ANNALS of the ORADEA UNIVERSITY.

Fascicle of Management and Technological Engineering, Volume VII (XVII), 2008

THE ANALYSIS OF EXISTENT INTERACTIONS WITHIN THE DESIGN PROCESS

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Keywords: design process, design interactions, design tools and methods

Abstract: The design is the first stage of the product life-cycle. Starting from the customer's requirements during this stage, the functional and the structural defining of product is carried out. The unfolding of design process and the quality of the product are influenced by a lot of factors. This paper presents an analysis of the existent interactions during the design process. A typology of interactions was realized and then has been analysed the following: the interactions between the participants at the design process; the interactions between participants and tools; the interactions between methods; the interactions between the participants and the similar solutions.

1. INTRODUCTION

In the first part of this paper, a study of the interactions between participants is presented to show the mechanism of interactions in the design process.

In the second part of the paper, are presented the interactions between participants and tools, methods and the similar solutions.

In our work we have analysed a design experiment.

The design experiment was made at the University of Piteşti, Faculty of Mechanical Engineering, Department of Technology and Management, in the laboratory of integrated design, by a team made up of seven designers, one expert and the project leader. The goal of the experiment was to design a quick gripping system of the pieces on the table of a machine-tool.

The experiment needed more meetings and during all these the designers worked synchronically and collectively. The methods and the devices they used were specific to the design, as follows: computer software, calculus models, transmission devices, information processing and registry, data base, drawings, standards.

The objective of our work is to study the interactions using a qualitative analysis in order to understand how and why interactions occur in the design process. The different forms of interactions as they occur in practice are identified.

This investigation will help us in the classification of interactions in order to distinguish their impact on the design process performance.

2. THE INTERACTIONS IN DESIGN PROCESS

2.1. The interactions between participants

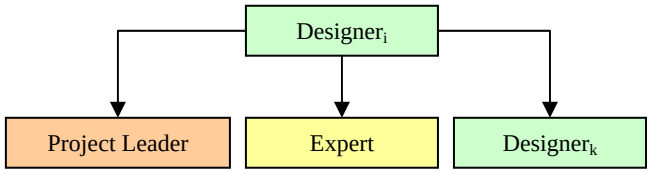
In the design process, to obtain certain solutions or information, the participants collaborate in different ways and by different technique.

In our study we used a team with three types of participants:

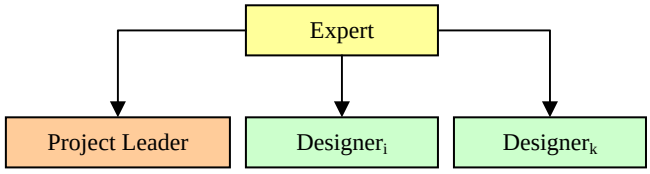
PL- project leader; D- designer; E- expert.

The participants change information, texts, drawings, and computer data by different ways, [1].

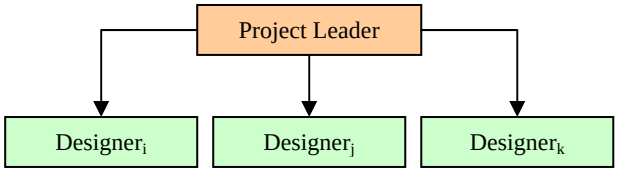
In figure 1 we are showing all the possible interactions between the participants.



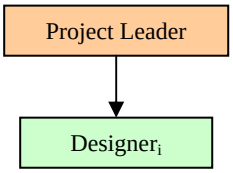
a) An Designer can launch an idea of application to the Team Leader, to an Expert and to the others Designers



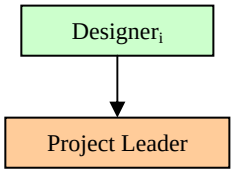
b) The Expert takes the initiative to directly propose an idea of application to the Team Leader and to the Designers



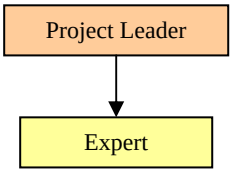
c) Co-ordination, transmission of information's, request



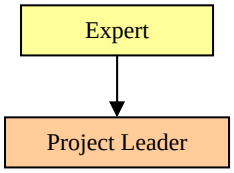
d) The Team Leader ask for a solution to the Designer



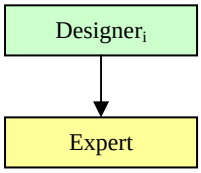
e) The Designer propose a solution to the Team Leader



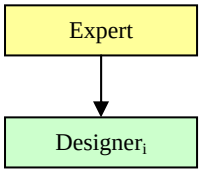
f) The Team Leader ask for a solution to the Expertr



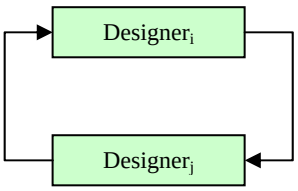
g) The Expert propose a solution to the Team Leader



h) The Designer propose a solution to the Expert and ask him an answer



i) The Expert propose a solution to the Designer



j) Collaboration between designers

Fig. 1. ***The interactions between the participants***

2.2. The interactions between participants and tools

During the design process, the participants are in contact with several tools. These tools are used to communicate, to make calculations, to simulate behaviour of a part etc, figure 2.

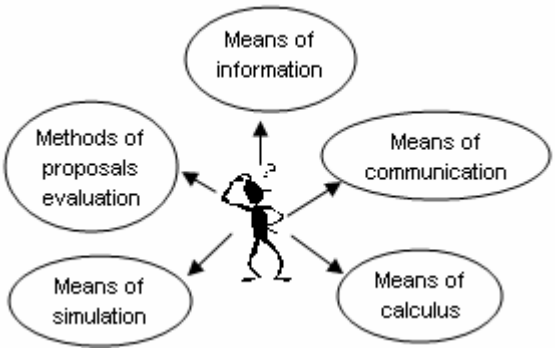


Fig. 2. ***The interactions between the participants and tools***

2.3. The interactions between participants and methods

According to *John Jones* [3], the principal methods of design are classified in:

- Prefabricated strategies (convergences);
- Strategy of control (convergences);
- Exploration of the design situations (divergences);
- Research of ideas (divergences and transformations);
- Structures of problem exploration (transformations);
- Evaluation method (convergence).

2.4. The interactions between participants and the similar solutions

The evolution of the product during the design process is carried out step by step [4], [5]. In each step, one or more partial solutions are treated. For their treatment, the designers try to come in interaction with one or more similar solutions. According to *Nigel Cross* [2], the interactions are:

- Evaluation of the options;
- Improvement of the existing solution.

3. FINDINGS

In order to identify participant's behaviour in the design process, we have first identified the activities performed by each participant, in each design session.

For every one design session, the interventions of the participants are showing in figure 3.

A good number of interventions are making by Designer (43%). The interventions of the Team Leader and the Expert are equal, approximately 28% each one.

The most used type of interventions is "c" and "j".

We can observes that in a design process, the interactions between the designers are most frequent, because the designers try to find new solutions, to answer to the design problems, to improve the existing solution, and to explore the space of solutions.

Session 1											
	The interaction types	a	b	c	d	e	f	g	h	i	j
Participant	Team Leader	5	2	1	4	4	1	1	0	0	1
	Designer	3	2	2	3	3	0	0	5	1	6
	Expert	2	2	2	0	0	2	1	1	3	1
Session 2											
	The interaction types	a	b	c	d	e	f	g	h	i	j
Participant	Team Leader	1	2	1	2	2	3	1	0	1	1
	Designer	3	3	4	2	4	0	0	3	2	4
	Expert	1	1	4	0	2	1	2	3	2	1
Session 3											
	The interaction types	a	b	c	d	e	f	g	h	i	j
Participant	Team Leader	1	2	3	3	3	3	1	0	0	3
	Designer	3	2	2	3	2	0	0	3	2	5
	Expert	0	2	2	0	0	2	1	2	2	1

Fig. 3. ***The interactions between the participants in the design experiment***

4. CONCLUSION

The issues addressed in this article concerning the interactions in the design process are the subject of many studies today. This analysis provides those who are interested a vision on the behaviour of the participants to the design process, on how to build a team of specialists and how to interact they, in different circumstances.

For the team leader is important to know how to manage the project activities and, to coordinate the team of design, to mediate the conflicts, to optimize the flux of information.

REFERENCES

[1] Anghel, D-C., Belu, N., (2005), The interactions between designers, in the concurrent engineering context, International Conference on Integrated Engineering C2I 2005 Timisoara-Romania.

[2] Cross, N., (1997), Descriptive models of creative design: application to an example, Design Studies, vol. 18, Issue 4, pages 427-435.

[3] Jones, J. C., (1970), Design Methods, New York, John Wiley & Sons.

[4] OSBORNE, S., M. (1993), Product development cycle time characterization through modeling of process iteration, PhD Thesis, MIT.

[5] Pahl, G., Beitz, W. (1996), Engineering Design: A systematic approach, Springer-Verlag.