**Using a Ruler to Size Software**

 Neil Lester, F.G. Wilkie and Fergal McCaffery

Centre for Software Process Technologies (CSPT)

University of Ulster

Newtownabbey, Co Antrim, BT37 0QB

N. Ireland, UK

NG.lester@ulster.ac.uk, FG.Wilkie@ulster.ac.uk, F.McCaffery@ulster.ac.uk

Research into the area of software sizing has produced numerous sizing techniques (Delphi wideband, pair wise comparison, algorithmic models) and units of measurement (Lines of code, web objects, and COSMIC FFP). Even with these techniques and measures there are still difficulties sizing software at the early lifecycle stages. Here we outline the main problems and summarise research being undertaken by the CSPT to address these problems.

‘Early and Quick COSMIC FFP’ [1] is an approach to estimate Cfsu (COSMIC Functional Size Unit). In this technique a work break-down hierarchical structure is produced for the work to be sized. Each piece of functionality in the hierarchy is classified as either a Function Process, a General Process or a Macro Process and also as small, medium or large. Look up tables are then used to determine a range of Cfsu’s for each category and size. Each piece of functionality is assigned either the minimum, average or maximum Cfsu’s from the look up table. The sum of the Cfsu’s assigned to the various pieces of functionality is the total size in Cfsu’s of that piece of work. One problem with this approach is that it requires the user to have an understanding of COSMI FFP and how it relates to ‘Quick and Early COSMIC FFP’. A person with little or no experience of COSMIC FFP will have difficulty relating a Csfu size to an actual piece of software.

Another approach to address the problem of lack of information at the beginning of a project is pair wise comparisons. Miranda [2] describes a technique for sizing work using paired comparisons. The idea behind paired comparisons is to estimate the size of n entities by asking one or more experts to judge the entities’ relative size rather than to provide absolute size values. A judgement matrix is used to record the outcome of the comparison of every entity to every other entity. The outcome of each comparison is a relative size. Mathematical formula can be applied to the relative size value to achieve the absolute value of the entities being sized. In order to perform the sizing it is necessary to have at least one entity whose size is accurately known. This entity acts as a reference entity. With the pair wise comparisons, the main problem is the number of comparisons that are required. Every entity to be sized must be compared to every other entity. This could be time consuming especially when sizing many entities as would be typical of even a modest system.

Our research is concerned with evaluating ways to overcome the difficulties associated with each of the aforementioned approaches. We have developed the idea of a COSMIC FFP Ruler which we propose using in the sizing process. The idea of a COSMIC FFP Ruler was motivated partly from the pair wise comparison technique. The Ruler consists of a set of pre-sized entities. The entities are arranged in ascending order of size. The pre-sized entities that form the ruler are carefully selected to be (approximately) equal distance (in Cfsu’s) apart e.g. every 50 Cfsu’s. It is the arrangement of these entities that forms the COSMIC FFP ruler. Entities can be anything that needs to be sized, including entire projects. The pre-sized entities are examples of assets from past projects within the organisation. The organisation may require several COSMIC FFP rulers for different artefacts and different sizes of artefacts.

The entity to be sized is compared to the other entities on the appropriate Ruler. The person performing the sizing will then be able to slot the entity into the most appropriate place along the scale. This slot reflects the person’s impression of the entity’s size relative to the pre-sized entities on the ruler. The Cfus’s can then be estimated by considering the size of the pre-sized entities on the Ruler at either side of the entity being sized. The position of the entity between the two pre-sized entities can also be used to fine tune the estimation.

This approach allows a person to perform software sizing while having little or no knowledge of COSMIC FFP, and so addresses the drawback with the ‘Quick and Early COSMIC FFP’. Only the person responsible for developing and maintaining the COSMIC FFP ruler within the organisation requires a good understanding of COSMIC FFP. The number of comparisons required to size the entity will be considerably less than that required using the pair wise comparison approach. The ruler can also be used at the very early life cycle stages because it is a relative model comparing like with like. In order to validate the Cfsu estimate it is important that a proper COSMIC FFP count is performed during the later development life cycle phases.

We are currently working with a commercial software company to develop COSMIC FFP Rulers to help in performing sizing at early development life-cycle phases. Initials results from these trials will be presented.

**References**

[1] R Meli, A Abran, V.T. Ho, S. Oligny “On the applicability of COSMIC-FFP for measuring software throughout its life cycle”, ESCOM 2000

[2] S. Vijayakumar “Improving Subjective Estimates Using Paired Comparisons”, IEEE Software, Jan/Feb 2001

**Acknowledgements**

The Centre for Software Process Technologies is supported by the EU Programme for Peace and Reconciliation in Northern Ireland and the Border Regions of Ireland (Peace II).