factors.
2. Determine and compute the Environmental Factors.
3. Compute the Unadjusted Use Case Points.
4. Determine the Productivity Factor.
5. Compute the product of the variables.

## **Technical Complexity Factors**

**Standard weights:**

<b>Technical Factor</b>	<b>Description</b>	<b>Weight</b>
<b>T1</b>	Distributed system	2
<b>T2</b>	Performance	1
<b>T3</b>	End User Efficiency	1
<b>T4</b>	Complex internal Processing	1
<b>T5</b>	Reusability	1
<b>T6</b>	Easy to install	0.5
<b>T7</b>	Easy to use	0.5
<b>T8</b>	Portable	2
<b>T9</b>	Easy to change	1
<b>T10</b>	Concurrent	1
<b>T11</b>	Special security features	1
<b>T12</b>	Provides direct access for third parties	1
<b>T13</b>	Special user training facilities are required	1

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**Calculations:**

Technical Factor	Description	Weight	Perceived Complexity	Calculated Factor (weight*perceived complexity)
T1	Distributed System	2	4	8
T2	Performance	1	4	4
T3	End User Efficiency	1	3	3
T4	Complex internal Processing	1	3	3
T5	Reusability	1	2	2
T6	Easy to install	0.5	3	1,5
T7	Easy to use	0.5	3	1,5
T8	Portable	2	4	8
T9	Easy to change	1	3	3
T10	Concurrent	1	2	2
T11	Special security features	1	4	4
T12	Provides direct access for third parties	1	3	3
T13	Special user training facilities are required	1	3	3
			<b>Total Factor</b>	<b>46</b>

TCF = 0.6 + (.01\*Total Factor)

**TCF = 0.6 + (0.01\*46) = 1,06**

## Environmental Complexity Factors

**Standard weights:**

Environmental Factor	Description	Weight
E1	Familiarity with UML	1.5
E2	Application Experience	0.5
E3	Object Oriented Experience	1
E4	Lead analyst capability	0.5
E5	Motivation	1
E6	Stable Requirements	2
E7	Part-time workers	-1
E8	Difficult Programming language	2

### Calculations:

Environmental Factor	Description	Weight	Perceived Impact	Calculated Factor (weight*perceived complexity)
<b>E1</b>	Familiarity with UML	1.5	3	4,5
<b>E2</b>	Application Experience	0.5	2	1
<b>E3</b>	Object Oriented Experience	1	4	4
<b>E4</b>	Lead analyst capability	0.5	3	1,5
<b>E5</b>	Motivation	1	2	2
<b>E6</b>	Stable Requirements	2	5	10
<b>E7</b>	Part-time workers	-1	0	0
<b>E8</b>	Difficult Programming language	2	2	4
			<b>Total Factor</b>	<b>27</b>

$$ECF = 1.4 + (-0.03 * \text{Total Factor})$$

$$ECF = 1.4 + (-0.03 * 27) = 0,59$$

## Unadjusted Use Case Points (UUCP)

Unadjusted Use Case Points are computed based on two computations:

1. The *Unadjusted Use Case Weight* (UUCW) based on the total number of activities (or steps) contained in all the use case Scenarios.
2. The *Unadjusted Actor Weight* (UAW) based on the combined complexity of all the use cases Actors.

### Standard weights:

Use Case Type	Description	Weight
<b>Simple</b>	A simple user interface and touches only a single database entity; its success scenario has 3 steps or less; its implementation involves less than 5 classes.	5
<b>Average</b>	More interface design and touches 2 or more database entities; between 4 to 7 steps; its implementation involves between 5 to 10 classes.	10
<b>Complex</b>	Involves a complex user interface or processing and touches 3 or more database entities; over seven steps; its implementation involves more than 10 classes.	15

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**Calculations:**

Use Case Type	Description	Weight	Number of Use Cases	Result
<b>Simple</b>	A simple user interface and touches only a single database entity; its success scenario has 3 steps or less; its implementation involves less than 5 classes.	5	9	45
<b>Average</b>	More interface design and touches 2 or more database entities; between 4 to 7 steps; its implementation involves between 5 to 10 classes.	10	11	110
<b>Complex</b>	Involves a complex user interface or processing and touches 3 or more database entities; over seven steps; its implementation involves more than 10 classes.	15	3	45
			<b>Total UUCW</b>	<b>200</b>

**UAW**

In a similar manner, the Actors are classified as Simple, Average or Complex based on their interactions.

**Standard weights:**

Actor Type	Description	Weight
Simple	The Actor represents another system with a defined API.	1
Average	The Actor represents another system interacting through a protocol, like TCP/IP.	2
Complex	The Actor is a person interacting via an interface.	3

Actor Type	Description	Weight	Number of Actors	Result
Simple	The Actor represents another system with a defined API	1	1	1
Average	The Actor represents another system interacting through a protocol, like TCP/IP	2	2	2
Complex	The Actor is a person interacting via an interface.	3	1	3
			<b>Total UAW</b>	<b>6</b>

**UUCP = 200 + 6 = 206**

## **Productivity Factor**

The Productivity Factor (PF) is a ratio of the number of man hours per use case point based on past projects. If no historical data has been collected, a figure between 15 and 30 is suggested by industry experts. A typical value is 20.

## **Final Calculation**

In order to finalize the calculations we have to multiply the values obtained earlier:

$$\text{UCP} = \text{TCF} * \text{ECF} * \text{UUCP} * \text{PF}$$

$$\text{UCP} = 1,06 * 0,59 * 206 * 20 = 2576 \text{ man hours}$$

$$2576 / 40 = 64 \text{ man weeks}$$

that gives about **16 man months**

Conclusion:

The estimated time needed for one developer to complete the project is about 16 months.