Abstract

Field trials of the COSMIC-FFP functional size measurement method were initiated at the end of 1999 with the aim of advancing the method from a 'proposal' status to a 'proven' status by demonstrations and tests with real data on development projects from software from a variety of functional domains in a variety of organizations.

Data has been collected in a number of organizations since then and the analysis of the first results started in July 2000. This paper summarizes the context of the COSMIC-FFP field trials and presents some of the key observations obtained to date. Parts of the analysis focused on the relationship between software size and project variables like effort and schedule while other parts of the analysis focused on the relationship between the components contributing to the functional size of the software. Notably the relevance of considering the count of data attributes as a contributor to functional size and the distribution and variation of the size displayed by the functional processes of real-time software was investigated.

The paper concludes on the status of the COSMIC-FFP measurement method, outlining the key events and further results to be expected by early 2001.

1. Context

Quantifying the size of software is generally recognized as one of the key to adequate estimation of effort, cost and schedule of software projects. Source lines of code was the first generally accepted measure for this purpose and is still used extensively, as demonstrated by the many estimation models that have included this measure as a key parameter [1, 2]. As a measure of software size though, the source code measure carries some inherent limitations, and this has been recognized by software engineering practitioners and researchers alike [3]. Among the practitioners, Allan Albrecht was the first to propose, over 20 years ago, a new way of quantifying software size based on the user's view of the software [4]. Albrecht's 1979 method, now referred to as the IFPUG method, is still used today and provides useful results in many organizations, but it also has some limitations and these have been well documented over the past 15 years. One of these limitations is the difficulty of applying such a method outside the MIS domain, as documented by [3, 5, 6, 7, 9, 10, 11, 12, 13, 14]. In 1996, the industry sponsored the development of an IFPUG extension for real-time and embedded software, which was put into the public domain under the name of Full Function Points [8, 15, 16]. This extension enjoyed fair recognition, notably within the telecommunications industry and the embedded software sector of the automotive industry.

Building on the strengths of this work and with the support of the industry, the Common Software Measurement International Consortium (COSMIC) was formed in 1998 to design and bring to market a new generation of software measurement methods. The COSMIC group
reviewed existing methods (IFPUG, MarkII [17], NESMA [18] and version 1.0 of the Full Function Point methods [8]), studied their commonalties, and proposed the basic principles on which a new generation of software functional size measurement method could be based [19, 20, 21]. In November of 1999, the group published version 2.0 of COSMIC-FFP [23], a measurement method implementing these principles, and put its measurement manual on the Web for public access. Overall, close to 40 people from 8 countries participated in the design of this measurement method. The Measurement Manual, describing the method, is available in English, French and Spanish; Japanese and Italian versions are in preparation. The purpose of this paper is to introduce the COSMIC-FFP functional size measurement method and to present some results of the field trials, gathered over the past year.

2. COSMIC-FFP, A Summary

2.1. COSMIC Key Concepts

From the perspective proposed by COSMIC, software is part of a product designed to satisfy functional user requirements. From this high-level perspective, functional user requirements can be allocated to hardware, to software or to a combination of the two. The functional user requirements allocated to software are not necessarily allocated to a single unit of software. Often these requirements are allocated to pieces of software operating at different layers of specialization and cooperating to supply the required functionality to the product in which they are included. This is illustrated in Figure 1.

![Figure 1 - Allocation of functional user requirements, adapted from [19]](image)

All functional user requirements allocated to any one piece of software can be decomposed into, and represented by, functional processes. In turn, each functional process is represented by sub-processes. A sub-process can be either a data movement type or a data transform type. Version 2.0 of the COSMIC-FFP measurement method recognizes only data movement type sub-processes. Further research is deemed necessary to incorporate data transform sub-process types into the measurement method. In the meantime, an approximation assumption is made such that each data movement is associated with a constant amount of data transformation. This assumption, which should be valid for most MIS, real-time and operating system software, is