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# 6COM1042: Software Quality Assignment1 – 2020/2021

An empirical evaluation of an effort estimation technique

**Overview (**The following is a hypothetical Case Study**)**

As part of your Software Quality assignment, you have been asked to build a stock control system. The following is the specification for the proposed system:

**Specification A**

**Specification for a stock control system:**

**The Baseline:** Our stock control system will contain a relational database that stores information on Stock, Suppliers, Orders, Customers and Invoices. Occasionally, it will interact with our Supplier database, run in a separate section of our organisation, in order to update Supplier details. Our system will also frequently interact with a Payments system in the Payments section that processes customer payment of invoices.

**Key Functions:** Our stock control system will update or create customer records. It will also check customer credit rating and create customer orders. When a customer places an order, the system will first check the customer credit rating, then check the availability of the product being ordered, create an order, then update the stock levels to reflect the product that has been ordered. For every Customer Order an Invoice is created. At the end of every day’s transaction a Dispatch list, made up of all customer orders with their delivery addresses is generated and printed off. Overnight, our system interacts with the Payments systems by sending it an update of Customer Invoices. The Payments system, in turn, sends our stock control system an update of each customer’s credit rating based on their outstanding payments.

There are no other functions of this system.

The following are the identified sub-functions of the system specified by Specification **A**.

* External inputs (4)
  + Create/Update Customer Record, Cre
  + ate order, Update Stock, Create Invoice

* External outputs (1)
  + Printed Dispatch List
* External inquiries (2)
  + Customer credit status, Stock Availability
* External files (2)
  + Supplier Database, Payments System

* Internal files (1)
  + Relational database of Stock, Supplier, Orders, Customers and Invoices.

**Question 1)** Assuming the following weightings for all the sub-functions in **Specification A**:

External inputs: *Average*

External outputs: *Simple*

External enquiries: *Simple*

External files: *Complex*

Internal files: *Average*

Calculate the Unadjusted Function Point count for the specification above. Remember to detail the stages of your calculation by showing the formulae and standards used to derive your solution. You must explain the Unadjusted Function Point count and how it fits into the overall formula for Function Point calculations and also explain the constituents of any formula that you use for your calculation.

[10 Marks]

**Answer 1)**

Given that we have found the subfunctions we are now able to substitute the values in the formula to find out the UFC. Given the formula is:



“Number of items of variety” stands for the subfunctions and the weight means the task difficulty.

Once we obtain both values only then can the UFC be identified. Following the table of assigned weight. We can cross reference which weighting factor will have for each item.



As show from above the subfunctions are:

4

1

2

2

1

External inputs: *Average=4*

External outputs: *Simple=4*

External enquiries: *Simple=3*

External files: *Complex=15*

Internal files: *Average=7*

So the UFC will the corresponding values multiplied and added.

(4\*4) +(4\*1) +(3\*2) +(15\*2) +(7\*1) =63

**Question 2)** Calculate the adjusted Function Point count of the above specification by factoring in the Technical Complexity Factor. For this calculation, assume the following Technical Complexity Factors profile:

* 1. The following contributing factors are irrelevant:
     + F1: Reliable back-up and recovery
     + F3: Distributed functions
     + F4: Performance
     + F5: Heavily used configuration
     + F7: Operational ease
     + F9: Complex interface
     + F10: Complex processing
     + F11: Reusability
     + F12: Installation ease
     + F13: Multiple sites
     + F14: Facilitate change
  2. There are NO contributing factors that are average:

* 1. The following contributing factors are essential:
* F2: Data communication
* F6: Online data entry
* F8: Online update

[5 Marks]

**Answer 2)**

TCF means the Technical Complexity Factor (TCF) which is rated 0 to 5 where 0 means it is irrelevant, 3 is average and 5 means essential. With the formula being:

14

TCF = 0.65 + 0.01 ∑*Fi*

***i*=1**

With the factors being essential and having 3 we can then calculate with the values. 5\*3. Then substitute it in the formula.

0.65+0.01(15)=0.8

**Question 3)** If it took you exactly **25.2** Person Hours to implement the Stock Control system above, calculate your rate of productivity in Person Days, assuming that each Person Day is equal to exactly 8 Person Hours.

[5 Marks]

**Answer 3)**

To identify the productivity, we need the function point. To calculate that we need the UFC times the TCF.

(UFC)63\*(TCF)0.8=50.4

With the Function point we know divide it with the person hours to identify the rate of productivity.

(FP)50.4/25.2(PHrs)=2

With each person day is 8 then the rate of productivity is 8\*2= 16 Person Days

**Question 4)** Using the productivity rate calculated in Question 3), predict how long it should take you to implement the system described below.

[10 Marks]

**Specification B**

**Specification for a simple marks recording system:**

Student records are uploaded electronically from another database onto the marks recoding system. These records will contain no marks at this stage. After the examination period, an administrator will enter the marks of students onto the database on the system. The administrator will compute a set of averages for the marks obtained. She would also convert the marks from numbers to letter grades. When a student rings up to enquire about her marks, the administrator will enter the student’s number, which will in turn invoke the student’s record. At the end of the exam period, students’ marks are printed and sent off to another department for processing.

The following are the identified sub-functions of the system specified by Specification B.

* External inputs (1)
  + Enter marks
* External outputs (2)
  + Student record, printed student marks
* External inquiries (3)
  + Compute averages, Convert marks to grades, Student inquiring marks
* External files (1)
  + Database of student records
* Internal files (1)
  + Internal database of marks recording scheme

You should follow the steps given below to predict how long it should take you to implement the system above:

1. Calculate UFC, assuming that all the weightings for the above sub functions are simple.
2. Assume the following Technical Complexity Factor (TCF) profile:

The following contributing factors are irrelevant:

* + - F1: Reliable back-up and recovery
    - F3: Distributed functions
    - F5: Heavily used configuration
    - F9: Complex interface
    - F10: Complex processing
    - F11: Reusability
    - F12: Installation ease
    - F14: Facilitate change

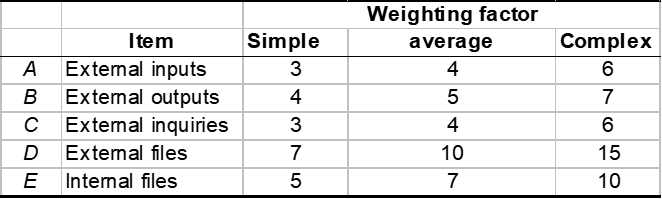
The following contributing factors are average:

* + - F4: Performance
    - F6: Online data entry
    - F7: Operational ease
    - F8: Online update
    - F13: Multiple sites

F2: Data communication is essential

1. Then use the productivity rate from Question 3) to predict how long it will take you to implement this simple marks recording system.
2. State any assumptions you make in the calculation.

**Answer 4)**



i)As before we need the subfunctions amounts and the weighting factors to Find out the ufc.

As show from above the subfunctions are:

1

2

3

1

1

External inputs: Simple=3

External outputs: Simple=4

External enquiries: Simple=3

External files: Simple=7

Internal files: Simple=5

So the UFC with the corresponding values multiplied and added.

(3\*1) +(4\*2) +(3\*3) +(7\*1) +(5\*1) =32=UFC

ii)As before with the TCF. 14

TCF = 0.65 + 0.01 ∑*Fi*

***i*=1**

With 5 factors being average and the rate is 3 (5\*3) and having 1 factor Essential (1\*5) we can then calculate with the values. 5\*3. Then substitute it in the formula.

0.65+0.01((5\*3) +(5\*1)) =0.85=TCF

iii)As shown before to identify the productivity rate we time the TCF to the UFC.

(UFC)32\*(TCF)0.85=27.2

With the Function point we know divide it with the productivity rate from question 3 which was 16.

(FP)27.2/16(PHrs)=1.7

Making it 1.7 Person Days.

iv)

When doing this calculation, we must assume that the productivity rate will or would be the same when the system is being undertaken.

**Question 5)** Discuss why the predicted effort calculated above may be different from the actual effort involved in implementing the above system by giving **TWO** reasons why the two efforts may be different.

[10 Marks]

**Answer 5)**

One reason is that both systems are completely different. From the specification a lot more is needed to be implemented for the “stock control system” when compared with the “simple marks recording system”. As the productivity rate of the second system was based from the first (stock control system) this can be a huge outlier of making the calculated effort for the second system (simple marks recording system).

Although these are calculated predictions, when actual implementing it could be tremendously different from what was calculated. As the foundation of the data might not be accurate which would lead to the overall calculation not be respectable to work alongside too causing a lot of problems when implementing.

**Question 6)** By comparing and contrasting Albrecht’s Effort Estimation Technique with at least one other effort estimation technique give **TWO** strengths and **TWO** weaknesses of this technique.

[10 Marks]

**Answer 6)**

Albrecht effort estimation only needs the specifications to calculate a predication which is very viable unlike another effort estimation, DeMarco’s effort estimation. As this needs the number of entities involved in the system in a relationship diagram. Compared to just a specification some parts can be missed when portrayed as a relationship diagram. However, if the speciation is lengthy it can cause a few problems while the other technique does well with a lengthy spec as it gives a visual understanding making it a lot easier to go back while implanting.

Another disadvantage of Albrecht’s approach is that it is not possible to calculate the foundation of the calculation in early lifecycle stages. Which makes unusable for some situation however DeMarco’s can allowing a lot of ease with the visual aid too.

**Supporting notes for calculating Function Points**

**Sub-function weightings:**



**Technical Complexity Factor (TCF) involves the following contributing factors:**

