

# A Kids' Club Model for Innovation Creation between Business Life and School Students; The Intelligent Door Project

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## Abstract

*Kids' Club, university-based technology club, and a company, Abloy Oy, created an intelligent door system in a collaborative innovation creation project. The model applied in project, that works between school students and the company, is a combination of modern learning concepts and a model for a software project. The model is proposed especially to support beneficial collaboration between the educational community, school students, and the company.*

## 1. Introduction

Collaborative projects between companies and school students are seldom reported, except sponsor support for activities and school students visiting companies. Only in some cases school students have also been included in different phases of a product design or testing [3]. In the Kids' Club technology club we wanted to create two-way collaboration between the Kids' Club children participating in the club activities and the company in innovation creation, where both actors benefit and can learn from each other. In this paper, we present this model based on experiences we have had in Kids' Club.

Kids' Club [4] is a technology club for children and young people and the research laboratory of educational technology at the Department of Computer Science, University of Joensuu. Since 2001 Kids' Club has functioned and provided a platform for developing applications and educational methods of educational technology. Kids' Club is based on concretizing socio-cultural [9] and constructionist [7] views on learning using concretization tools, like programmable robots or, in this case, door automation. These make possible inventive learning that emphasizes creative problem

solving and creating of new artifacts by observing different solutions.

The common goal of the Intelligent Door Project was to create an intelligent door system designed and realized by children participating in Kids' Club with help of the Kids' Club tutors and company's (Abloy Oy [1]) experts. In order to stimulate an inventive atmosphere, the goals of the Intelligent Door Project were rather loosely defined. The project plan provided the framework, within which the actual project work would happen. However, it was important to tie the goals with the children's, the company's, and the educational community's needs.

The goal for children was to create a concrete, physical system, which was bound to the context of intelligent door. Thus, the Kids' Club children had a possibility to become acquainted with technology used in real life situations and to learn to build and program a system that includes many kinds of technology. In this way, their understanding of the applied technical tool increased and so-called black box thinking changed to glass box thinking [8].

The company, Abloy Oy, had set three goals for the collaborative project. The first goal was to motivate young people to work in cooperation with industry. The second goal was to get novel ideas that could be improved and designed for products. The third goal was to remodel the image of the company.

The Kids' Club tutors and researchers, wanted to seek novel ways of collaboration between the company and children as their goal. It was thought that mere sponsorship was not enough; a deeper and more meaningful model for collaboration was needed.

The goals served also as research questions for the project. From the researchers' point of view, the most interesting question to be answered was to find and define a model for collaboration between a company and children. In addition to the process, also the

physical outcome (the intelligent door system and its definition) of it was interesting. The method, which the researchers used during the project, was participatory action research [2]. The researchers were actively participating in the club sessions and making observations. In addition to researchers' observations, the children were asked to make reflections and self-assessments after each club session throughout the project. Also the company's representatives were asked to reflect on their participation on club sessions.

## 2. Case study

Collaboration with Abloy Oy started with a visit to their manufacturing plant in Joensuu in February 2003. During the visit, a decision to find ways to collaborate in a meaningful manner was made. Abloy Oy and the tutors of Kids' Club founded the Intelligent Door Project on June 2003 after collaborative design process and mutual acceptance of the project plan.

The active participants of the project were five Kids' Club children aged 13 to 15, five Kids' Club tutors and five representatives from Abloy Oy. The project was realized within 10 club meetings during the fall 2003.

### 2.1. Project Work

The project work began with creation of software components by the tutors to help the Kids' Club children take advantage of different technical parts used in the project. These components were later introduced to the children in such a manner that they could operate with them and understand their function and construction. The children began the project with the conceptual modeling phase. The children, the tutors and the Abloy Oy's visiting members collaboratively created a mind map about the concept of the door. From the mind map the children chose things that they wanted to include in their system. The mind map remained in use until the end of the project and was used to reflect the progress they had done.

After the conceptual modeling phase, the Kids' Club children started to create the system they had designed. They decided their project roles independently according to their expertise and interests. Some special counseling was given to help the children to understand some features of the system work by the tutors and by the professionals from Abloy Oy. During the project the children kept a shared project diary where they reflected on their progress. The children also reflected on their learning

by answering the questions in the Virtual Reflection Tool, Virre [5].

The children and tutors presented the intelligent door system at Abloy Oy in December 2003. All project participants were responsible and took part in writing the project report. Collaborative publishing let the children to see how the company and the tutors appreciated and evaluated their work. It also made the work more transparent, since it showed all the goals for the project and how they were met during the project.

## 3. Analysis of Results

The results are three-fold: the intelligent door as a physical artifact, a model for collaboration between the school students and a company, and experiences from each of participant groups.

### 3.1. Door as the Physical Artifact

The technological environment of an intelligent door has a PC, a keyboard, a touch screen, a motion sensor, Abloy Oy's electronically operated model door and electronic locking system. All the pieces of the system were connected to the PC and programmed with Visual Basic.

The program, that control function of the door, was operated with a help of a touch screen and it was based on user profiles. According to these profiles, the system decided who was allowed to enter the door. The door included also a message system which can be seen as an expansion of the traditional concept of the door.

### 3.2. The Model for Collaborative Innovation Creation

The model used in this project with the Kids' Club children and the company was based on modern learning concepts and on a model for software project [6]. The model for collaborative innovation creation is proposed to support beneficial collaboration between educational community and companies. The key parts in our model are:

*Preparations:* setting up the initial requirements with the clients (young people, companies), creating a project plan providing the general framework for the project according to the requirements and, where applicable, providing the prepared tools and software components.

*Actual project work:* conceptual modeling of the problem area using creative problem solving methods,

software design done according to the conceptual model, coding, testing and documenting by counseling the experts available and reflection in comparison to the conceptual model. The last phase has been done throughout the project work in a side of the other phases.

Reflection of outcomes were done by comparing outcomes to expected outcomes with the clients, evaluating the working through reflection, and producing the final documentation of the project and creating future development plan.

### 3.3. Experiences

**3.3.1. Kids' Club Children.** The Kids' Club children learned about programming, designing and planning, working practices and subject matter during the project. The children concretely understood the importance of version management and learned to use good programming manners.

Counseling given by engineers of Abloy Oy or the Kids' Club tutors supported the Kids' Club children's glass box thinking. Other advantages for the children were getting an impression about engineers' work and learning about project-based working style in a self-guided way.

**3.3.2. Kids' Club Tutors.** An industrial project requires tutors to give the children detailed information and support concerning principles of operations as well as keeping to the schedule. From the tutors' viewpoint, the collaboration was successful and provided clear benefits to both parties.

Time requirements and evaluating of the time needed is one topic for further development in a project that uses open-ended problems and inventive learning. From the tutors' point of view it is also important to plan how tasks can be shared so that all participants have meaningful tasks throughout the whole project without been tied too tightly into areas of expertise. Research should be an integral part of the whole process, not only an analysis of the final products at the end.

**3.3.3. Abloy Oy.** Compared to a conventional sponsoring, the company's commitment to the collaborative project brought them more benefit than merely the positive changes in their public image. The Kids' Club group perceives Abloy Oy as an attractive company that implements high technology. Interviews of Abloy's engineers indicated that they received the needed stimulus and novel solutions in their work. The mind map generated in the beginning phase will be

used in development work by Abloy Oy. The final version of the intelligent door system received an enthusiastic reception at Abloy Oy.

## 4. Concluding Remarks

According to the feedback from the children, the tutors, and Abloy Oy the project succeeded. The planned goals were reached and the collaborative innovation creation project has continued with the theme of the learning door throughout the year 2004 and early 2005. In the Learning Door Project, the model has been developed further by bringing the Kids' Club children into even more crucial role in the project by introducing them from the very beginning of the project planning.

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