

# SOFTWARE DEVELOPMENT PROGRAM CHARACTERISTICS

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## Abstract

Important information and communication technology (ICT) related projects fail too often. Less than 20 % of software development projects of large organisations succeed; that is, they were delivered in time and in budget; according to Standish Group's CHAOS reports [3.].

The author, together with his colleagues [1.], developed a Characteristics Analysis method and a MS Excel® based tool to support use of the method. The intended users of the tool are the ICT development program managers within the customer organisation. The result of the Characteristics Analysis is a recommendation for different ICT project types needed to subdivide large or complex ICT programs. In this paper, the author first introduces the seven ICT project types, and then the method for analysing the characteristics of an ICT development program.

At the end of the paper is a brief experience report illustrating the use of Characteristics Analysis and the seven ICT project types.

**Keywords: project types, software development, portfolio management**

## Background

Information and communication technology (ICT) has become more and more ubiquitous in the modern world. As developers, we have learned to develop large and very complex ICT systems, which often may be integrated with several other systems. Today's ICT development programs are larger and more difficult to manage than ever before.

The International Software Benchmarking Standards Group ([www.ISBSG.org](http://www.ISBSG.org)) and the Finnish Software Measurement Association ([www.FiSMA.fi](http://www.FiSMA.fi)) have both been very successful in collecting software project data since early 1990s. The data of both repositories clearly show that the simpler and better defined are the projects, the more productive and successful is the development [2.].

If the originating organisation cannot figure out the characteristics nature of their starting ICT development program, they usually launch only one complex, single project. The software supplier, i.e. the project organisation, can't see the danger this poses to program success, even when they should. They typically think: "the bigger the deal, the better for us", and decide to take the challenge of delivering a complex program as a single monolithic project. This is how the worst ICT projects get started. In most of these cases, the project fails both in time and in cost management, or delivers unacceptably low quality systems, or all of the above.

The need for better measurability and controllability comes from the originating organisation. If the customer wants their ICT programs to succeed, they must see the value of and be capable to split large ICT development programs into several smaller projects. The natural division should be based on the different ICT project types, and the characteristics of the development program that is being started. In addition to project types the subdivision into projects may be based on technical and architectural aspects.

### **ICT Project Types**

Sometimes, but not very often, an ICT development program can be run as a single project. More often, however, a program consists of multiple different project parts demanding a different type of project management. The practice has proven that, for example, software package configuration needs to be managed differently than customer specific software development. The differences between the different types of projects lies in how they manage specific components of the project, such as planning, risk management, etc.

It is difficult to find any organisation having good business rules for subdividing ICT programs into independent and standalone development projects. The situation typically is that one large development program is started as a single project and later subdivided when management problems begin to occur. The authors became convinced through actual workshops that if the program is not compact and easily managed, it becomes critical to divide it into several ICT projects.

It is important to divide an ICT program into multiple ICT projects and subprojects already in its initiation phase. The following rules provide guidance about how to do it:

1. If the program consists of ICT development and other development work, such as manual process development, re-organising staff or technical development, different type of work should be assigned to separate projects.
2. If you apply an incremental or iterative development approach, every increment or iteration should be assigned to a separate project.
3. Different types of ICT development work should be assigned to separate projects.
4. If the program must be stopped consciously for long time, for example to wait external decisions, the work before and after the break should be assigned to separate projects.
5. If two parts of product or service development are of a similar ICT project type but differ from each other by development technology, they should be assigned to separate projects.
6. If two parts of product or service development are of a similar ICT project type but differ from each other by development environment, they should be assigned to separate projects.
7. If two parts of product or service development are of a similar ICT project type but differ from each other by development team experience, they should be assigned to separate projects.
8. If two parts of product or service development are of a similar ICT project type but differ from each other by quality requirements of target result, they should be assigned to separate projects.
9. If two parts of product or service development are of a similar ICT project type but differ from each other by stakeholder dependencies, they should be assigned to separate projects.

10. If two parts of product or service development are of a similar ICT project types but differ from each other by risk level, they should be assigned to separate projects.

As we see from the number of rules above and the number of different possible combinations, this approach leads to a larger number of smaller projects. As such, this approach has a number of pros and cons. One of the biggest pros is improved manageability, which is so important to program and project success that neither the customer nor the supplier should resist it. In our project management book [1.], we identified seven distinct ICT project types, which are listed in Table 1. The definitions of each project type follow the table. Table 1 also identifies a four character technical abbreviation, which is only used to facilitate statistics collection and tool data entry. Due to the proliferation of abbreviations in ICT industry, we recommend the use of the full ICT Project Type classification for identification and project management.

1. Customer specific new development project	CUST
2. Software product new development project	PROD
3. Software version enhancement project	VERS
4. ICT service development project	SERV
5. Package software configuration project	PACK
6. Data conversion project	CONV
7. Software integration development project	INTG

Table 1. ICT Project Types and Abbreviations

It is possible and even probable that information and communication technology products or services are developed in such projects that do not match this classification. However, we decided to stay with the seven project types because they were the most important groupings for distinguishing the projects within the organisations involved in the writing of the book [1.].<sup>1</sup>

#### **1. Customer specific new development project**

Is a project to create a completely new customer specific software.

#### **2. Software product new development project**

Is a project to create a new software product. A software product is always developed to be used by more than one customer. A software product may be either an independent packaged software or embedded part of any other product.

#### **3. Software version enhancement project**

Is a project to create a new version of an existing software. The existing software may be either customer specific software or a software product.

#### **4. ICT service development project**

<sup>1</sup> While the seven project types may not be identical to those you might use in your organisation, there were twelve major organisations across a range of industries representing both the public and private sectors, and from both the customer and supplier sector.

Is a project to create a contract-based continuous or temporary ICT service. The service may be, for example, either software or hardware related, and consists of maintenance, support, help desk, or operating service.

#### **5. Package software configuration project**

Is a project where the result is an installed, parameterized and, user configured software package.

#### **6. Data conversion project**

Is a project where data is moved from persistent data storage of one information system to persistent data storage of another information system. The software developed in a data conversion project is often “throw away” in that it is only used once. Even so, the pieces of conversion software may reside on one or more hardware platforms.

#### **7. Software integration development project**

Is a project to create software that provides interfaces services between two or more information systems.

The reader will note that in the book [1.] and in this article we do not consider requirements specification, software implementation or system test as independent ICT project types, but rather as phases of the ICT project itself. It is typical that every ICT development program consists of feasibility study, several development phases from requirements specification through to installation, and one or more software roll-out / deployment projects.

Feasibility studies and system roll-outs are very often managed as projects, but the focus in these projects is more on business process improvement than on developing an ICT product or service. For this reason, neither the feasibility study or system roll-out phases (including user training) are considered as ICT project types.

Most often an ICT development program also includes other projects, in addition to the seven ICT project types introduced above. When we consider the possible combinations of ICT project types that an ICT program can contain, it is not feasible to begin creating names for such combinations. However, in practice there may be need to refer to common ICT program names.

We resolve this issue of common ICT program names by specifying a program based on the most value-added or dominant ICT project type within it. We can talk about Packaged Software programs when the most important and visible result will be the implementation of packaged software. A New Software Product program would be the applicable name when software product new development is the dominant ICT project type.

### **Characteristics Analysis**

When the development board of an organization makes a decision to start a new ICT development program, it is important to know what are the goals, the concrete results to be created, and how the development work will be accomplished. Usually the program

proposition document presents high level concepts to gain management approval for the program, but it inadequately addresses the level of detail required to proceed with the project. An additional feasibility study is often needed to clarify the pre-requisites and constraints associated with the actual development of the ICT program.

We have created a tool called “Program Characteristics Analysis” for business development managers and members of development boards. With this tool we can ensure that the ICT program is manageable and consistent by its different goal content and development approaches. The result of characteristics analysis is a recommendation of how to split the ICT program into ICT projects, or at least what types of projects there are within the program.

The inputs for the characteristics analysis are the program proposition document, the knowledge and experience from prior development programs, and the requirements of the program portfolio. The characteristics analysis method consists of thirty questions related to the contents of the development program. When the members of the development board are answering these questions, they must consider the goals, results, context, and specific requirements of the development program. The questions are either positive or negative statements for which their applicability to the program (correctness) will be evaluated. The tool has been implemented as an MS Excel® worksheet with automatic tabulation based on decision rule sets. Table 2 depicts typical examples of the questions in the characteristics analysis tool.

Question/statement	0=Fault, not true 5=Exactly true						
	0	1	2	3	4	5	N/A
The result of the project will be run on several different IT environments.						x	
The customer is not willing to manage or operate the target platform.					x		
The data of current information system will not be used in the target information system.	x						

Table 2. A sample of statements of program characteristics analysis (N/A = not applicable question or “don’t know”)

Use of the characteristics analysis ensures that when we are initiating a project within the program, we understand the “big picture” for the program and its composite ICT project parts. If there are too many types of ICT projects within a program, the risk level may be too high and it may make sense to subdivide and re-scope the program into multiple programs.

Another objective for the characteristics analysis is to reach consensus and establish a common understanding about the desired results and context for the projects within the ICT program. This common understanding has a direct relationship on the steering and management practices, the commitment of stakeholders, and the ultimate realization of program benefits.

In addition to the aforementioned results, we obtain valuable advice about how to split the program. The results of the characteristics analysis illustrate the volume of each ICT project type in the particular development program. Figure 1 graphically depicts results of applying the characteristics analysis on an example ICT program.

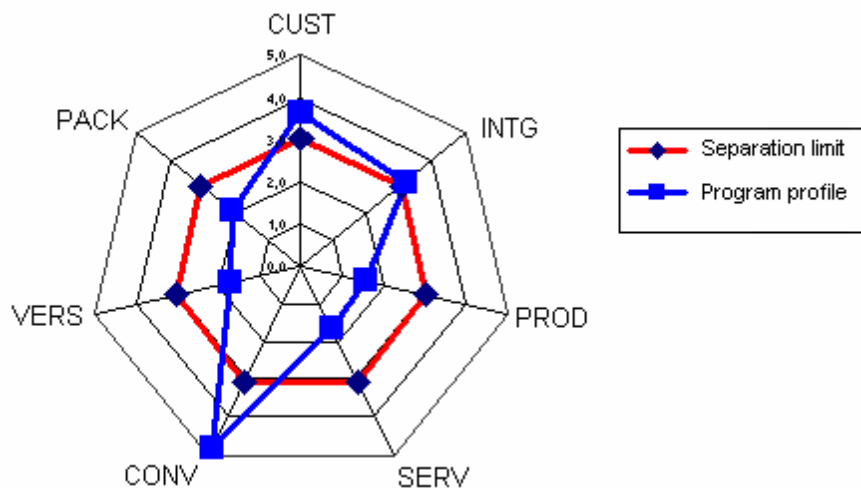


Figure 1. An example of characteristics analysis.

The profile marked by squares shows the volume of each ICT project type in the program. The other profile marked by diamonds shows the hybrid limit. If there is more than one project type exceeding the hybrid limit the program should be subdivided into multiple projects.

The ICT program type in figure 5 is clearly Data Conversion (CONV), but there are plenty of features present that involve Customer Specific New Development (CUST) and Software Integration Development (INTG). Confronted with these results, the development board must then consider whether or not to subdivide the program into three composite ICT projects, or whether to commence with only the Data Conversion project type, trying to apply rules of sound project management. It is the recommendation of the authors to split such a program into its composite ICT projects.

### First Experiences of Use

The Characteristics Analysis method introduced above is rather new. It was published less than 12 months ago. That's why most of the experiences so far come from different training events that the authors and the Finnish Information Processing Association FIPA have organised. However, the cases analysed during those training events have always been real development programs from the companies of the trainees. Without exceptions the owners of cases have been positively surprised, and recognised some of the recommendations very useful.

Some project management consultants and Scope Managers [4.] are already encouraged to use the method in consulting. The software project data collection at FiSMA will benefit from the

seven ICT project types, starting to get better specified data in future than so far. The increased quality of project data will improve all decision-making, estimating and benchmarking processes based on it.

The seven defined ICT project types seem to cover the business needs for project classification rather well. FiSMA organised a small survey among its member organisations in the autumn 2005, asking the annual numbers of different types of starting ICT projects. The results are presented in Figure 2. Interestingly all the project types were represented, and the amount of different combinations was very small. Of course the FiSMA member organisations don't represent the whole industry, but the result was interpreted to be promising anyway.

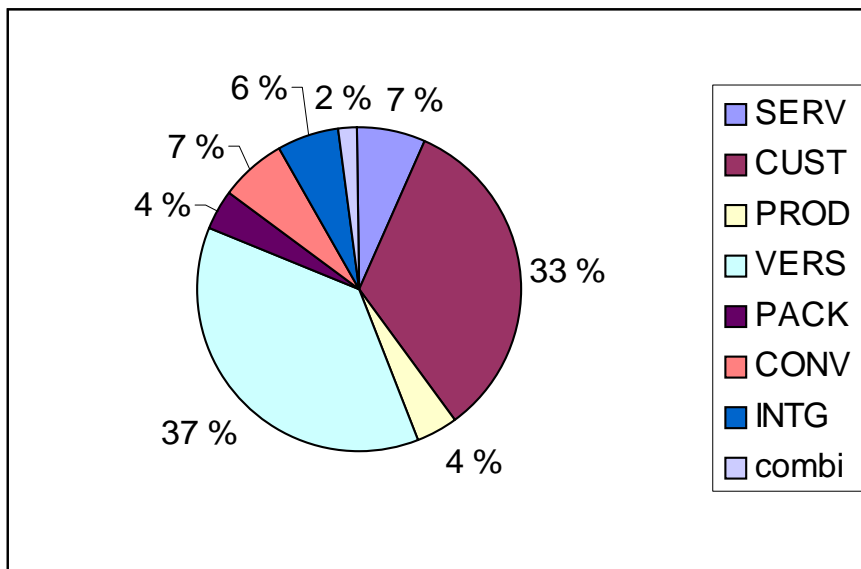


Figure 2. The ICT Project Types of FiSMA in 2005

We look forward to get more feedback and research results in future, so that we can improve both the project type definitions and the Characteristics Analysis method, to better serve the management of ICT development.

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