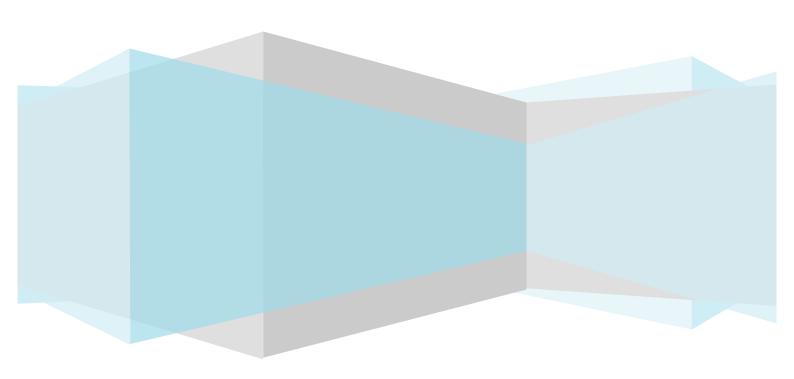
# **Short Cycle Product Creation Processes**

**DB501** 



Assignor:

prof.dr.ir. Brombacher

#### Students:

Ehsan Baha Edward Drabovitch Meriete Horst Paula Kassenaar Sebastiaan Pijnappel Christian Sallustro

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#### 1. Introduction

The first half of this report analyzes the product creation process of the Philips CD-i using the Ishikawa model for initial problem definition, consequently applying IDEF, DSM and MRI to analyze and model the process lifecycle, inter process relations and information flows. The second half starts by shortly discussing current business trends. These, along with conclusions from the analysis of the CD-i are then used to formulate changes to the CD-i's product creation process needed to successfully create a similar product within the current market.

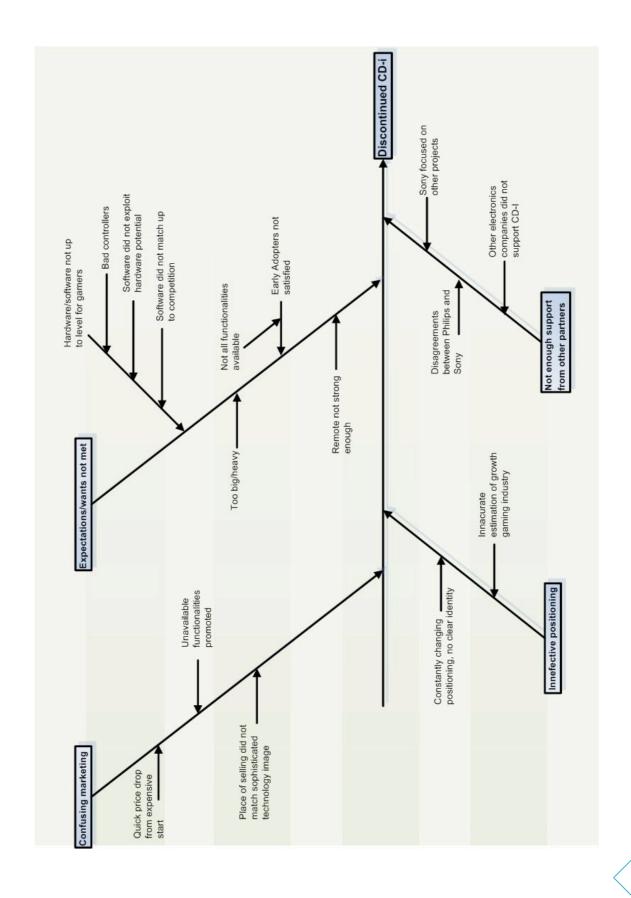
## 2. Problem Description

In 1991 Philips launched an interactive multimedia player called the CD-i (Compact Disc Interactive) into the market. What should have become "the family entertainment system of tomorrow" [2], featuring interactivity and the ability to play various CD based media, ended up selling only a million players since market introduction. This happened despite large amount of money spent on development and promotion. Moreover various strategy changes and various repositioning attempts to adjust to the market changes and previous setbacks were unfruitful. The product was discontinued in 1996, ending nearly a billion US dollars in losses for Philips.

Initial marketing strategy presented the CD-i as a multimedia platform for all ages. Furthermore several versions for the professional market were produced. Starting in 1994 the system was promoted as a gaming platform. [3, 4]

The problem obviously occurs in the user phase of the product's lifecycle, as buying or not buying the product is part of the user phase [1]. However the origin of the low sales might be located in other (and in more then one) phases of the product lifecycle.

## 3.1 Ishikawa model



## 3.2 Ishikawa description

#### 3.2.1 Confusing marketing

Initially the CD-i was promoted as the "imagination machine", focusing on the wide range of functionalities. At release not all of these where available though, which caused confusion. [2]

Another thing was the price: high to start with, but lowered considerable already after the first few weeks. Frustrating and confusing for early adopters who had just bought the device for a much higher price. [10]

Finally, the CD-i was marketed as a sophisticated technological machine, but was sold in shops that did not match the image of CD-i (e.g. Sears and Circuit City). [2]

#### 3.2.2 Expectations/wants not met

As mentioned, early on, there was a discrepancy between expectations and what was actually delivered. Early adopters were disillusioned when they found out some of the promoted functionalities were not present in the system they just bought. This may have been a potential cause of bad worth of mouth. [2]

When the CD-i was marketed as a gaming console, another group of customers was disappointed. The quality of the games did not live up to the wants of gamers, who were by then already awaiting the more powerful and cheap Sega Saturn and Playstation. [3, 8]

Much of the software available at launch were gaming titles. Philips did not expect this to be a problem since the potential buyers were thought to be married with children and therefore assumed to be satisfied with the gaming titles. However early adopters were also looking to be the first ones to have the newest technology. Their wants were not represented in the initial software offer. [2]

A disadvantage of the CD-i was the excessive size and weight of the product compared to products on the market. This also disappointed the users. [5, 6]

At the CD-i's release, VCR players were a common appliance in households, occupying the space underneath the TV. As a result many people placed the CD-i next to the TV. A result was that signals of the CD-i's remote were often not picked up. This had a negative effect on the user experience, resulting in bad word of mouth. The design of the standard remote was not altered because a stronger remote was already on the market. Philips just did not include the stronger remote in the package with the CD-i system. [2]

#### 3.2.3 Ineffective positioning

In the late 80's and early 90's a lot of consumer electronics companies saw a big future for the gaming industry. They focused a lot of R&D on this subject and later came up with valued consoles like the Sony Playstation.

Philips, with the development of the CD-I, obviously saw more potential in the broader info- and edutainment sector, especially for families. If Philips would have anticipated the enormous growth of the gaming industry they might have focused the development of the CD-I towards a good gaming experience, which might have majorly increased their changes within this industry. [9], (see timeline)

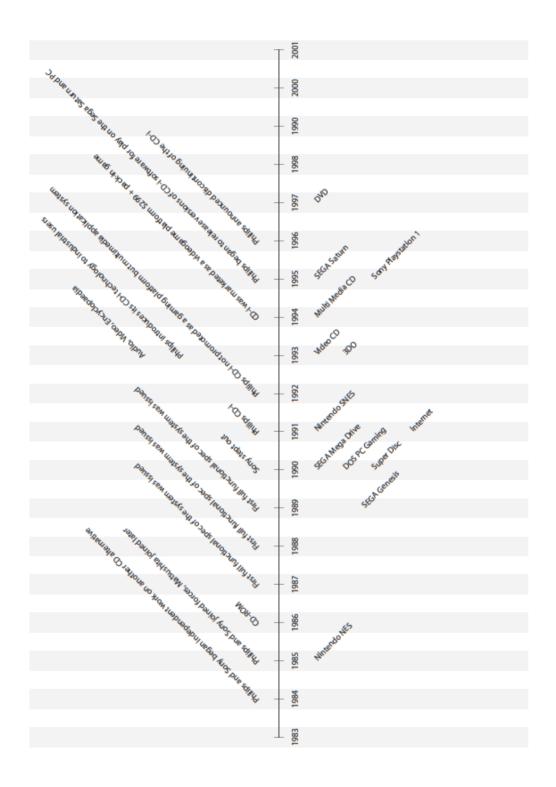
Philips first positioned the CD-I as an info- and edutainment system for families. After three years they switched to marketing it as a gaming console. These positioning changes prohibited the CD-I from having one strong identity. Adding to this was the fact that the name was even kept the same. This was quite confusing to customers. [7] (see timeline).

#### 3.2.4 Not enough support from other partners

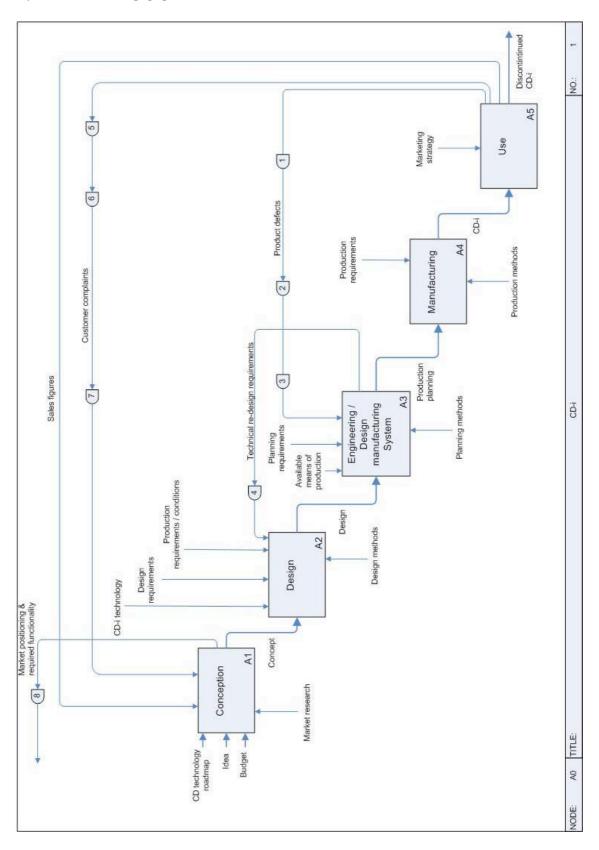
Philips has made attempts to cooperate with other partners on the creation of the CD-I, for instance their long-term cooperation with Sony. Sony eventually backed out of the project. Philips tried to launch the CD-I as the new standard in home entertainment, but there were not enough companies that also believed in the CD-I system to help in the development of software or related products for the CD-I system. This lowered the chance for the CD-I to succeed.

A reason for Sony to back up the CD-I project might have been their disagreements in the past. Sony and Philips for instance had a quarrel about the standard for audio CD's. This may have been influencing their business relationship negatively. Speculatively, one could also reason that Sony's focus on the development of the Playstation was another reason for them to not invest further in the CD-I.

#### Timeline CD-I development



# 4. IDEF model



#### 4.1 Description of the IDEF model

There are five stages in de IDEFO. The conception stage input comes from the upper management in Amsterdam. They decide what products Philips will produce at what cost, and give the initiation for ideas, in this case the CD technology road map. A control for this phase is after the first iteration of the five phases, namely the feedback on sales figures and customer complains. Market research about the competitors, users and consumer electronic fairs were methods that influenced the conception phase. From the conception phase the concept derives, and is the input for the design phase. The design phase is controlled by CD-i technology, design requirements, technical redesign requirements and production requirements/conditions. Big companies like Philips often apply standardized design methods, which were the basic mechanism for the design phase. The design will be communicated to the engineering/design manufacturing system phase.

The main controls for this phase are available means of production and planning requirements. Furthermore the feedback from product defects will control the process of the engineering/design manufacturing system phase. The main mechanisms were planning methods at this stage. As a result of this stage a planning for the production is made, and is communicated to manufacturing.

The production requirement controls the manufacturing phase and the production methods were a means to execute the actual production. The CD-i product is the end product after this phase, and is being put on the market.

In the use phase the marketing strategy decides how the product is promoted on the market, which influences the people it attracts as target users. From this phase several feedback loops will derive; sales figures, product defects and customer complaints.

#### 4.2 Feedback loops

The first feedback loop from the use phase is product defects. When the user encounters a broken product or when a product is returned to retail within 8 days, the product is send back by retail to manufacturing without questions asked. The delay (1) is that it takes time before the product malfunctions or the user can make the decision not to want the product. In the first case the time before the problem is encountered can vary a lot, but in the second case we know it would be within 8 days (otherwise it would be categorized as customer complaints). The second delay (2) is that it takes an estimated time of two weeks before the retail sends the product back to manufacturing. Manufacturing will test the product, and when the same failures are often encountered, this will be communicated to engineering/design manufacturing system. This delay (3) until the engineering/design manufacturing system it will be over 2 months, because multiple products need to be tested to be able to draw conclusions. The loop from customer complaints towards the conception department also encounters multiple delays. The first delay (4) is from the user. Customer dissatisfaction typically becomes more apparent after a period of four weeks after purchase, after the "high" of having your beautiful new product has passed and you become more critical and willing to admit, because you are now using it in your daily life. Then one has to put themselves to go to the retailer and actually fill out the complaint form, which then has to be sent back to Philips. This delay (5) will take about 2 weeks. Finally there will be a major delay. The complaints have to be analyzed and interpreted. To be able to have a good image of the problems, there has to be an amount x of complaints to be able to analyze. Logically analyzing a collection of complaints and translating the data to conclusions will take time. We assigned a minimum delay (6) period of three months to this and analyzing sales figures. The sales figures give the marketing people in the conception phase an idea of how well the product is received. Together with the customer complains this will give reasons to give recommendation on marketing strategy, to for instance reposition

the product, or do other design recommendations. This will be communicated to the department in Amsterdam, and the design department.

#### DSM model

#### 5.1 DSM model

	A	В	С	D	E	F		
Д		×						
В	x					x		
0		x		×				
D			x			x		
E				x				
F					×			
				Ci .				
Д	Pre-process							
В	Conception							
С	Design							
D	Engineering / Design manufacturing system							
E	Manufacturing							
F	Use							

#### 5.2 DSM description

A Design Structure Matrix models dependencies and information flows for a process divided in several steps. In our case the steps of the process are the function boxes of our IDEF model. In this matrix you can see that each step in the process sends information to the following step. This is for instance the 'Design' that is communicated from the design phase to the engineering phase.

The interesting information flows are the feedback loops that are depicted in the top half of the DSM matrix. As already described in the IDEF model you can see that there is feedback loop from use phase to engineering and design phase. There is a feedback loop from engineering phase to design phase. And the last feedback loop goes from conception to pre-process phase. The pre-process phase coincides with the general management in Amsterdam.

The quality of these information flows will be described in the Maturity Index on Reliability.

#### 6. MIR model

Product Defects information loop: Use → Engineering

This loop concerns product defects and consists of returned products. Customers take back the product to the retailer, who then sends it back to manufacturing. They test the device, with two possible outcomes:

The device is defective → manufacturing communicates to engineering.

The device is not defective → reason of return remains unknown. The customer might have been unsatisfied, e.g. because certain expected functionalities weren't there and the machine was therefore perceived as a defect.

This loop is at level 1 MIR. A test is executed to determine where the defects occurred in the product, the problems are thus analyzed, which would mean level 2 MIR. However this is by no means complete, since not finding any physical defects means the analysis is stopped at that point.

Technical Re-Design Requirements information loop: Engineering → Design
This loop concerns technical re-design requirements. In Philips there are continuously
technical novelties. Engineering can make those novelties known for the designers,
which encourages them to implement the novelties in a next version of the CD-i. This loop
is at level 2 MIR since there is explicit communication about the chance for improvement
is and why it should be changed. Also technical defects that were discovered through
returned devices can be communicated in this feedback loop. Since there is no way to
implement newly arising possibilities for improvement in the design of the process this
loop is at its highest quality level.

Sales Figures information loop: Use → Conception

This loop simply concerns sales numbers. Low sales numbers can be interpreted as reason to worry and change strategy or product for Philips. However, no information about the reason for the low sales is contained within this loop, making it level 1 MIR.

Customer Complaints information loop: Use → Conception

This second loop from use to conception concerns customer complaint forms, which customers were required to file if they wanted to return a product eight days or more past the purchase date. Filed complaint forms are sent to conception through customer service at Philips (causing a delay). Conception then receives the complaints and then handles them in one of three ways:

No translation to recommendations (e.g. the mentioned remote control problems were never translated to changes to the product)

Design recommendations for small changes for the next version of the CD-i Recommendations for major design changes (e.g. repositioning CD-i as a game console), which then had to be approved of by Upper Marketing Amsterdam, taking up a lot of time. This loop is level 2 MIR, as specific information about the nature of the problem is filed by the customer.

Market Positioning & Required Functionality information loop: Conception → Upper management Amsterdam

In case conception formulates recommendations for changes to the CD-i this might significantly influence the concept of the CD-i. But those big changes have to be approved of by the upper management in Amsterdam. This causes big delays, amongst others caused by troublesome discussions. This information is level 2 MIR: it tells where what is wrong with a design and how it should be changed, but not why it was designed in the wrong way at first.

#### 7. Conclusions

Developing revolutionary products like CD-i is always a risk for a company. With regard to the CD-I, Philips took this risk and entered the market. Soon Philips was confronted with the consequences of this risk as the sales rates came out to be low.

When things do not go well for a company adjustment is needed. This adjustment however can only be right when the cause of failure is clear. Next to clearly knowing the cause of failure, it is crucial to communicate this cause to the right department from which adjustments can take place.

Unfortunately, Philips did not have an advanced customer feedback system in its business process back then. The only feedback came from product return and it was not always clear why customers returned products (think of 8 days no questions asked return policy). For the returns that the reason(s) were clear or later became clear, a big part of this information was lost in translation simply because the feedback loops were directed towards the wrong department(s). Moreover, information sometimes not at all arrived at the right department or arrived with delay.

Not knowing why CD-i did not do well as a product on the market and not having the means to find the correct reasons immediately, was a big dilemma for Philips. This is clearly portrayed in the CD-i development timeline as the device's identity and market position has too often rambled resulting in confusion and a weak identity.

Those delays not only geared down Philips in responding to the market and competitors actions but also contributed to the withdrawal of supporting partners like e.g. Sony. This upheaval even caused no support from other companies in the first place preventing CD-i from becoming a standard. By the time Philips discovered and their Amsterdam department gave green light to market CD-i as a gaming console, they were too late. Philips was behind with experience in the gaming industry compared to its competitors (SEGA e.g.).

All of the above mentioned factors, relating to one another, caused Philips CD-i to fail and discontinue existence.

## 8. New Business Process Proposition

#### 8.1 Introduction

In redesigning the business process for CD-i like systems we first need to give a general description of: 1) what systems these are, 2) what trends one can see arising for future product developments, and 3) what trends are predicted for future business process improvements.

#### 1) What are the systems?

Future products that try to create a similar impact to what the CD-i tried to be in the 1990's are for

instance (ambient) intelligent products. These products try to enhance the world we live in and empower us by seamlessly embedding their valuable functionality in our surroundings while providing us with a joyful way to interact with them.

2) What trends are relevant to future product development in 2009? Trends that are arising in the development of these products are:

- The time-to-market shortens
- The product's complexity increases (also their intelligence)
- The complexity of the development process increases, often also due to globalization
- The customer's demand on quality and reliability of the product increases
- Responsibility of companies toward environmental issues increases (sustainability)

#### 3) What are the business process improvement trends?

Developing these types of products can be of a high risk to companies due to the above mentioned factors. Therefore there are two trends arising for building in some sort of security or fail-safe in the business process of developing these products, which are:

- trying to avoid changes late in the development process
- trying to implement a high flexibility in the design

The first business process improvement trend could be achieved for instance through conducting a risk analysis of the process before the process is executed. In this risk analysis one envisions the process taking place in theory and tries to discover the bottlenecks. One can then communicate these weak or crucial points to the different departments to give them a heads up for the execution of the development process. It should be noted through that the above is something that is becoming increasingly difficult to implement due to increasing product complexity and a higher time pressure on the development process.

The second business process improvement can be realized in creating a closer cooperation between the conception, design, and engineering departments to ensure the highest level of freedom and possibilities in creating and developing the product. This allows for different departments to boost and support each another and work more synchronized and effective. Luckily this second improvement is not necessarily made more difficult by the upcoming product development trends because globalization, for instance, allows for a higher degree in freedom of choosing suppliers.

#### 8.2 Improving the business process

Keeping this introduction in mind we can propose several points of improvement for the business process of developing (ambient) intelligent products. In describing these points of improvement we use the IDEF and MIR model of the CD-i system as a basis.

#### 8.3 Improving or adding feedback loops to the process

- We have classified customer complaint feedback loop (use to conception) as an information flow with MIR level 2. A way to upgrade this feedback loop to a MIR level 3 loop would be to analyze what the design department should have considered in their design process to avoid making the choices that led to the bad design that caused certain complaints to occur a lot. Including this knowledge in their design requirements would help them avoid making the same mistakes again. This however can go beyond a specific product. It can be beneficial for the design of more or less similar type of products. By including the knowledge of how wrong design decisions are made, the MIR level can be increased to level 4 by implementing this learning step in the business design process. In this way you move from quick, product specific fixes to prevent similar mistakes from occurring in the first place in future product.
- The technical re-design requirements feedback loop (engineering to design) is classified as an MIR level 2 feedback loop. This information flow is, to our opinion and reasoning, at its highest level. In the product development process there is a natural attention to avoiding technical defects in the design. But every now and then a technology that is considered as trustworthy fails, or new technological improvements arise that were not available yet at the time of creation. Therefore there is no way to implement these improvements in the design of the business process earlier or in a more mature way. But we do see a chance to include more information in this feedback loop by also communicating the usage re-design requirements. To explain consider this: when a product is returned and it is defect, the reason of the defect is discovered in manufacturing, communicated to engineering, and from the engineering department communicated to the design department. A solution for the defect is then embedded in the new design. But what if the product was not defected at all? A reason for a customer to return a device as defect when it is not could be that the customer expected a certain functionality that just was not present in the device. This wrong expectation could be the fault of the marketers (e.g. promoted a wrong proposition) or the designers. Including information on the origin of the problem (why exactly the product was returned) in the feedback loop would allow engineering to send non-defect issues through to marketing and design so they can adapt to these issues and make decisions concerning marketing or requirements for design accordingly. This means adding one extra feedback loop containing this information from engineering to design and conception which we called the usage re-design requirements. As products become more complex, situations in which returns are not related to defects is likely to increase, thus the business process has to be optimally adjusted to deal with this.

For this added feedback loop the same story holds as for the complaint feedback loop (use to conception). It could be improved to a MIR level 3 or even 4 feedback loop if they would consider adapting the design methods for future products to avoid making similar mistakes.

- The sales figures feedback loop (use to conception) is classified as a MIR level 1 information flow because only the sales figures are communicated back to conception. If the customers would be invited to communicate their arguments for buying the CD-i system this information flow could be of a higher quality. One way to do this is to ask the

customers to fill in a short survey in return for a discount on the product or extra product guarantee. We realize though that this is a rather naïve improvement, amongst others because customers might not feel compelled to share this information or since the information could be on a more unconscious level. More importantly, gathering this information the company only receives information from customers who already decided to buy the product. The desired information actually concerns the opinions from people who decided not to buy. More in line with the thought of preventing changes late in the creation process however, is to start involvement of potential users at several stages throughout the design and development process and then keep in touch after launch (discussed more elaborately later on). Trends show that in the future companies do not only sell a product to the customer but sell a long lasting service like experience to the customer through which the company and consumers are in touch after purchase. Great opportunity for a higher level MIR.

#### 8.4 Making feedback loops more efficient

The shortening time to market is a prominent trend. A resulting fact is that large delays in information loops start become a liability to the product even more then they already did. For example feedback from the use phase might imply changes to the design, marketing or manufacturing. This thus needs to be acted upon timely to prevent a situation where the product is outdated before the information needed to make the change even arrives at the right department. We suggest two ways of tackling this problem: on one hand by shortening delays, on the other hand by creating an information loop from use to conception/design even before the product is launched.

#### Advancing information loops:

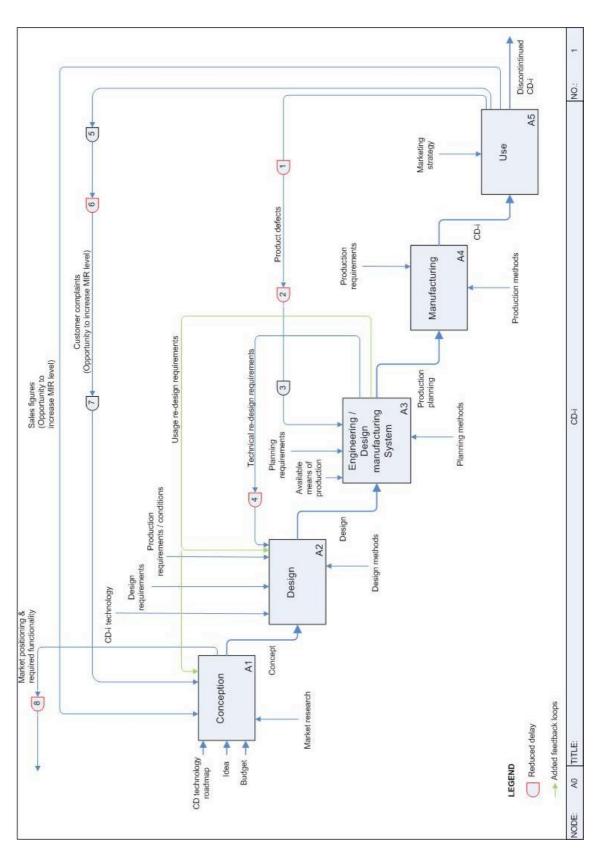
The latter basically means allowing user feedback on the product in an early stage. This mainly implies implementing in-between user input methods (e.g. focus groups or user tests). This was difficult to realize at the time of CD-I because the project was top secret, but in current practice arrangements like non-disclosure agreements make implementation of this solution well feasible. This advances the manifestation of an information loop from use to conception and design and thus partly prevents the costly and time consuming business of waiting for user feedback once the product has been launched. According changes to both marketing and the design can start to take place much sooner.

#### Shortening delays:

Within the loop of defect products there are three delays. The first delay is caused by the user because it takes time to notice that the product or part of the product malfunctions. Then the second delay is caused by the retailer to send the product to the manufacturing department. The third delay is caused by the manufacturing stage by figuring out the problem and sending the formal information to the engineering department. The last of these three could be shortened by reporting a short piece information together with the returned product in which the user indicates where exactly the error/defect occurred. This would help the manufacturing department to be more efficient in finding the problem. Another delay takes place within the within the feedback loop between engineering department and design department. If these departments partly merged or worked closer together, delay caused by information exchange could be shortened. Either department can immediately pick up on problems that concern their part of the creation process, and then come to solutions together.

Three delays can be found within the customer complaint feedback loop to the conception stage. To reduce the delays and increase information quality, the customer service unit could be integrated more with the marketing research unit. Users could call a free dedicated number to file complaints. Marketing research employees could

communicate with customer service about what questions to the user are relevant at the current phase of activities (e.g. user experience). In this way the standard procedure of asking questions becomes more dynamic, adapting to current situations and increasing value of the gained information. At the same time the communication between customer service and marketing becomes more direct.



#### 9. Conclusion

Over the years the product creation cycles have become shorter while the products are becoming more complex. In today's competing markets, with demanding customers not to forget, it is very important to react on time. Next to these, globalization causes business processes to become more complex, and because of the new areas future products address, new and unknown business changes may be required. Because of the lack of experience with new technologies an increase in product failure is bound to occur.

To reach this several changes in the business processes are needed:

The need to efficiently acquire customer feedback has become crucial. Technological advances cause high-speed developments, sometimes without any feedback. Companies sometimes have to put new versions of products on the market without knowing much about how well the previous version was received. Therefore, there is need for new business processes in which new ways of acquiring usage information are embedded. Think of how new technological advances also enable products to monitor own use and communicate this information to the company without any effort from customers.

Another important aspect is to reduce the delays in the process, by optimizing the information flows. To be able to meet the customers' expectations, a wide range of high quality information has to be generated and deployed throughout the product development process, and better contact should be maintained with the customer after purchase. This will increase the quality and reliability of the product, which are a rising demand of the customers.

When launching products with new technology, the number of products with no faults that are returned will increase. Therefore it is needed to gather more information about why the product is returned, and this method should be embedded in the process, so the root cause of the complaint can be pointed out.

Because of the shorter time span, working simultaneously in different departments is necessary, and close communication and cooperation between different departments will become a must. It is necessary to have employees who can function as a bridge between different disciplines.

Finally, we believe that one of the most important implications for future businesses are that they will have to be consciously aware of their business process. When they are aware of the way they design, produce and market a product it will be easier for them to spot the areas where they (often) make mistakes. Correcting these mistakes not only when they occur, but on an overall process level will make the company more mature, allowing it to more easily create innovative products with the highest impacts.

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