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FROM BUSINESS TO BUTTONS

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1. Introduction

Companies and institutions are increasingly dependent on IT products as value-creating instruments in their everyday activities. Information technology permeates everything from supporting, to business critical, processes. In fact, few businesses could survive without Information Technology, and how well IT works has a direct impact on the bottom line.
Each year companies invest huge amounts of money in Information Technology. The rationale behind these, like all other investments, is that they will help the company to achieve certain business goals, e.g. gain competitive advantages, increased market share, etc. Investment decisions are often made from a product perspective. The means to reach a certain business goal may therefore e.g. be an "Intranet", or a "CRM system".
The public image of these products is often promoted with a language more appropriate for a religious saviour than for a technological solution. It is therefore not strange that IT investments often are treated as if the expected benefits will "appear" the moment that the product is in place. We believe that this gap between business value and the actual design of a product is one of the main reasons why many IT projects exceed time estimates and budgets, and why many IT products do not generate the expected business benefits once the development project is finished.

2. The missing link

In people's minds the mere concept of an IT product (e.g. an Intranet) creates the business value, even though all stakeholders have her own idea of how the business value is created (which attributes of the imaginary product that generates the business value).
However, the development of IT products is in fact an endeavour including millions of design decisions, even when the product is based on standard applications such as SAP R3. Designing IT products includes decisions about such diverse areas as content, ergonomics, cultural issues, work processes and so on. Since IT products mostly serve organizations (not single users) in handling information processes (not simple flows) to meet some expected business value (not simple functions), the design of such products are very complex. In the optimal development process, every design decision would increase the probability that the product will generate the expected business value. However, due to the fact that the focus of systems development is rarely the product's quality-in-use [Ehn 1997], there is no effective way of telling whether the design decision will actually generate the business value or not. What often seems to be forgotten is that the generated business value corresponds to the level of usage (number of users who actually use the product) and the product's quality-in-use (effectiveness, efficiency and user satisfaction when the product is used). In other words, business value is generated through product usage.
As soon as an IT development projects starts, the focus seems to shift from business to system and

from goals to requirements. Most software development methods seem to be based on the assumption that if a satisfactory analysis has been done, the problems that hinder the business are identified, and when the problems are identified, the solutions are given [Stolterman 1991]. Löwgren [1995] draws a general but expressive picture when describing engineering design as follows:

> *"Engineering design assumes that the "problem" to be solved is comprehensively and precisely described, preferably in the form of a requirement specification. The mission of engineering design is to find a solution to the problem. The solution must satisfy the requirements and other constraints, such as cost or performance. Engineering design work is amenable to structured descriptions and seen as a chain of transformations from the abstract (requirements) to the concrete (resulting artefact)."* [Löwgren 1995]

Misunderstanding user requirements is a common problem in IT-projects, leading to need for rework, thus causing projects to exceed time and budgets [Lederer and Prassad 1992, Kiel et al. 1998]. We strongly suspect that these misunderstandings can be avoided if goals are explicitly defined, and ideas, functions and design details are be coupled with these goals and thereby made visible. This is a design process based on goals instead of requirements, and, as Löwgren's creative design it focuses just as much on understanding the problem as the resulting artefact [Löwgren 1995]. Goal Cards provide help in clarifying the design task.

One of the biggest problems in IT development is that design decisions are rarely made explicit during the development of the system. This means that there is no description of how the imaginary product will create expected values that will lead to the desired business goals, i.e. which attributes in the product contributes to the expected values and to what extent. Many design decisions are made without having the product's quality-in-use in focus. Instead, design decisions rely heavily on the experience and knowledge of the project members. At best, project members and project managers have firm ideas of how the expected business value will emerge from the new IT product, and they will strive to see to it that the product comprises attributes that creates this expected value. However, there is no effective business and usage based technique for discussing potential design decisions, or for explaining the rationale behind design decisions. The most severe problems due to this lack of directed design process is the relative inability to prioritise ideas about new functions and handle changes in functionality as well as in scope. In addition, many design decisions are based on lengthy and emotional discussions, adding up to substantial time wasted. In worst case, decisions are made that steers the product's presentation, behaviour and content away from those attributes needed to create business value.

In order to come to terms with these problems we suggest that the chain of reasoning behind those design decisions that have a direct impact on the business value should be made explicit. We call this practitioner's tool Goal Cards.

3. Goal Cards

To bridge the gap between the Business Goals and the product in use which should, - at least in theory, be a real world manifestation of the Business Goals we have designed a tool called "Goal Cards". Goal Cards describes the product at three different levels of detail:

- Business Goals and the Expected Business Benefits, which describes the Business enhancements in terms of goals.
- Usage Goals and the Expected Usage Benefits, which describe how the Business enhancements will manifest themselves when the product is used.
- Steps, that describe all measures taken to fulfil the Usage Goal

Goal Cards formulates a hypothesis stating: *Why?* (Business Goals), *How?* (Usage Goals) and *What?*" (Steps), that is evaluated, reformulated and refined as the design process progresses.

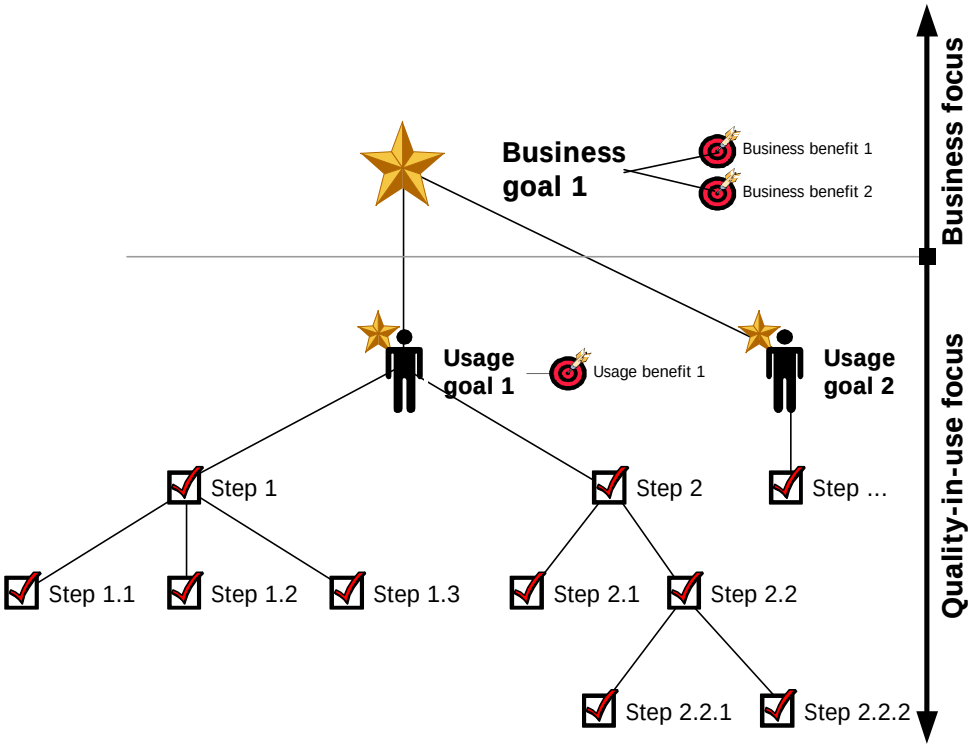

Figure 1. A map describing the relations between Business Goals, Usage Goals and Steps

3.1 Business Goal

The Business Goal defines the business reasons for building the product, and thus answers the question:

"Why are we building this product?"

A product can have one or several Business Goals. Each Business Goal should describe an expected change, or a strive to resist unanticipated changes, relating to the business (e.g. to increase, decrease, improve or maintain something). If there are multiple Business Goals, they should be prioritised in order to facilitate design decisions. A typical Business Goal for a manufacturing business could e.g. be:

Business goal 1: To significantly increase the efficiency in order handling

Business Goals are important for pointing out desired changes in the business, but they do not help us to decide if and when the changes are realized and the Business Goal is met. Therefore a Business Goal should have one or many measures that in some way define when a Business Goal is realised. We call these measures Business Benefits. Relevant Business Benefits for the example above could e.g. be:

Business Benefits

Business benefit 1: By the year 2002 the system should handle 30.000 orders, by 2003 40.000, and by 2005 50.000 orders.

Business benefit 2: Maximum handling time should be 2 weeks per order, average handling time should be 1 week.

The example is from the manufacturing business, but Business Goals can be formulated for non-commercial projects as well.

3.2 Usage Goals

The Usage Goals defines how the Business Goals will be achieved when the product is used, and answer the question:

"How can one ensure that the Business Goals will be achieved?"

Every Business Goal has one or many Usage Goals and a Usage Goal can support one or many Business Goals. If there is more than one Usage Goal they should be prioritised. A Usage Goal focuses on a single aspect of how the product in use will contribute to the Business Goal, for example:

Business Goal: *To significantly increase efficiency in order handling*

Usage Goals:

Usage goal 1: Decrease the number of incomplete orders received by Order Managers

Usage goal 2: Increase the number of Order Managers who use the IT-system instead of pen and paper

A Usage Goal should have one or many Usage Benefits connected to it. The Usage Benefits are quantified and tells us how to measure if a Usage Goal is achieved. A relevant Usage Benefit for a Usage Goal could be:

Usage Goal: *Decrease the number of incomplete orders received by Order Managers*

Usage Benefits:

Usage benefit 1: 90% of the orders sent to the Order Manager should be accepted for further processing. The number of orders with the status "Incomplete" will be measured.

Usage benefit 2: 80% of the orders that are marked "incomplete" should be correct after being re-processed once.

Since a Usage Goal always describes aspects of the product in use, it obviously has a direct effect on the users. In order to handle users with different needs it is quite effective to categorise them into User Groups. A User Group describes distinct usage patterns for a group of users. One Usage Goal often has one primary User Group but may have none or several secondary User Groups. User Groups are similar to Personas [Cooper 1999] but do not necessary have to be described as fictive persons.

Defining relevant Usage Goals requires at least:

- Business information: Business goals or some other form of information that describes the expected benefits.
- Usage information: Information about user groups and their intentions, values, usage patterns, requirements and so on.

The most important thing to notice about Usage Goals is that together they form a foundation that clearly states which assumptions the design will be built upon. The definition of usage goals is therefore in a sense the first iteration in the design process, and that the usage goals forms a hypothesis telling us how the Business Goals will be achieved.

3.3 Steps

The Steps describes how the Usage Goals will be achieved, and answers the question:

"What steps are required to ensure that the Usage Goals will be achieved?"

Every Usage Goal has one or many Steps and one Step can support one or many Usage Goals. A Step usually have one or many sub Steps and describes a concrete action taken to fulfil the Usage Goal:

Usage Goal: Decrease the number of incomplete orders received by Order Managers

Steps:

- ☑ Step 1: Simplify the Order Form
  - ☑ Step 1.1: Remove fields that are not used by the Customer
  - ☑ Step 1.2: Validate field input
  - ☑ Step 1.3: Make it possible to attach files with complementary order information
- ☑ Step 2: Facilitate informal information exchange between Order Manager and Customer
  - ☑ Step 2.1: Add a text field for informal information in the Order Form
  - ☑ Step 2.2: Create a message log for every Order
    - ☑ Step 2.2.1: The message log shall support threaded messages
    - ☑ Step 2.2.2: It must be possible for the Order Manager to see if there are new messages added to the order when they process a Order

There are basically two main types of Steps:

- Steps that prescribe how to design the features, functions and content of the product.
- Steps that facilitate that the product is *used to the expected extent*. For example steps for supporting the organisational and individual change process, learning or training programs, marketing and information activities and product support.

4. Using Goal Cards

Creating a Goal Cards is a highly dynamic and iterative process that in order to form an overall idea of what should be achieved early in the process focuses on high level goals. Details describing how to achieve the Usage Benefits are added as the work progresses. A Goal Card is iterative in the sense that it is driven by formulating a hypothesis stating: *Why?* (Business Goals), *How?* (Usage Goals) and *What?* (Steps). This hypothesis is then evaluated, reformulated and refined as the process progresses. The process is dynamic since it allows information on different levels (from Business Goals to implementation specific requirements) to coexist and support each other throughout the design process.

Business and Usage Goals support the forming of a common understanding of what a project should achieve. This means that different perspectives, ideas and functions are discussed and expressed with the Usage Goals as a common point of reference.

The creation of Goal Cards starts with gathering Business Information and Usage Information. With this information as a starting point the first step is to formulate a hypothesis of which Business Goals and Usage Goals best defines the expected business enhancements. Normally when gathering information and defining goals, steps and measures that focus on the solution are expressed and identified "since there can be no pure analysis" [Gedenryd 1998]. The steps often describe low-level design issues and can be very distractive if they are pursued too far before the goals are defined. A better way of handling them is to briefly describe them and then add them to the Goal Card for later reviewing in the light of the Business and Usage Goals.

The process of forming the Business and Usage Goals can be performed during or after the gathering of Business Information and Usage Information. The most important thing to remember is to make

sure that the goals form an hypothesis that confidently answer the following questions:

Business Goal: "Is this enough to describe the desired changes in the business?"
"Does this quantify the desired Business Benefits?"
Usage Goals: "Is this enough to achieve all Business Goals?"
"Is this enough to satisfy all User Groups?"

When the goals are confidently defined, different perspectives, ideas, functions, activities, design elements and different kinds of requirements are discussed and formulated as Steps as long as they help to achieve the Usage Goals. If not, they are set aside to be reviewed when changes are made to Business Goals, Usage Goals or high-level Steps. Formulating Steps is a process that tests the validity of the goal hypothesis and serves as a "reality check" stating the question:

Steps: "Will this help us to achieve the Usage Goal?"

If the answer to the question is "no" then consider adding more Steps or consider reformulation the Usage Goals. This is repeated throughout the design process and results in more and more refined Goal Cards that at all times clearly shows the design decisions and the assumptions they are based upon.

Formulating Steps usually means that multidisciplinary competences in a project team work together to define the relevant Steps. As skilled practitioners they are proficient in generating design decisions, but often have problem expressing the underlying perspectives and values that the design decisions are based upon. This can cause problems in understanding each other's points of view, and lengthy, endless discussions. In this situation, the Usage Goals serve as a catalyst that encourages different perspectives to be expressed in terms of *usage* instead of design solutions. This often helps to bridge different perspectives and even leads to a better understanding between the project member's points of view, thus making Goal Cards a good multidisciplinary design tool.

5. Experiences from using Goal Cards

So far Goal Cards has been used in two different projects, and the results are promising. In the first project, which aimed at developing a component ordering system, the main purpose of the goal cards was to help the project to create measurements to define success criteria for the project and as a base for future development. The project was a success, and the project members found the support from the Goal Cards very positive. The most apparent benefit was the tangible mapping between the requirements, functions, ideas and the Usage Goals. In the second project, an Internet based history teaching tool, the project participants had extremely different backgrounds, ranging from artists to programmers. In this case the primary benefit of the Goal Card was that it really helped the project team to form common view of the product design despite different perspectives.

Other benefits with Goal Cards that we have discovered so far include:

- Business, usage, and design issues are gathered and presented together and the different perspectives they represent have to be considered as a whole.
- Steps that describe product design and to what extent a product should be used are defined early and are equally important.
- The different levels in the Goal Card form a chain of reasoning from a Business Goal to a single design decision, and vice versa, that support traceability.

6. Related research and summary

Goal Cards differs from the concept of design rationale in the sense that it describes expected business and usage effects for any product decision, thus creating a chain of reasoning that can be reviewed by all stakeholders. A possible future development is to integrate Goal Cards with Process-Oriented Design Rationale approaches [Louridas & Loucopoulos 2000], and thereby making it possible to describe how and why the Goal Cards are changed over time.

Our approach resembles somehow the activity Usability Goal Setting as defined by Mayhew [1999]. However, our approach demands that the Business Goals are made explicit, and that Usage Goals are defined as means to achieve Business Goals. Furthermore Usage Goals are not pointing out how they are measured the way Usability Goals are, which means that one Usage Goal can have many Usage

Benefits. This indicates the possibility that many design elements can support one Usage Goal. We believe that the Goal Cards approach shows greater strength to serve as means for supporting IT-projects in the design process, since it strongly supports traceability. Furthermore, Business Goals and Usage Goals are inspired by Coopers description of Corporate Goals and Practical Goals [Cooper 1996] but are more tightly coupled to each other and more formalized.

Future work includes trying out different visualization techniques of Goal Cards for different purposes and users. Today one card is created for each level, i.e. one card for all Business Goals, one card for all Usage Goals and one card per Usage Goal together with all associated Steps. We are currently pursuing two interesting techniques:

- Mind Maps, which we think could be useful mainly for visualisation when forming the Business and Usage Goals and for creating a map that provides an overview that is easy to grasp for all members in the project.
- Associative networks, mainly used for creating special views e.g. a design view, a function view, or a requirements view. The idea is to start with the Goal Cards structure and then create new views by connecting relevant parts of the Goal Cards. This can for example be to connect all steps that are functions to a Functions view.

A very promising work process to find usage goals is Declaration of System Usability as described by Comstock and Duane [1996]. This work process could be a successful approach to gain commitment in defining business and Usage goals in a project team.

The conclusion is that Goal Cards is a useful tool for practitioners supporting and charting the often perilous journey “from Business to Buttons”.

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