

# A Sensitivity Analysis Approach to Select IT-Tools for Global Development Projects

International Conference on Global Software Engineering, ICGSE, Munich, 27.08.2007



**Céline Laurent, E-Business and Partner Integration**

In collaboration with:

Prof. Broy, TUM, Munich

**BMW Group**



# Introduction

## Agenda

### 1. Introduction

- **Context of work**
- **The methodology: global concept**

### 2. Sensitivity analysis

- **What is a sensitivity analysis?**
- **Description of the data used**
- **Application to the selection of IT-tools for global development projects**

### 3. Case Study

### 4. Conclusion

# **Introduction**

## **Context of Work**

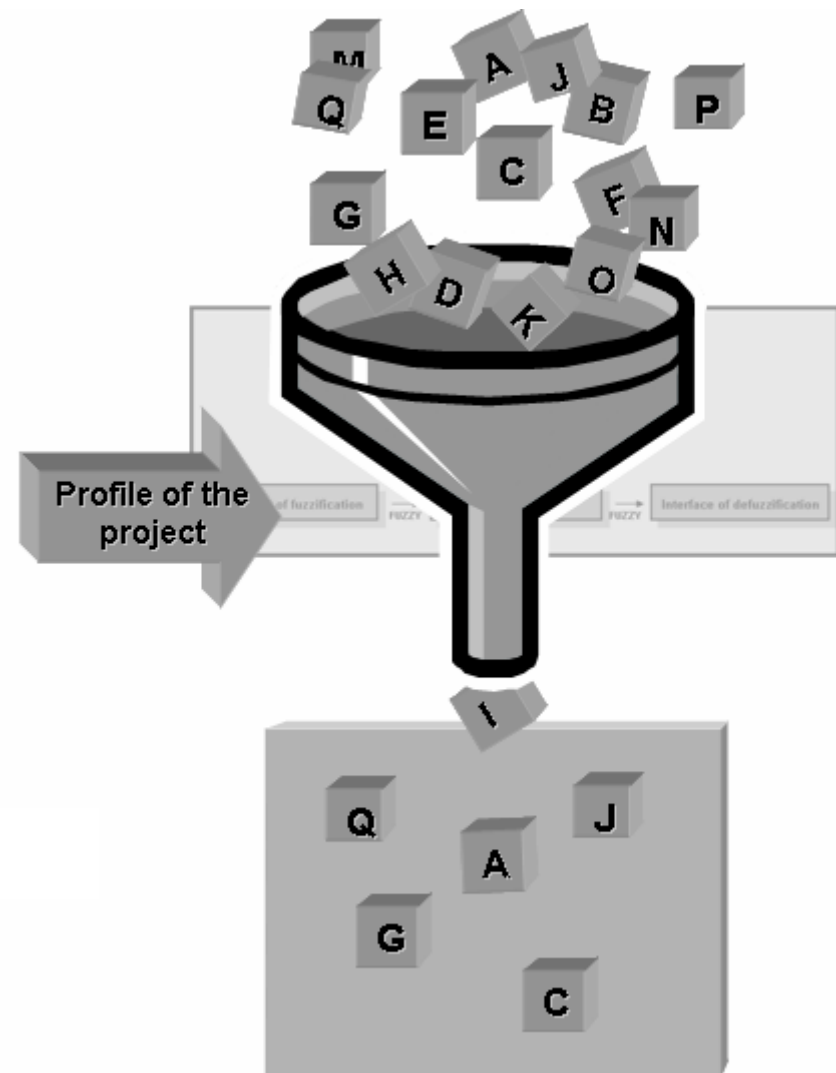
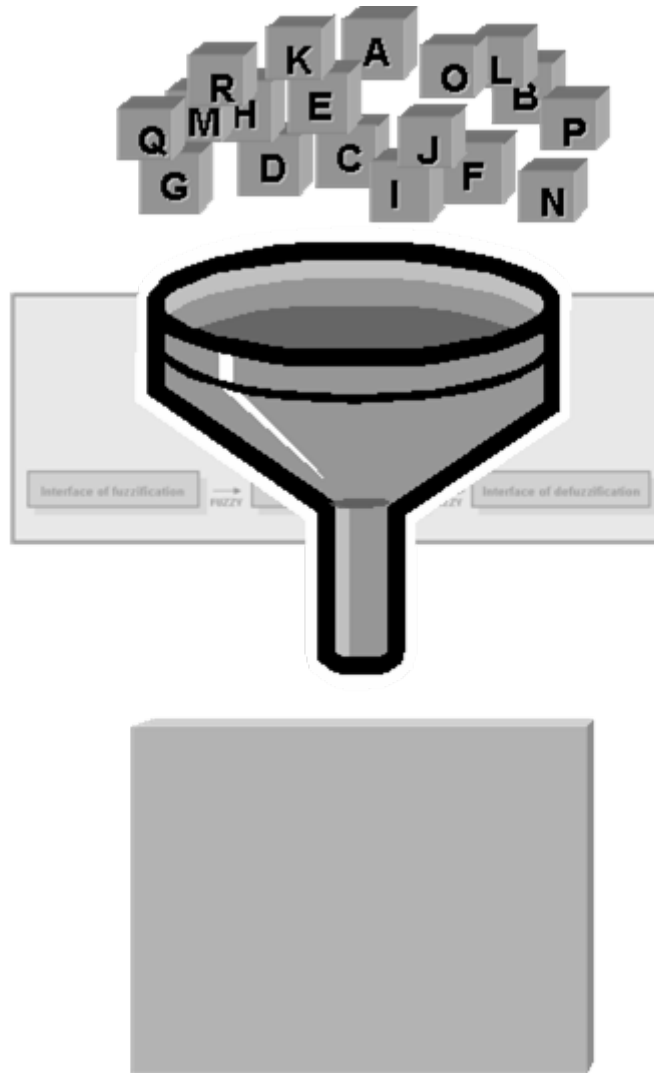
**Providing a methodology to select IT-tools for global development projects**

**The methodology to be developed has the following characteristics:**

- It considers aspects of global projects such as: distribution of locations, language, interdisciplinarity, etc.**
- It is independent from the processes to be followed in the project.**
- It helps in defining requirements on collaboration software.**

# Introduction

## The Methodology: Global Concept



# Introduction

## The Methodology: Global Concept

- **The project profile is given by influencing factors of distributed and interdisciplinary projects.**
- **It considers standard IT-tools: Groupware, CSCW, etc. such as project management systems, online-conferencing, forum, etc.**
- **Every factor has been formalized with the help of Fuzzy Logic.**
- **The rules are based on an own made empirical study relating the influencing factors to the IT-tools.**
- **The weight of the influencing factors for the selection of each IT-Tool is determined by a sensitivity analysis.**

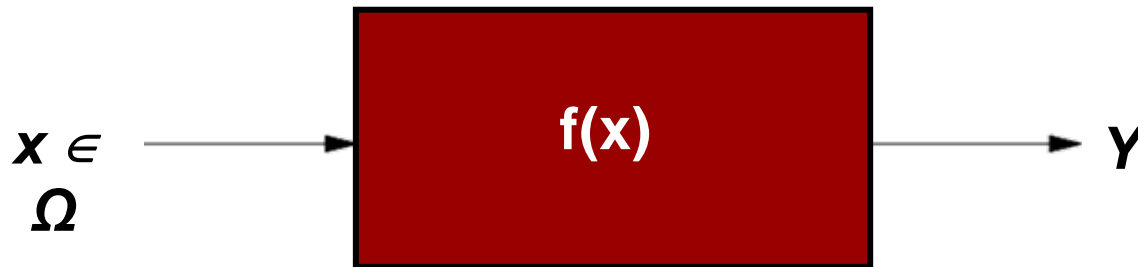
# Sensitivity Analysis

## What is a Sensitivity Analysis?

**Sensitivity analysis is the study of how the uncertainty in the output of a model can be attributed to different sources of uncertainty in the model input.**

**In other words:**

**How do the input parameters ( $x \in \Omega$ ) influence the output values ( $Y$ ) ?**



# **Sensitivity Analysis**

## **What is a Sensitivity Analysis?**

### **Possible applications:**

**Factor Fixing: which factors are not relevant for the output and thus could be removed?**

**Factor Prioritization: which factors have the most impact on the output?**

### **Realization:**

**Generation of random samples with the sensitivity analysis tool Simlab.**

# Sensitivity Analysis

## Description of the Data Used

Type	N°	Factor	Possible Values		
CEE	1	Cooperation partners	2	2 --> 5	>5
	2	Location	Same Location	Same company	Other country
	3	Skill level in the agreed language	Insufficient	Satisfying	Excellent
	4	Type of engineering process	Parallel	Sequential	
	5	Organisation and company's culture	Same Business Unit	Same company	Other company
	6	Size of the organisation	Small	Middle	Large
	7	Intensity of collaboration	Low&irregular	Integrated	
	8	Distribution model	Equal	Unequal	
	9	Number of interfaces	Low	Average	High
	10	Access to data	Very Difficult	Difficult	Easy
	11	Skill level in the use of IT	Low	Average	High
	12	Influence of time	Sufficient	Insufficient	
	13	Methods and instruments	Same	Different	
CDE	14	Vocabulary	Same	Different	Contradictory
	13	Methods and instruments	Same	Different	
	15	Standards and laws	Same	Different	
	16	Dependencies on own domain	Yes	No	

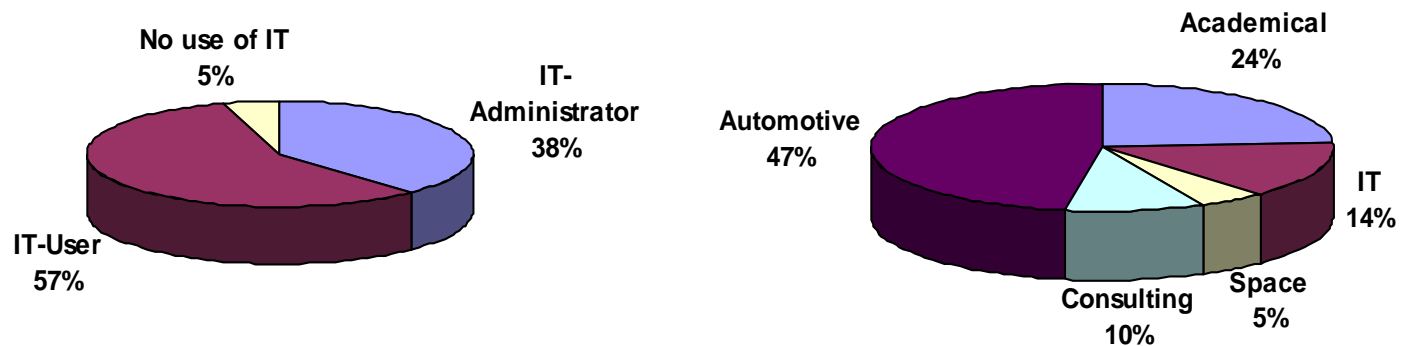
Factors from the classification system of Gierhardt et al. and the empirical work of Hartmann

# Sensitivity Analysis

## Description of the Data Used

Data collected by asking experts of cooperation projects in each kind of engineering domain to answer the following question:

Which IT-tools would you select to support specific forms of global development projects?



•18 IT-tools have been rated regarding 16 influencing factors

Example of question:

If you are working with only 1 cooperation partner, would you like to use a document management system:

Yes

No

Possibly

# **Sensitivity Analysis**

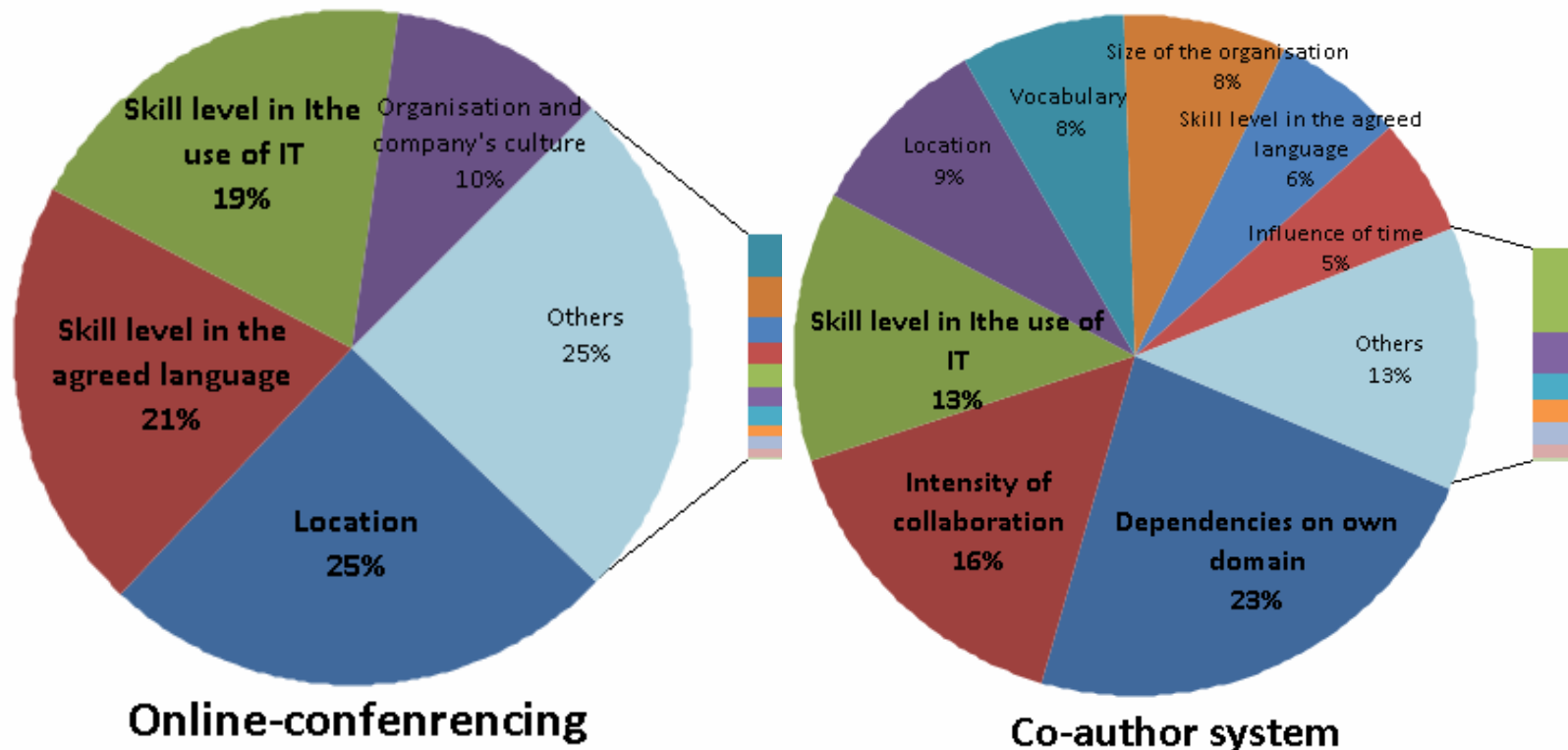
## **Application to the Selection of IT-Tools for Global Development Projects**

- 1. Use of any simple model which uses each factor once, and with the same weight to determine the factors having more impact.**
- 2. Generation of samples using value sets derived from the results of the expert survey.**
- 3. Identification of the factors which have the most impact.**
- 4. FP: Creation of a ranking of the factors for each tool separately.**

# Sensitivity Analysis

## Application to the Selection of IT-Tools for Global Development Projects

Each tool has its own characteristics and their selection does not depend on the same boundary conditions of global development projects.



# Case Study

## Engine Development at BMW

N°	Factor	Input
1	Number of cooperation partners	2 partners
2	Location	Other country
3	Skill level in the agreed language	60%
4	Type of engineering process	9/10 tasks
5	Organisation and company's culture	Other company
6	Size of the organisation	All > 1100 employees
7	Intensity of collaboration	50%
8	Distribution model	50/50%
9	Number of interfaces	12
10	Access to data	1/5 (0=very difficult)
11	Skill level in the use of IT	20%
12	Influence of time	70% (time remaining)
13	Methods and instruments	40%
14	Vocabulary	40%
15	Standards and laws	90%
16	Dependencies on own domain	70%

- **E-Mail system**
- ~~Instant messaging~~
- ~~Online-Conferencing~~
- ~~Chat room~~
- **Whiteboard**
- ~~Forum~~
- ~~Document management system~~
- ~~Knowledge management system~~
- **Electronic calendar**
- **Project management system**
- ~~Workflow system~~
- ~~Social software system~~
- ~~Problem solving system~~
- ~~Co-Author system~~
- **Online-Translation**
- ~~Requirement, change management tool~~
- ~~Discipline specific tool~~
- ~~Electronic Meeting System (EMS), Group Decision Support System (GDSS)~~



# Conclusion

- **Easy evaluation of the IT-tools for a specific project by considering only the relevant factors.**
- **Quick sort out of a set of IT-tools appropriate for specific project configurations.**
- **Simplification of decision-processes in the user requirement phase of collaborative-software.**
- **No time-consuming analysis of the project and its processes to select the right set of IT-tools.**
- **Quick-start of global development projects possible with the appropriate IT-support.**

# Thank you for your attention.



Céline Laurent

BMW Group

mailto: [Celine.Laurent@bmw.de](mailto:Celine.Laurent@bmw.de)