

Process assessment: the BOOTSTRAP approach (18 citations in Feb. 2013)

G R Koch (1993)

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Group B

Introduction

The writer of the process assessment paper is Günter Koch. He was born on the 4th of June 1947 in Germany and is now a professor at the Graz University of Technology. In his career, he has made over 100 publications on multiple topics (Execupery, sd.).

As stated by Koch (1993), the BOOTSTRAP approach is a method which main goal is to provide an advanced process assessment methodology in order to get an organization to another and better level. The method has been funded by the European Commission within the ESPRIT program and is monitored by the BOOTSTRAP Institute to continue the development and promotion of the BOOTSTRAPs method (Dublin City University, sd.).

The BOOTSTRAP method provides instruments for problem identification, i.e. for precisely describing where an organization currently stands and what gradual changes are necessary. The BOOTSTRAP assessment focuses on the processes of a software engineering/producing unit (SPU) and is carried out in three steps (Koch, 1993). These steps are shown in Table 1. The first step (1a, 1b) defines the target organization, the SPU. The next step (2a, 2b) of the assessment measures the maturity of SPU. The last step (3) helps the organization in getting to another level.

Stages		Steps	In order to
1	a	The target area of interest	Define the scope of the assessment
	b	The structure and behavioral description	Model the processes of the targeted SPU
2	a	The scaling of the organization	Rank process oriented software engineering organizations
	b	Metrics for 'measuring' the organization	Measure the (quality) maturity level to discover strength and weaknesses of the SPU and make a profile of it
3		The process of changing the organization towards a 'better' state	Gradually change an organization by change of management

Table 1 Process of the BOOTSTRAP method with the used instruments (Koch, 1993)

As stated by Koch (1993) in the paper, BOOTSTRAP defines attribute trees to cover three major aspects: Organization (O), Methodology (M) and Technology (T). The aspects include 17 key attributes and are prioritized as follow: O > M > T. The quality attributes of the aspects are measured by means of the questionnaire, which is taken in step '2b' of the BOOTSTRAP method.

Related literature

The BOOTSTRAP method uses multiple models in order to make an assessment of an SPU (Kuvaja et al., 1993).

Instrument used
Classical software life-cycle model (ESA)
Five level capability maturity model (SEI)
Questionnaire (based on the ESA model)
Kaizen

ESA - The classical software life-cycle model is used in the BOOTSTRAP method to model the software development as a linear flow of activities, which form the life-cycle (ESA, 1991). The ESA model is used in step '1b', where the processes of the SPU are being modeled.

Next to that, the standards of the ESA model play a major role in the structure of the questionnaire, which is assessed in step '2b' in order to make a strength and weaknesses profile of the SPU.

SEI - The five level capability maturity model (CMM) was designed to help developers to select process-improvement strategies by determining the current process maturity (Paulk et al., 1993). The CMM in the BOOTSTRAP method is used in step '2a' in order to rank the maturity level of an SPU.

Kaizen - The Kaizen style of changing the SPU is used in the last step of the BOOTSTRAP method. It helps gradually changing the organization by focusing on the people of the company (Huda et al., 1992) (Feldman, 1992) in a cyclic way (Koch, 1993).

As stated before, the BOOTSTRAP Institute has been established to make sure that the BOOTSTRAP method keeps developing. As an example, the attributes for assessing process maturity continued to evolve (Haase, 1994).

Next to that, the BOOTSTRAP assessment model was updated to align with the ISO 12207 life-cycle. The ISO 12207 life-cycle is a more complete model to describe the processes of an SPU (Kuvaja, 1999).

The BOOTSTRAP method modeled

The BOOTSTRAP method will be modeled in this section. The different steps and deliverables of the method are elaborated in a so-called process-delivery diagram (PDD). The PDD is a notation created by Weerd and Brinkkemper (2008) to show processes and deliverables of a method. The method will be shown as a diagram. However, the elements within this diagram will be further elaborated in separate subsections.

Process-Delivery Diagram

The PDD of the BOOTSTRAP method in Figure 1 has been created using the PDD notation (Weerd and Brinkemper, 2008).

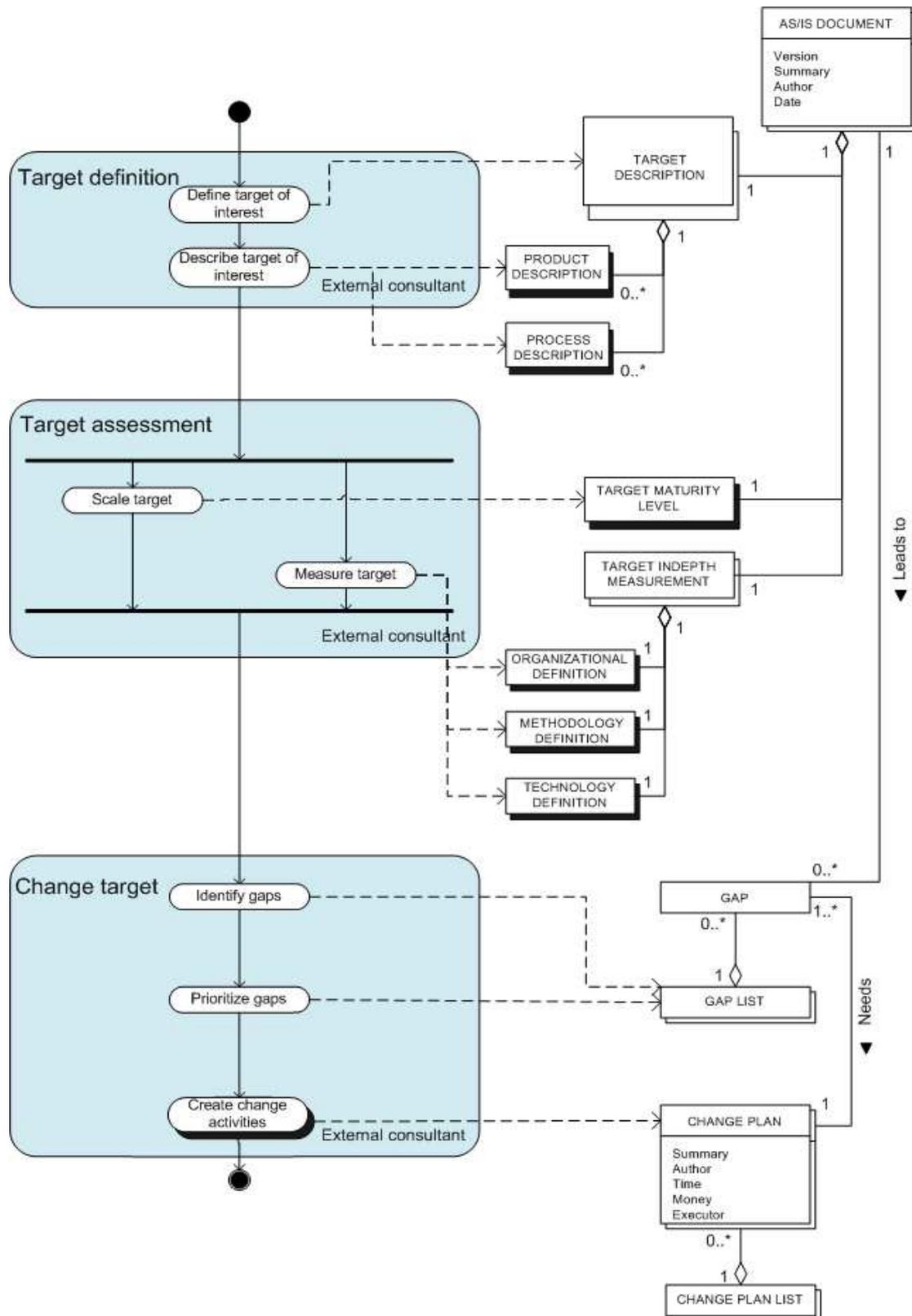


Figure 1 PDD of the BOOTSTRAP method

Activities

The activity elements in the process-delivery diagram of the BOOTSTRAP method in Figure 1 are described in Table 2.

Activity	Role	Sub activity	Description
Target definition	External consultant	Define target of interest	Define the scope of the assessment.
		Describe target of interest	Model the products and processes of the target. The products and processes are described using the ESA model (ESA, 1991).
Target assessment	External consultant	Scale target	Rank process oriented software engineering organizations. This ranking is done with the help of the five level capability maturity model. The model is designed to select process-improvement strategies by determining the current process maturity (Paulk et al., 1993).
		Measure target	Measure the (quality) maturity level to discover strength and weaknesses of the SPU and make a profile of it. This is done by means of interviews. The questions in the interview are based on and structured by the ESA model (ESA, 1991), but are elaborated in the BOOTSTRAP method.
Change Target	External consultant	Identify gaps	Based on the AS-IS assessment, the target organization is able to identify its gaps.
		Prioritize gaps	It is necessary to handle the right gaps in the right order at the right time to get to the next level of maturity.
		Create change activities	A change plan has to be created to gradually change the targeted organization to the preferred maturity level. The change activities are made with the model of Kaizen (Huda et al., 1992) kept in mind.

Table 2 Activities of the BOOTSTRAP method

Concepts

The concept elements in the process-delivery diagram of the BOOTSTRAP method in Figure 1 are described in Table 3.

The template, which can be found in the Appendices, is created for the concepts "GAP", "GAP LIST", "CHANGE PLAN", and "CHANGE PLAN LIST".

Concept	Properties	Description
PRODUCT DESCRIPTION		A description of all the products that are created by the target organization.
PROCESS DESCRIPTION		A description of all the processes that are carried out by the target organization in order to get the products.
TARGET DESCRIPTION		All the relevant information (history, culture,

		products and processes) are put together in this concept.
TARGET MATURITY LEVEL		This concept holds the information about the maturity of the organization.
ORGANIZATIONAL DEFINITION		An indepth definition of the organizational structure of the targeted organization.
METHODOLOGY DEFINITION		An indepth definition of the methods used in the targeted organization.
TECHNOLOGY DEFINITION		An indepth definition of the technologies that are used in the targeted organization.
TARGET INDEPTH MEASUREMENT		A combination of the organizational, methodological, and technological definition.
AS/IS DOCUMENT	Version Summary Author Date	Based on all the information, this document is created in order to see where the targeted organization currently resides.
GAP		The gap between the AS-IS and the TO-BE situation that is identified for the targeted organization. (Appendix I)
GAP LIST		A list of all the gaps of the targeted organization. (Appendix I)
CHANGE PLAN	Summary Author Time Money Executor	A plan that has been made based on the assessment in order to change to another level. (Appendix I)
CHANGE PLAN LIST		A list containing all the change plans that have been made based on the assessment. (Appendix I)

Table 3 Concepts of the BOOTSTRAP method

Example

A software oriented organization is needed in order to commence the BOOTSTRAP method. As an example the organization *Xample* will be used throughout this section. The first step is to define *Xample*. What is the area of interest and what are its characteristics, i.e. goal, mission, vision, structure, processes, etc.

The next step is to measure the maturity, and make a strength and weaknesses profile of *Xample*. This will be done with a questionnaire. The first stage focuses on the overall maturity level of the SPU. This will be done by scaling the O, M, and T aspects with the SEI model. The second stage focuses on the 17 key attributes.

After the analysis is done, the result can look like the result in Figure 2.

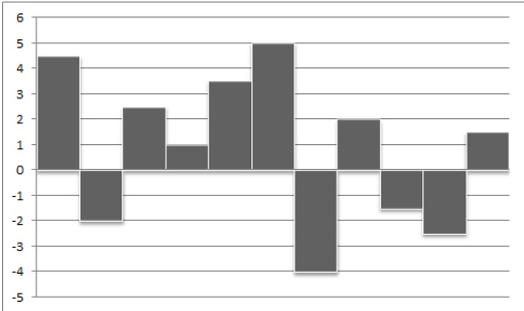


Figure 2 Example results of a sample profile

As an example for *Xample*, Figure 2 will be used. It is clear from the figure that the majority of the attributes are positive, however, *Xample* needs to deal with the few negative attributes in order to grow. The attributes in the histogram with the lowest score will have the highest priority to be dealt with. This will result in Figure 3.

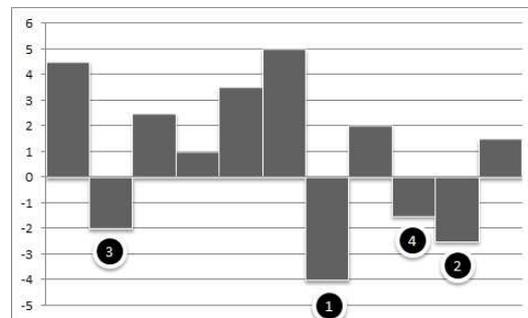


Figure 3 Example prioritized result

Based on the prioritized result, the BOOTSTRAP method allows setting up a course with well-defined actions to bring the SPU, in the example case *Xample*, to another level.

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Appendix I – Template

Aspect	Category	Area	Focus	Maturity level		
Organization			Business Engineering			
			Human Resource Management			
			Infrastructure Management			
Methodology	Life Cycle Dependent		System Requirements Analysis			
			System Architecture Design			
			Software Requirements Analysis			
			Software Architecture design			
			Software Detailed Design			
			Software Implementation & Testing			
			Software Integration & Testing			
			System Integration & Testing			
			Maintenance			
			Migration			
			Retirement			
			Life Cycle Independent	Management	Project Management	
		Quality Management				
		Risk Management				
		Subcontractor Management				
		Support			Documentation	
					configuration Management	
				Quality Assurance		
				Verification		
				Validation		
				Joint Review		
					Audit	
					Problem Resolution	
				Customer supplier	Acquisition	
					Customer Need Management	
					Supply	
					Software Operation	
					Customer Support	
		Process-Related		Process Definition		
			Process Improvement			
Technology			Technology Innovation			
			Technology Support for Life Cycle Processes			
			Technology Support for Life Cycle Independent Processes			
			Tool Integration			

Table 4 Maturity levels



Graph 5 Maturity levels

Priority	Action	Money	Time	Executor
1	descriptive action	xx,xx	x days	function or department
2	descriptive action	xx,xx	x days	function or department
3	descriptive action	xx,xx	x days	function or department
4	descriptive action	xx,xx	x days	function or department

Table 6 Priorities