Measuring complexity of SAP systems

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Abstract. The paper discusses the reasons of complexity rise in ERP system SAP R/3 and proposes a method for measuring complexity of SAP. A program in ABAP for measuring complexity of particular SAP implementation is proposed as a tool for keeping ERP complexity under control. Main principle of the measurement method is counting the number of items or relations in the system. The program is based on counting of records in organization tables in SAP.

Keywords: Complexity, ERP, SAP, measurement, information system, business.

1 Introduction

In this paper we state the related approaches to complexity and show that several methodologies used for ICT and information systems management don't handle the topic of complexity well. Then we discuss the complexity of SAP ERP system and the reasons for rising complexity in SAP implementations. Then we propose a method and a program for measuring complexity of ERP systems and describe a verification of the methodon a certain business case.

2 Related work on measuring complexity

A good theoretical basis for describing and exploring complexity can be found in the mathematical graph theory[1][2], which can be applied to some IS/ICT models to facilitate their quantification and subsequent comparison and, in some cases, even their simplification. Publications that come closest to the topic of business information system complexity deal with using metrics to measure complexity, such as information flow metrics, [3] Halstead's method or functional point analysis [4], or a simple number of source code lines [5]. There are also publications dealing with the impacts of complexity on system security and maintainability. Their objective is to adapt the MATra framework to describe certain aspects of complexity [6] and/or to point out the negative impacts of complexity on the business [5].

The topic of managing information system complexity is discussed, for example, by John Maeda in his book 'The Law of Simplicity', where he defines ten rules of simplicity. [7] ERP systems are specifically discussed in 'A Metric for ERP Complexity' [3], which counts process inputs and outputs and works with the concepts of in-

ternal and external module complexity, applying data flow complexity according to [8]. Best practices for simplicity of IS describes the book „Managing Complexity of Information Systems“[9].

The proposed SAP measurement method is a part of a general complexity management methodology being prepared by authors.

The important principle is to keep the managing complexity itself simple. The managing complexity including measurement should not bring another complexity, so it should be kept simple and simplified even at the expense of accuracy or precision. The reason for measuring complexity is to have a metric, which can measure not the actual absolute complexity of the system, but relative complexity in time or before and after a change, and which is therefore useful for managing complexity and keeping the system as simple as suitable.

When measuring system complexity, the first step is to select relevant content dimensions D and the IS lifecycle phase *f*, using which we wish to measure complexity. Let us designate their number as *d*. For dimension *i*in phase *f* we can define complexity $C_f(D_i)$ as the number of entities (elements and/or links) of its model.

Let us define system complexity C(S) as a sum of the complexities of each of its dimensions $C(D_i)$. Thus, complexity C of system S in phase *f* is the number of entities (elements and/or links) in the models of each of its content dimensions (D) selected in the given phase; *d* shall be the total number of dimensions considered.

$$C_f(S) = \sum_{i=1}^{d} C_f(D_i), \tag{1}$$

This formula (1) allows us to quantify the complexity of a system or its part, and in practice it can be used to compare various systems or solution alternatives that meet the given requirements, yet there is no objective criterion why one of them should be selected.

3 Complexity of SAP

In this paperwe research the SAP ERP information system in terms of complexity and use it as an example of how the complexity of an information system can be defined and calculated, what its causes are, and what impact system complexity has. We discuss the context of SAP complexity and propose simple way to measure it. Resulted measure is meant to be used to control unexpected complexity grow during several phases of information system lifecycle.

3.1 SAP systems and the growth of their complexity

The complexity of the SAP system is determined in part by the selection of the set of business processes that are to be supported by the system and also by which systems or modules are to be implemented and how.

3.2 Measuring the complexity of SAP systems

The complexity of SAP system changes over its lifecycle and if it is not specifically managed, it grows. To calculate it we use a program written in the ABAP programming language.

Which parameters influence the complexity of SAP systems? The complexity of the system grows during its customisation. The SAP system contains tens of thousands of customisation tables, the entries of which define the system's settings and determine its complexity. The basic setting that determines all the others is the company's organisational structure setting. Like all others it takes place in an SPRO transaction[1].

Program for complexity calculation. In order to calculate complexity, the authors created the program IHC_ORG (Identify High Complexity), which counts the entries in the relevant tables (here the tables that determine the settings for the enterprise structure) and at the same time aggregates them according to individual SAP modules. The result of the program is a single number which counts items in selected tables, or possibly set of numbers sorted by SAP modules to which the tables primarily belong. The program can be launched for one or multiple clients of the given system and then their complexity can be compared.

Evaluation. The method, the program and its usage was evaluated in a case study of division of one industrial company in Germany (Company A), which was divided to two companies (Companies B and C), of which one (C) was merged with other one company (D). The result is described in a study (not yet published, in review process). The resulted measure was used to manage and decrease resulted organisation structure complexity of ERP re-implementation. The Fig. 1 shows the result of measuring complexity of SAP systems of companies C and D.

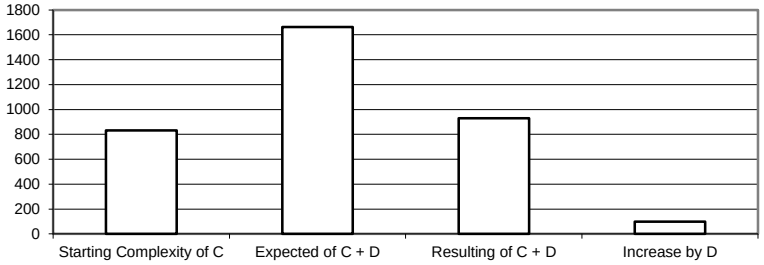

Fig. 1. Organization structure complexity of the SAP system in Enterprises C and D

[1]SPRO – a four or more digit code used when working in SAP by which the user directly launches the given transaction (application) without having to click through what are often several levels of menus.

4 Conclusion

We discussed the context of complexity in SAP systems, proposed a method for measuring complexity of running SAP R/3 ERP systems, and implemented the method in a software. The complexity of SAP systems is influenced by extension of SAP R/3 system by other systems and by duplication functionality and data structures outside the core ERP system. The simple measurement method can count selected items in the system from a chosen dimension, which brings a tool for observing complexity in time and during changes and for reducing complexity and keeping the system as simple as possible.

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