

# From Novice to Expert: The Iterative Travails of a Hatching Design Practitioner (A Panoramic Overview)

## ABSTRACT

Based on my tacit knowledge as new design graduate, especially one from Chemistry background, reflecting on some of my recent past experiences I have come to realize that designing of artefacts is a ever dynamic contraption of somewhat convolutions of factors; from idealism to reality to vision and sometimes individual desires. It can only be likened to a cauldron of sporadic explosions from a chain of controlled random nuclear explosions.

## Keywords

Learning; Design Process; Iterative; Participatory Design; Reflections

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## 1. INTRODUCTION

The aim of this paper is to present how my empirical knowledge and observations had revealed to me how social factors such as emotions, communication, collaboration, learning, etc could influence the outcome of certain scientific experiments and research activities. As a hatching design practitioner, coming from a background in the field of science (Chemistry) which is known for its bias for the strict scientific methods of the basic pattern: Experiment leading to Observation, leading to Conclusion based on hard data which must always give the same result anywhere in the world provided the physical conditions are kept constant, my experience of the design process and activities, especially that of participatory design, appeared to be a kind of never-ending story, where the end of one major activity is usually turning into an initiating stage for a new one. This assertion is exemplified by the study of three process plants in Denmark namely: Tuborg-Fredericia, Sønderborg. Wastewater Treatment Plant and Danfoss-Nordborg's Electroplating Waste Control Plant, between November 2003 and April 2004, for Masters degree dissertation project was transformed into one main design concept and an artifact named *Flashback*; and how some of the jettisoned concepts from the same project metamorphosed into three new design concepts tagged *Reveal*[14]. Another interesting case mentioned in this paper is how a once abandoned project focusing on feeding bottle related ailments when revisited, not only portray a good illustration of Participatory design potentials, but ended in innovative, patentable concept (*SOS Nursing Packs*) leading to further research and knowledge sharing in the academia and also a worthwhile collaboration with the industry.

### 1.1 Background of the research

Both projects were commenced with ethnographic field studies of the chosen context; such as the afore-mentioned work places in the case of *Flashback*, with the aim of sighting opportunities for initiating design activities.

In the case of making of *Flashback*, two basic research questions were posed for the project:

1. How can Pervasive/Ubiquitous computing technologies be employed to enhance social interactions among process plant workers?
2. What is the best way to design, a functional and ergonomic artifact which will fit seamlessly into the workaday activities of process plant workers?

The project revealed that the day-to-day running of the Process Plants is directly dependent on the alarm messages and, documented logs of routine as well as special or uncommon alarms; and that the record of these alarms (Log records), were

used to predict and hence plan [21] how to run the plants in the nearest future.

## 1.2 Methodology

The approach for executing the project was of two basic directions:

1. Concurrent ethnographic fieldworks [10], observations and interviews.
2. Participatory Design, which entails co-authoring of the emerging artifact through workshops and iterative [6; 2] refining of concepts by returning to the users.

## 1.3 Visualization as a way of effective communication

According to Davies: “A design method based around participatory design through visualization and active involvement has previously been formulated and shown to be effective in a number of workplace design cases (Ehn et al.,1996; Wilson, 1999). The crux of this method centres on envisionment – using visual and experimental media to find a common language for a design team participating in the design of a work place. [Davies, 2004] This supports the fact that visual objects such as mock-ups, sketches, video cards, cultural probes, etc enhances dialogue [7] between all the stakeholders [2] in a design process.

## 1.4 Learning at work

The newcomer has to learn by doing, [14] “*It is follow the leader system here.*” Poul, an experienced electrician at the wastewater plant, commented. The set goal of the project was how to enhance social interactions such as learning through tangible interface among process plant workers. How they communicate with each other and also perform their computer aided tasks daily [22], and how they build also their competence through collaboration and learning from one another [13].

## 1.5 Trying on the User’s shoe

As a way out of the design dilemma, a workshop involving a group design professionals at the Mads Clausen Institute for Product Innovation was held on the 29<sup>th</sup> of March 2004. The workshop was targeted at inviting the participants, who are all members of the design community [18] into the world of the process plant workers. To experience how these people are compelled to hear through another person’s ear, see with another person’s eyes and feel through other’s hands, daily, because instructions and feedbacks are channeled via mobile phones. Short video clips of the field studies [1] was presented to all the participants, but none of the video was on the collaborative design workshops with the user, for fear of influencing their creativity later on when they would be required to *tinker* [12] up three tangible user interfaces for the process plant workers.

A brief reflection [19] session was held to evaluate shared meaning [13]. The most important aspect of the exercise was how it helped to reveal the fact that users do know what is best for them and a good design will always emerge from good synergy of ideas from all stakeholders, [2; 8] particularly the users.



**Figure 1: Tinkering session and two of the emerged early prototypes**

## 1.6 Why involve the Users in the design process?

It is necessary to involve the prospective users in the design of the artifact from the very beginning because “*Complex design problems require more knowledge than any single person possesses because the knowledge relevant to a problem is usually distributed among stakeholders. Bringing different and often controversial points of view together to create a shared understanding among these stakeholders can lead to new insights, new ideas, and new artifacts.*” [2] Inasmuch as the people expected to use the final product would do so in the context of their everyday work, it is quite logical to visit their work places, where all the action is taking place, [2; 5] for context-awareness for the emerging artifact.

Involving the user has the following implications:

- Involving the user in the design of new artefact enhances the usability of the product,
- Involving the user brings the designer into the context environment for the emerging artefact.
- Involving the user assures the designer that there is a market for his product.
- Involving the user exposes the faults in the product at a very early stage and thus saves energy, money and time.
- Involving the user increases the designer’s knowledge of other people’s work and expertise.



**Figure 2: Boundary Objects in the hand of the user provokes creativity and facilitates dialogue.**

## 2. Design Dilemma that gave birth to the Robotic Mobile Phone idea

### 2.1 Error in contextualizing

Early in the design process, the reception of alarms was taught to be the most important aspect of the daily activities of the

process plant workers; hence an effective way for relaying the alarms was focused upon as the most important way of supporting their work. A device which is designed to move and project alarms from two extended arms was proposed and developed. Returning to the users revealed that this concept would not affect their routine in any manner, because they receive over fifty alarm messages in a day and only the uncommon alarm and what is learnt from the alarms towards building their own competence is the interesting aspect.

The concept of a mobile device that respond tangibly to sound input also appeared interesting, hence the idea of a Robotic Mobile Phone, which can perform tactile movements relatively to specified sound impulses was saved for future development. The idea involves basically conversion of electrical impulses, separated into different amplitudes and frequencies into motions and gestures (Motic Sound Display System-MSDS).



**Figure 3: Electronic prototype of the Motic Sound Display System which developed into the concept of the Programmable Puppets (PROPS)**



**Figure 4: Alarm history tokens (RF-ID based or memory device) is inserted into the device for learning about past alarm history, training exercise or sharing new experience.**

## 2.2 Gender Issues

Demographically, there is quite a higher population of men to that of women at the process plants. The highest population of women found actively involved in process plant works during this research was four, two of which were student interns at the brewery. One of the remaining two worked at the office at the Brewery, while the other one takes care of the laboratory at the wastewater plant. It was confirmed by the workers that not many women could be found in active process plants across the country. The question now is whether the features of the emerging artefact should be basically for men or should it have any consideration for women also [20].



**Figure 5: Mock ups representing the final design concept presented at the end of project**

## 3. Taking it a step further

After presentation of the final design concept, it was apparent that there was room for improvement. It is always tempting to add to ones design while answering questions that pop up during presentations of the final concept, but this could be suicidal for the designer, because it removes the floor from under your feet. You are seen as not having done your job well enough before coming to the public.

In this project, it was revealed after a careful re-examination of the workshops, interviews and ethnographic field studies that there was room for re-designing the interfaces and the interaction styles in a manner that will make the artifact to blend further seamlessly into the work-a-day activities of the user [12]. Some key features, such as idea of placing the camera in the pocket so as to make free both hands of the active worker who want to record his activities without inhibiting progress of the task was revisited. Also the concept of viewing without having to hold the device while viewing the worker is learning or collaborating with remote colleague and the importance of the Log records for the successful operation of the Plant and the former informed two new concepts:

- Physical Placing of the device on machines or equipment of choice to generate and browse the history of the tagged machine, or to browse the Log of the previous and predicted activities. It follows the analogy of the touch-and-see interaction style of the tester-screwdriver tool used by electricians to differentiate between a live wire and ground or earth.
- Direct mounting of the device on the user's head is generated from the synthesis of all the desirable functionalities and also as a way to favor complete freedom of the hands, good positioning of the camera and the possibility of generating larger view of desired information as a superimposed virtual/holographic [11] images of similar repair exercise in the view of the worker as virtual guide for the task at hand as a form of "see and copy" concept.



**Figure 6: Head mounted concept for Flashback device, with its foldable visor, projecting the Log of the equipment's activities like hologram in the view of the worker; the projected image can also be pictures or video footages of past repair activities by the experienced for situated, peripheral learning at the scene of problem solving by the novice**

## 4. THE SOS NURSING PACKS' CASE

With respect to the earlier mentioned seemingly abandoned research project on feeding bottle ailments resulting in deaths of up to 1.5 million infants annually (in the developing nations), which was later pursued purely from the personal interest and desire of the design team, who had to self-finance the project. The project warranted trips to West Africa for both the problem definition and later in February 2005, was rounded off with a trip to Nigeria for user-feedback on the final design concept-a completely disposable aseptic nursing packs as a

substitute for the conventional feeding bottle, requiring repeated washing and sterilizing.

### 5. WHEN AM I DONE IN THE DESIGN PROCESS?

When is the project completed? Is it when the final concept is acceptable to the user to the satisfaction of the designer's drive or when the research fund runs dry? There are so many underlying, factors which escape the ordinary eyes inherent in every design project; especially if it is to involve ethnographic field study of the context space and direct participation of the targeted user.

It is common knowledge for every design tasks, that initiation of a project is often aimed at fulfilling certain specific, creative, imaginative desires of the designer. In other cases, it is the invitation of design practitioners by concerned stakeholders or the owners of the problems [Arias] that spur the designer's sense of creativity based on his understanding of the context for the design task.

Care must however be taken to ensure that the designer's *object world* [5] –favorite, vague ideas does not becloud him over the essentials of the context of the task at hand. It may be a good idea for him to learn to *kill his darling ideas* in order to explore deeper, all the possible resilient options. At the onset of the *Flashback* project, the darling concept was predominantly centered on tangible interface. Coming out of this box materialize into the head-mounted device concept.

From my little experience as a design student maturing into a design professional, I have observed that of all the factors affecting the process of designing user-friendly artifacts, availability of fund, absence or presence of stakeholders in the industrial sector seemed to be most prominent of all the limiting factors.

An attempt was made to represent this observation hypothetically so that it could be tested on other Participatory Design Projects in order to explore its validity. A statement was coined, which appears like a mathematical statement, it is yet to be validated:

*The outcome of any Participatory Design exercise is a function of the number of different methods adopted, the available research funds and the length of research period, provided that the commitment of the designer is kept constant throughout the process.*

Mathematically, this can for example, be expressed as:

$$f(O[P:D]) = (F[\$, \pounds, \text{€}..] \times M[1, 2..] \times P[\text{weeks}]) * K \quad (1)$$

Where:

*O* is outcome of Participatory Design exercise – unit not yet defined, but could be in percentage.

*F* is research fund in standard, international currency, e.g. U.S Dollars, G.B Pounds or the Euro.

*M* is the number of different types of method or techniques adopted for the research, e.g. Concurrent ethnography, culture probe, etc.

*T* is the period (in weeks) it takes to complete the design task.

\**K* is a constant, but a special one because it represents the commitment factor of the designer's commitment, which by nature cannot be a rigid factor. It may be an idea for this factor to have values from 0.0 to 1.

As scientific as it may appear, this equation had been debunked on the grounds that it is so generic in some quarters, but it is yet mentioned in this paper for the purpose of inviting further critiques. It is aimed at provoking the academia into exploring the possibility of a common ground conception of the driving factors influencing every Participatory Design task.

### CONCLUSION

From these few examples, I could deduce that design activities are more like a never ending story in nature, because the purported "Final Presentation" is situated and only a resting stage waiting for the appropriate fuelling factor, such as request from stakeholders, or review of the project by the academia, which will spark off a new chain of design activities, involving the pioneering designer(s) or a new set of interest group.

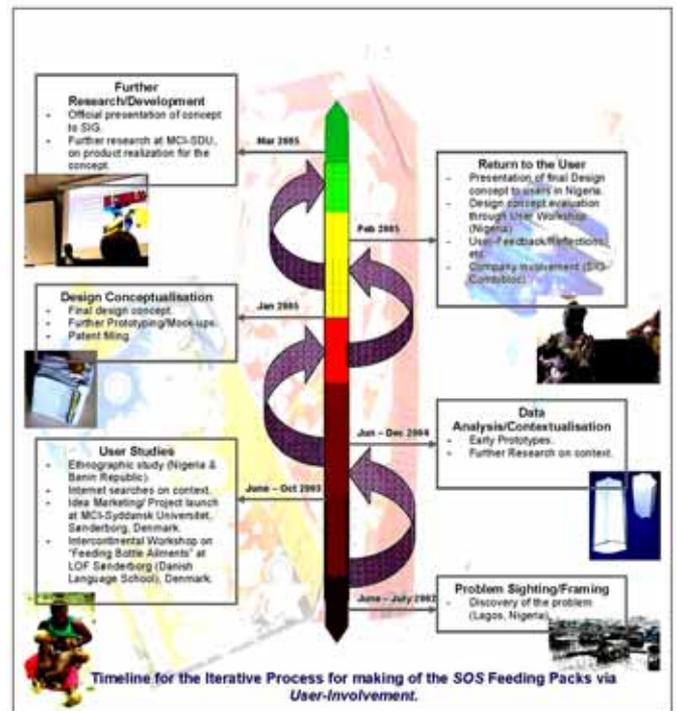


Figure 7: Timeline for the iterative process for the SOS feeding packs relating the fact that one peak in a design process is usually the initiation of a new line of design activities

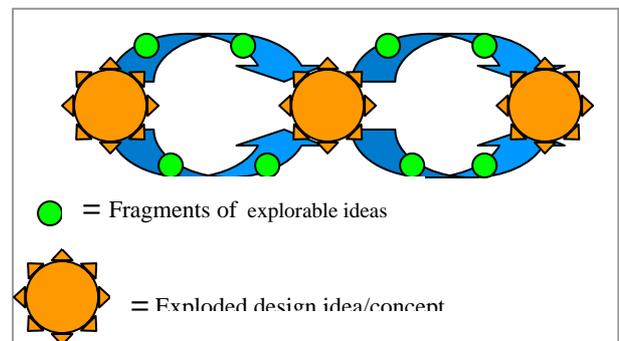


Figure 8: Analytic overview of design activities as a continuum of interrelated activities

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